IMPACT OF A MIDDLE SCHOOL MATH ACADEMY ON LEARNING AND ATTITUDES OF MINORITY MALE STUDENTS IN AN URBAN DISTRICT

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Abstract

A growing number of single-gender and after-school programs for youth continue to gain popularity within schools despite little empirical research regarding how these programs should be designed to achieve maximum success. The present study examined the effectiveness of a comprehensive middle school male academy program in terms of student achievement and attitudes toward learning. The results indicated that students who participated in the program improved their algebra readiness and interest in mathematics. Furthermore, there were gains in students' perceived importance of assignment completion, attitudes toward learning, goals for college, and self-concept. Implications for similar programs and future studies are discussed.

Keywords: Middle School, Math Achievement, Minority Males, After-School Programs

Educational achievement and attainment of high school students has become a national concern particularly in regards to the widening performance gaps by gender (Gurin & Stephens, 2007; Hall, 2006; Noguera, 2003) and ethnicity (Howard, 2010; Singham, 1998). Overall, male minority students have fallen behind female white students in academic success (National Council for Crime and Delinquency, 2008). African-American and Hispanic male high school students are dropping out of school at higher rates and are graduating at lower rates than white female counterparts (Cataldi, Laird, & KewalRamani, & Chapman, 2009; U.S. Department of Education, 2007), which in turn has had a negative effect on university enrollments of male students (Goldin, Katz, & Kuziemko, 2006). In addition, male students, as a group, have significantly

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more referrals for discipline problems, seem to be less motivated, show less maturity, and spend less time studying than female students (Buchannan & Grabmeier, 2008). In fact, minority boys get the majority of Ds and Fs and make up 80 percent of the discipline referrals (Gurian & Stephens, 2007; Townsend, 2000). Boys are also more likely to be referred to and placed in special education courses (Harry & Klinger, 2006; Skiba, 2005; Taylor & Lorimer, (2002).

Numerous and complex reasons may explain the achievement gap, such as a lack of academic and cultural literacy, college knowledge, mentors, positive relationships, and connections to the community (Martin, Martin, Gibson, & Wilkins, 2007) and lack of positive attitudes such as self-efficacy toward mathematics (Usher, 2009). Various studies have addressed the importance of students' positive dispositions, which incorporate a tendency to reflect, a willingness to explore, confidence in the subject matter, perseverance through a challenge and interest that is sustained over time (Bagley, & Gallenberger, 1992). In mathematics, *productive disposition* refers to the tendency to perceive mathematics as both useful and worthwhile, to believe that steady effort in learning mathematics pays off, and to see oneself as an effective learner and doer of mathematics (National Research Council, 2001). Successful school initiatives to close the achievement gap shy away from "one-size fits all" solutions and move toward comprehensive approaches and systemic reform that benefit the entire school culture (Montecel, Cortez, & Cortez, 2004). In mathematics intervention, researchers suggest incorporating motivators to help students regulate their behavior and substation attention to work hard at their academics (Fuchs, Fuchs, Prentice, Burch, Hamlett, & Owen, 2003). The purpose of this study is to examine the effectiveness of a comprehensive middle school male math academy program in an urban school district. More specifically, this study explores the extent to which a middle school math academy improves male students' learning in mathematics as well as general attitudes toward schooling.

At the start of the twenty first century gender equity was not a new topic in regard to girls, but it was relatively new for boys (Taylor & Lorimier, 2002). Boys still struggle to attain the same level of academic achievement as girls, and they often do not have the same social network of support in health care and other social services as those that girls have available to them (Edley & Ruiz del Valasco, 2010). Also, females are more likely to attend and graduate from college than males (Goldin, Katz, & Kuziemko, 2006). Boys tend to suffer disproportionately from familial challenges such as limited financial or social resources or worse yet, not having a father at home (Buchmann & DiPrete, 2006). Thus, an emphasis on boys' academic success is a clearly indicated need based on the literature.

Elements of Successful Math Programs for At-Risk Students

According to the final report of the National Mathematics Advisory Panel (NMAP) (2008), "There are large, persistent disparities in mathematics achievement related to race and income—disparities that are not only devastating for individuals and families but also project poorly for the nation's future" (p. xii). The report suggests an urgent need to develop effective programs that address social, affective, and motivational factors to reduce mathematics achievement gaps among minority groups (NMAP, 2008).

Based on research about supporting at-risk students, the Institute of Education Sciences issued recommendations for assisting students struggling with mathematics. The

recommendations included screening all students to identify at-risk students, using instructional materials that focus intensely on in-depth treatment mathematics, being explicit and systematic in instruction, using common underlying structures for problem solving, using visual representations, building fluent retrieval of basic facts, monitoring the progress of students, and including motivational strategies in Tier 2 and Tier 3 interventions (Gersten et al., 2009). According to Fuchs, Fuchs, Craddock et al. (2008), Tier 2 students receive supplemental small group mathematics instruction aimed at building targeted mathematics proficiencies.

Federal reports on low achievement in math indicate that only 39 percent of students in the United States are at or above the "proficient" level in grade 8 and only 23 percent by grade 12 (U.S. Department of Education, 2007). Although students in the United States face difficulties in mathematics learning, many researchers and mathematics educators identified the learning of algebra as a central stumbling block (NMAP, 2008). The NMAP report also indicated that as the achievement gap in mathematics varies widely among different ethnic groups, starting in middle school, the need for effective intervention programs remains high for students at-risk of academic failure.

Algebra is one of five important standards from the National Council of Teachers of Mathematics (NCTM) throughout the K-12 mathematics curriculum. NCTM (2000) standards stress the need to make school mathematics, especially algebra, available for all students because "algebra is often referred to as a gatekeeper to a college education and the careers such education affords" (Kilpatrick & Izsak, 2008, p.11). It has been established that the achievement gap for minority students can lead to significant economic gaps. Being without algebra skills can limit life outcomes, especially for families where multiple-generations have not attended college (Singham, 1998).

Middle School Male Math Academy (MS/MMA) Program

The Middle School Male Math Academy MS/MMA program exists in a large urban district in California. The overarching goals of the program includes "enhancing awareness of issues that impact male students, increasing academic engagement and achievement levels of male students, with an emphasis on algebra readiness, as well as increasing opportunities for boys to interact and learn directly from college educated men, which will increase self-confidence and awareness" (Brown, n.d.).

The program had two components: one attitudinal with an emphasis on leadership and the second that emphasizes the academic component to enhance students' math achievement and to prepare them for subsequent math courses. Generally, students met for one hour twice a week after school. Once a month a session was devoted to leadership and life skills, and students participated in activities and discussions, and had the opportunity to hear selected guest speakers (Hernandez, 1995). Discussion topics included leadership development, college readiness, and time management. Students also participated in community service activities and field trips to high schools and colleges. The other sessions focused on algebra readiness and math skills development, utilizing a curriculum planned by district math coordinators and teachers. The program included algebra readiness tutorial sessions along with hands-on applied activities. At each session, students played math games, completed math puzzles, competed with playing cards, and utilized a Jeopardy-style game based on algebraic concepts.

Methods

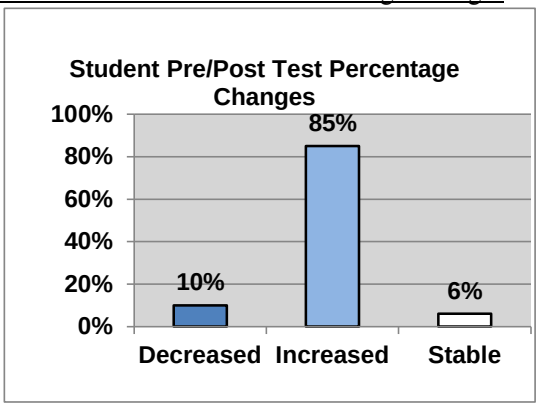
The MS/MMA program was implemented at 12 middle schools in an urban school district in California, in which approximately 240 male students are served. An average of 20 students were in the program at each middle school. The program participants were selected if they were identified as low-performing male students, with a grade point average of 1.0-2.5 and California Standards Test scores of Basic and Below Basic in mathematics. They also demonstrated potential for academic and social growth as assessed by site administration. The program as a whole had a demographic make-up of 60% Hispanics, 30% African Americans, 4% Southeast Asians and Pacific Islanders, and 6% others.

The study included the review and analysis of pre and post student math assessments and post-survey results related to student engagement, attitude toward schooling, and academic progress and aspirations for the 2009-2010 school year. Pre and post-district math assessments consisted of the administration of the practice second quarter exam as the pre-test and the administration of the actual second quarter exam as the post-test. The district research office administered a survey on the MS/MMA Program and published its results. It was based on responses from 150 middle school students who participated in the program. The survey topics included class preparedness, self-image, attitude toward learning, and future educational goals. Results of this evaluation should be interpreted with caution, as there were uncontrolled threats to internal and external validity.

Results

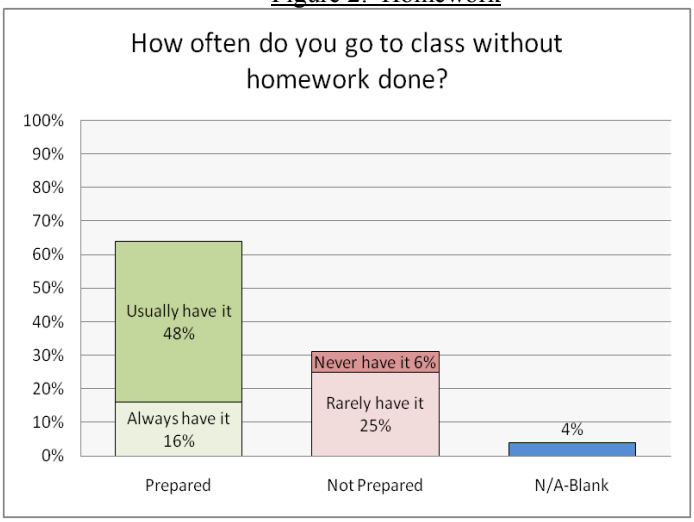
Test Changes. The MS/MMA was utilized as a targeted Tier 2 intervention to address, namely, the challenges that minority males were facing as indicated by their low scores or grades in mathematics. Pre and post district math assessments were used to measure the impact of the MS/MMA program on student achievement. The overwhelming majority of students, 85%, improved their district math assessment standard scores, while 10% of students showed decreased skills. Of those 85% of students, the average standard score increase was 26%. However, students' regular math class grades remained unchanged between the initial and final grades (see Figure 1).

Figure 1: Student Pre/Post Test Percentage Changes



Student Attitudinal Outcomes. Post-survey results at the year-end of the MS/MMA showed positive results. The survey topics included class preparedness, self-image, attitude toward learning, and future educational goals. The results were as follows: Almost two-thirds of the students (64%) stated they usually or always had their homework done before class (see Figure 2).

Figure 2: Homework



The vast majority of students had a positive self-image. They felt good about themselves (91%) and affirmed that they were leaders (78%) (see Figures 3 and 4).

Figure 3: Self Image

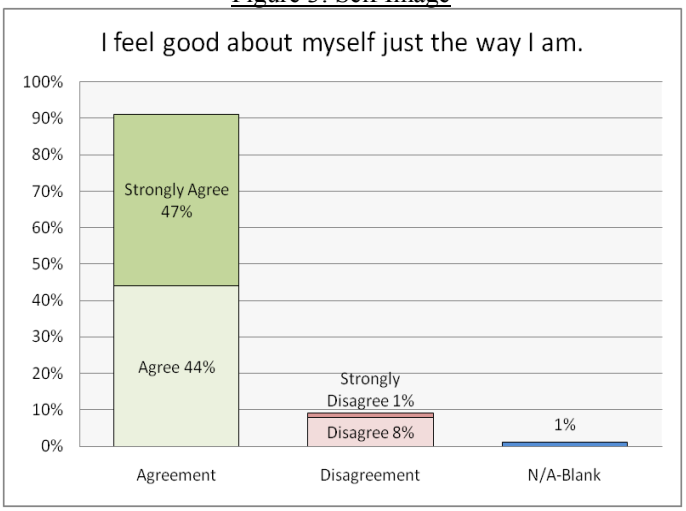
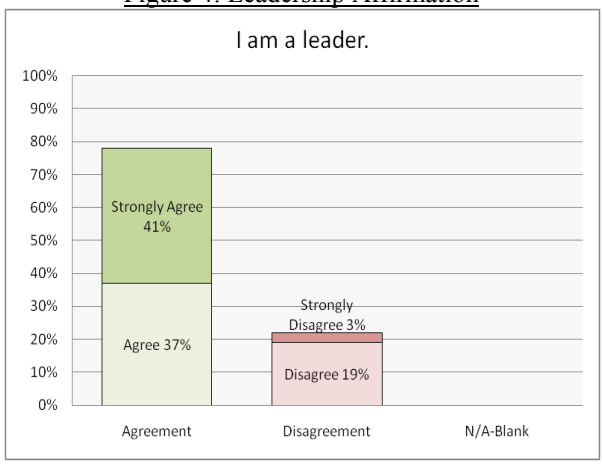


Figure 4: Leadership Affirmation



Positive School Attitudes. The overwhelming majority of students had a positive attitude toward learning. Over 90% of the students thought it was important to make good grades and believed the work they did at school was important to their future (see Figures 5 and 6).

Figure 5: Importance of Grades

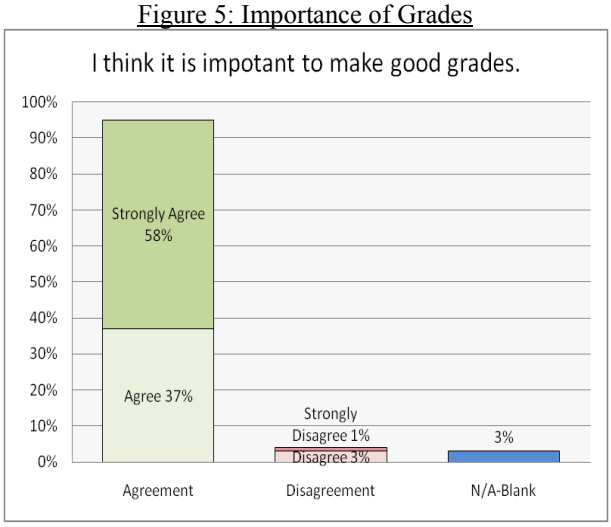


Figure 7 shows that 79% of students also understood the importance of mathematics and Figure 8 shows that 88% of students knew that they could do well if they studied and practiced often.

Figure 6: School Work and Future

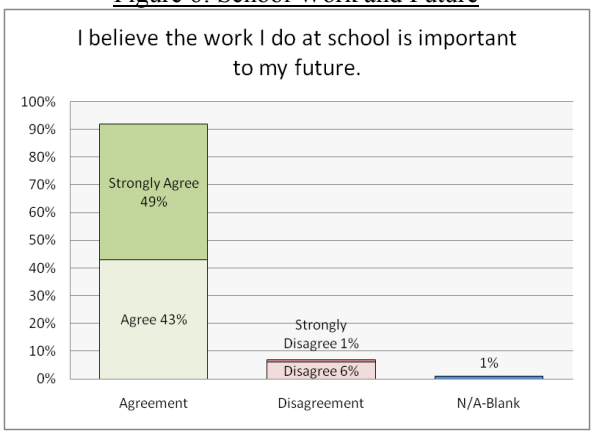


Figure 7: View of Math in Real World

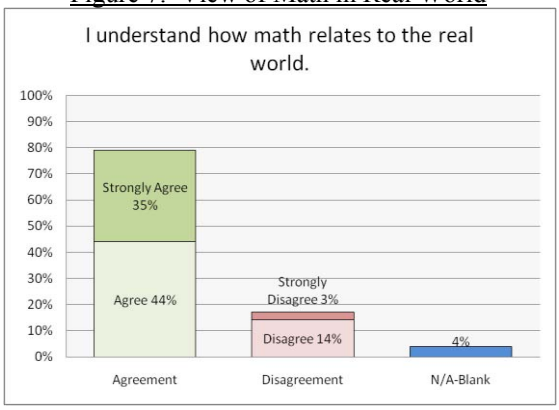
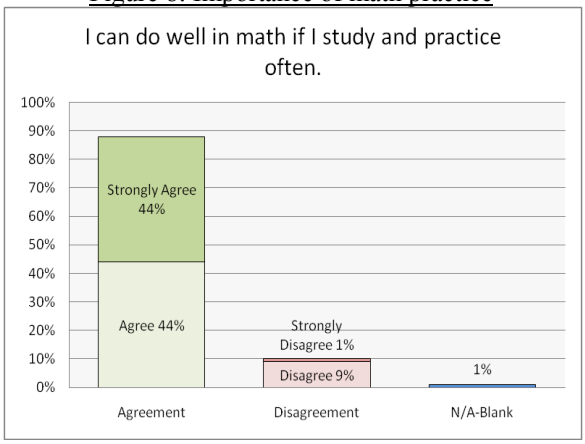


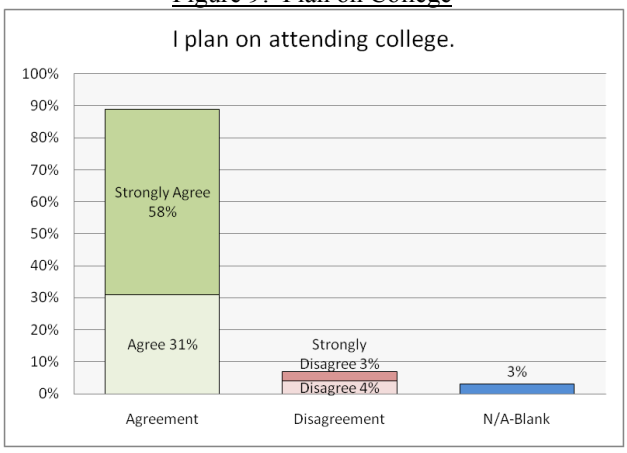
Figure 8: Importance of math practice



College Plan. The vast majority of students, 89%, planned on attending college. Although the program participants were identified as low-performing students, they demonstrated positive future aspirations (see Figure 9).

The math component of the MS/MMA program appears to be moderately effective. Students gained a greater interest in math and a new sense of empowerment with their math aptitude. The leadership component, however, was more challenging to measure. Upon general review of the program, there was little discussion and few activities related to leadership noted. It may be that recent budget cuts had a detrimental impact on that portion of the program. Teachers in the program mentioned the declining enrollment and retention, and they also attributed it to recent school-wide changes due to budget constraints.

Figure 9: Plan on College



Discussion

The results in this study show that students from the MS/MMA program not only improved their math scores on the district math assessments, but also felt their interest in math had been energized. Discussion will address attitudinal results and achievement gain, which was contextualized in our literature review by addressing the achievement gap between boys and girls, minority males in particular; elements of successful math programs for at-risk students; and the importance of algebra in middle school. Also, ideas on how to enhance the leadership component of the program will be discussed. Finally, implications for researchers will be given at the end of this section.

Impact of Positive Results on the Achievement Gap

Minority youth and the achievement gap have been of great concern to researchers (Singham, 1998) and practitioners (Skiba, 2005). The finding that over 91 percent of the participants indicated a high self-concept as demonstrated by the statement, "I feel good about myself just the way I am," is not surprising according to researchers in this area (Graham, Taylor, & Hundley, 1998). Although counter-intuitive, nearly two

decades of research (Graham, 1994) has shown that underrepresented minority students, especially males (Taylor & Graham, 2007), have had high levels of self-conceptualization, even though they may struggle at academics. This finding is thus consistent with the literature. Moreover, their perceptions of admirable and respected peers led to their nominating low-achieving peers in the aforementioned studies. This is in stark contrast to African American and Latina girls, as well as white boys who nominated high achieving peers as respected and admired.

At the beginning of the program there were concerns that students did not value the importance of education. Results have shown that 95 percent of the students agreed that it is important to make good grades and that over 92 percent of the students believed that their schoolwork was important to their life. However, *academic performance* is not just attitudes. It is one of several components of school engagement, which should be considered when qualifying or quantifying growth in this area for students as well as staff member's promotion of school engagement. Therefore the suggestion for continued success with the program is to emphasize the importance of students' reinforcing each other as peers who are high achievers and ready for college, despite the real or perceived obstacles of systemic racism as indicated by statistics in the school or cultural setting (Rueda, 2004). These include low math or other academic scores for minority males, lack of resources, and/or limited achievement of peers who are the same gender and background but a few years older than them. In the tradition of Paulo Freire (1970), students must become the ones who encourage not only each other but also others in their community if a substantive change is to be made in a district with a trend of low achievement of by minority boys.

Again, another positive indicator is that 89 percent of the students planned on attending college. An emphasis on "border crossing" or "multi-cultural navigation" may help the final 11 percent of students to see college as a more viable option (Carter, 2005; McKinney & Denton, 2006). Hall (2006) recommended a school-based mentoring curriculum that includes; arts-based activities, reflective writing, conflict resolution skill-development, discussion of relevant social-cultural topics, brotherhood, and a critical analysis of the boys' current situations within the district and the city. Another recommendation is a sense of agency (Stanton-Salazar, 2001) and purpose in reaching out to younger students to help them navigate their path towards graduation and the potential of collegiate success (Perry, 2003).

Elements of Success in Math Programs for At-Risk Students

Successful school initiatives use comprehensive approaches (Montecel, Cortez, & Cortez, 2004), that focus on promoting positive disposition (National Research Council, 2001) to motivate students to work hard at their academics (Fuchs et al, 2006). This program improved students' positive dispositions relating to their attitude, confidence, and beliefs. One incident of important improvement from this project was that about 64 percent of students usually or always submitted their homework on time, a crucial skill needed for academic success (Learning Points Associates, 2009). Miller (2001) suggested hands-on activities are very important in this type of program particularly because they engage students who may be discouraged and "turned off" by school. The mathematics hands-on activities in this program made a connection between math content and real-world application, which enhanced students' belief in mathematics learning.

Enhancing Leadership Components of the Program for Educators

Although it is significant that 81 percent of the young men saw themselves as leaders, nearly 20 percent of the students left the program still unsure about their roles as leaders. This may also be due to developmental ages. There was a lack of consistency of "leadership" or "character" education across the programs. However, as (Vigil, 2002) noted, when "segregated, underfunded, and inferior schools" do not provide tangible opportunities in impoverished neighborhoods, "the motivations and strategies for seeking higher status begin in the family but are formally forged in the education systems". However, if that status is not attained, Vigil stated, "being pragmatic, [students] assume they won't realize their dreams" (p. 9). Soon, "street socialization alienates youths from what is learned in the schools, while societal discrimination and economic injustice further endure allegiance to convention commitments" (Vigil, 2002, p.12). Truancy of students who have to drop out due to suspensions, lack of high school credits toward a diploma, or apathy can lead to students coming together for negative reasons such as gang activity. Fortunately, this was a middle school program, which can begin to highlight the need for long-term planning as well as reinforcing peer achievement that can help generate success and better engage students in school.

Eaton (2010) stated that issues to address in staff development include concentrated neighborhood poverty and understanding of environments that give rise to disruptive behavior, which often leads administrators, faculty, and staff to adopt policies that seek to control students rather than include them. Therefore, to eliminate racial and gender disparities in school discipline, educators must learn to recognize and respond to racial biases when they are making discipline and academic programming decisions (Rueda, 2004; Skiba, 2005; Townsend, 2000). The recommendations here were to provide ongoing professional development and coaching for teachers and to develop a clear set of student learning objectives in the area of culturally competent leadership development (Lindsey, Martinez, & Lindsey, 2007).

Suggestions for Similar Studies

According to Jimmerson, Campos, and Greif (2003), the measure of academic performance in mathematics, overall GPA, and students' own indicators of importance are in line with the construct of student engagement in the literature. Other indicators such as *classroom performance*, which may include individual on-task behavior, assignment completion, and/or referrals to the front office, should be included as well. Other areas connected to school engagement are the frequency and quantity of *extracurricular engagement and whether* students being more involved in school activities will bring out another facet of school engagement. As indicated earlier, *interpersonal relationships* regarding peers' admiration and respect for academic-success should be reviewed. Finally, the *school community* tie should be included and could be measured by questions that ask about students' feelings toward the school and the school community members.

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