The Effects of After School Math Clubs on County Benchmark Scores

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Abstract

The purpose of this study was to determine whether after school math clubs would have an effect on Anne Arundel County Public Schools math benchmark scores. The measurement tool used was the AACPS Math Benchmark 1 and Benchmark 2 assessments. This study involved collecting data after Benchmark 1 and 2 were given to students in the test group. After analyzing the data, students were placed in the math club. The math club met once a week during which time students reviewed previous skills taught. The results showed no significant differences in benchmark scores after participating in an After School Math Club.
CHAPTER I
INTRODUCTION

Overview

As with many elementary schools in mid to low socioeconomic areas, the study school has low scores on county benchmark assessments, particularly in fourth grade math. Every year with each math benchmark assessment teachers sit down and try to determine with which skills the students are struggling. Many of these low scores are coming from the boys and English Language Learner students. At the study school, the staff and administration are focusing on what can be done to raise the scores of these targeted students. Math teachers want to do whatever they can to help raise the achievement of their students. When looking at the data from these benchmarks, the researcher realized that there was a need to assist these struggling students in some way. It was determined that one way teachers could help these struggling students was to form an after school math club. The intention of a math club was to review and pre-teach skills to these struggling students in hopes to boost achievement on future county benchmarks.

Math achievement in elementary school is of the utmost importance. The math skills that students learn in kindergarten through fifth grade are the basis of what they will learn throughout the rest of their schooling. If they are struggling in elementary school, chances are they will continue to struggle in middle and high school, a challenge that is not at all what educators want for our students. Math achievement is critical for all students. In fact, it is considered to be the strongest predictor for college success (Sciarra & Seirup, 2008). As teachers, we want students to have the skills that they need to be successful. Sometimes this means putting in the extra effort to ensure that they master these basic skills.
Unfortunately there can be severe consequences for students who struggle in mathematics. Much of daily life revolves in some way around mathematics; this could be career-related or simply keeping track of our finances. If students specifically and people in general do not have a strong background in math such tasks could become problematic. Many students who struggle in elementary school will not have a solid math foundation and will continue to struggle in both middle and high school.

Just like reading is related to academic language, math is reflective of a specific academic language. Math has two types of language, words and symbols. Although math might be considered a universal language, it can be difficult for any student to understand. (Freeman & Crawford, 2008). In order to really help students grasp all of the concepts being taught in math teachers need to make sure that the “language” is also being used. Many struggling students simply just do not know the math language, and that, in itself, creates a huge barrier. This is especially true for the ESL students. These students already have a language barrier and now they must in essence learn an entire new language just to be able to follow along in math.

**Statement of Problem**

This study was designed to identify the impact of after school math clubs on the math benchmarks achievement of struggling math students.

**Hypothesis**

There will be no difference in the math benchmark achievement of fourth grade struggling students who participate in an after school math club and students who do not participate in the math club.
Operational Definitions

The variables in this study will be after school math clubs and benchmark achievement.

After school math clubs- Students have been placed in an after school math club because of their low achievement on county benchmark assessments.

Benchmark achievement- The benchmark achievement of these students will be monitored over the course of one school year. These benchmarks are designed by the county and are given three times per school year. The benchmark assessments are cumulative and assess the students on the material that they have learned since the beginning of the school year.

Struggling students- The students that were chosen for this group earned a score of 70% or below on the first benchmark. Not only did these students not only scored low on the assessment but the instructor noticed that they had poor basic math skills also. They lacked fluency in both basic math addition facts and multiplication facts.
CHAPTER II

REVIEW OF THE LITERATURE

County Benchmark scores have long since been a point of contention for teachers in Anne Arundel County. School districts across Maryland are under pressure to show rising test scores to parents and school officials. County benchmark testing is one way to show this progress or lack thereof. In order to ensure that all students are making adequate progress, teachers need to help students better understand the material that is taught in class and assist them in learning how to retain that material. After school math clubs are one way to boost student achievement on county benchmark tests. Finding the right strategies to use during an after school math club could be just what students need to succeed in math.

Motivation to be Successful in Math

Motivation, which is defined as the general desire or willingness to do something, plays a large part in the success rate of students. This is a challenge that teachers face on a daily basis. Motivating students can be very difficult; it is ultimately the teacher’s responsibility to find interesting and intriguing ways to interest each of their students in order to be successful.

According to (McClelland, 1961; McClelland & Winter, 1969) the need for achievement is one of the psychological motives that play an important role in success and achievements of a man. Motivation as an academic engagement refers to “cognitive, emotional, and behavioral indicators of student investment in and attachment to education” (Tucker, Zayco, & Herman, 2002, p. 477). Many students are intrinsically motivated to succeed in school, but there are also many who are not. These students need to find the motivation to come from other sources such as parents, teachers, or even other students. People with high achievement motivation will act in ways that help them outperform others, meet or surpass some standard of excellence, or do something
unique (Schmidt & Frieze, 1997). All students are influenced by a need to achieve to a certain degree. Those students, who hold a high desire of success, work hard to achieve.

Many studies have examined motivation based on mastery of material and performance goals. Some students may in fact be motivated to achieve more once they have mastered a skill whereas other students may be motivated simply by performance in an area. Elliot and McGregor’s (2001) model of achievement motivation discusses two broad classes of goals: mastery goals (i.e. to “master” the task at hand) and performance goals, demonstrating superior performance relative to others. Research indicates that when students adopt mastery goals, they tend to engage in more effective cognitive processing strategies.

An individual’s concept plays a large part in academic success. A student’s feeling toward a certain subject can influence the way he or she demonstrates knowledge at any given time. It may be understood as individuals’ feelings or confidence levels in accomplishing particular academic tasks. Chowdhury and Pati (1997) assert that ‘self-concept plays a significant role in the educational process when a child is accepted, approved, respected and liked, one will have an opportunity to acquire an attitude of self-acceptance and respect for one’s self. Years of research have shown that the way students feel about themselves contributes to success in an academic setting.

**Support from Parents and Teachers**

It is widely thought that parents’ involvement in their children's education is associated with a variety of benefits, including higher achievement. The problem is that many parents are not as involved in their children’s education as teachers would like or that is beneficial to the child. It would be helpful for both parents and teachers to be on the same page with regards to
the student’s education. There are many parents who are completely disconnected from their child’s education. Not only are they lacking direct communication with the school, they are not even asking questions once the child gets home in the afternoon. "Just asking your child how was their school day and showing genuine interest in the learning that they are doing can have the same impact as hours of private tutoring. It is something every parent can do, no matter what their education level or social background,” said Schieder (New York Times, p. 11 2011).

Something as simple as reading with your child can lay the foundation for academic success in later years. For instance, the PISA study revealed that "students whose parents reported that they had read a book with their child every day or almost ‘every day’ or ‘once or twice a week’ during the first year of primary school have markedly higher scores in PISA 2009 than students whose parents reported that they had read a book with their child 'never or almost never' or only 'once or twice a month.' On average, the score difference was 25 points, the equivalent of well over half a school year." (New York Times, 2011, p. 11). Many parents do not realize that it is the little things that count. Simply taking a few minutes each night to show a child that the parent is interested in what they are doing at school can create a lifelong learner who is successful. Students need to know that someone cares, and it is helpful when the support system involves both the parents and the teachers.

**Math Clubs and Tutoring**

Since No Child Left Behind was introduced, many school districts have been looking for ways to raise test scores and maintain adequate yearly progress. Math clubs and tutoring sessions are one option that many schools are exploring.
Math clubs and tutoring services are widely available in just about all areas of the state. The problem is that many students, however, are not taking advantage of these services. What students do not understand is that, by attending math clubs or tutoring sessions, they can potentially boost their achievement in math. One of the issues with math clubs and tutoring is that the students who are in need of these services do not view the extra help as anything except more work. As such there is a need to find ways to make these extra help sessions fun and appealing to students. One way to entice these students is with food. A fifth grade teacher in Arlington Virginia recently started a “Breakfast Club.” Her intentions were to help her students reach grade level by meeting twice a week for 45 minutes. Students focused on multiplication facts and other basic math concepts during these meetings. Students really loved the experience. According to one student, “It’s fun to come in and have breakfast with your teacher, even if you’re doing long division,” Pfoutz (p. 8).

Many teachers overlook a very simple point, Gilpin (2010) argues, “Students tend to shy away from situations in which failure is probable. Failure can often deal a devastating blow to the fragile psyche (p. 21). When students are feeling like success is not an option they will spend less time on a subject in school and at home. They will not volunteer or ask questions in class for fear that they will be incorrect or ridiculed. By having these struggling math students attend a math club, teachers attempt to foster positive attitudes and higher levels of achievement.

When Diana Vargas was a freshman in high school she was neither excelling at math nor had any interest in math. By the time Diana was a junior she was busy planning her future as a math teacher. What changed over these few short years? Diana joined a math club. Diana found that by joining the math club not only did her grades improve but so did her attitude and
confidence. “If math seems hard at first, just keep trying it; it will get much easier,” Diana says Gilpin (2010).

In order to make math clubs successful, teachers need to make them appealing to the students. By incorporating fun activities and games and even a snack or two, students may be more willing to give clubs a try and, in turn, may change their attitude towards math.

**Technology**

Technology is a way to gain students’ attention and build interest in math classes. Teachers and students can meet in a computer lab to hold a math club and work on engaging and interesting computer programs to practice basic math skills. One school in Cambridge, Massachusetts started a “Breakfast Club.” The school opens the computer lab at 7 a.m. to help students struggling in math. In this particular math club, students focus on word problems. The teachers and students come up with problems that they can solve together. “Here is an activity which provides a secure base for students in math and computer studies without the pressure of grades,” (Gilpin, 2010, p. 21) a Cambridge Breakfast supervisor said.

Students learn in different ways. Some students can be successful using paper and pencil method, while others are not successful that way. Technology can be a way to reach all students. There is a wide variety of activities on the internet that students can use to practice math skills and boost their confidence in this subject area. If students try a program that is uninteresting they can quickly and easily change to another program through which they can be successful. Technology is can be a vehicle for students to practice math skills and be successful in math.
The research on the success of math clubs and tutoring on higher achievement in math is unclear. Several articles stated that math clubs did contribute to a higher success rate and positive attitude towards math. Other articles stated the opposite, finding no evidence that math clubs contributed to higher achievement. There are many factors that could be related to the success rate of students in math. The effectiveness of math clubs for struggling students seems to be unclear.
CHAPTER III
METHODS

The purpose of this study was to identify the impact of after school math clubs on the math benchmark achievement of struggling fourth graders.

Design

The design of this study was quasi-experimental. This study was designed to assess the impact of the math club intervention among the students who participated in relation to benchmark assessment scores. The sample of this experiment is a convenience sample. This group of students has been placed in the math club because of low achievement on the county benchmark assessments. After the Benchmark 1 assessment (pre-test) was given at the beginning of the school year, the scores were analyzed and several students were chosen to participate in the after school math club. This club was created in the hopes of providing small group instruction to students who were struggling and in need of extra instruction. The instructor was monitoring the progress of these students over a period of several months. At the end of the study, the students were given the final benchmark of the year (post-test) and again, their scores were analyzed.

Participants

The study school is located in Pasadena Maryland. The school’s student body consists of 692 students; it is one of the largest elementary schools in Anne Arundel County. The students at the study school represent almost all student groups; Hispanic, Multi, American Indian, Asian, African American, and Caucasian. The largest percentage of our students is Caucasian. The
study school is located in a low to mid socioeconomic area. Most of the parents of our students did not graduate from college; few did not graduate from high school either.

As a whole, the students at the study school struggle in math. This is evident when analyzing Maryland School Assessment (MSA) and Anne Arundel County Benchmark data. Improving math scores across the grade levels has been a school improvement goal for the past several years. The group chosen for this math club was comprised of five boys and two girls. Of the seven participating students two were Caucasian, three were Hispanic and two were African American.

The students who were chosen to participate in the after school math club were the students who demonstrated need according to the scores of their first benchmark assessment. This group consisted of seven students, all ten years old, five boys and two girls. Of those students, four boys and one girl were English Language Learners (ELL) students. All of these students lacked basic math skills. They lacked fluency in addition math facts and in multiplications facts. They struggled with number sense, general concepts, and mathematical operations. Students were chosen for the group based on their assessment scores. Students who earned a 70% or lower were invited to join the group.

**Instruments**

The instrument used in this study was the Anne Arundel County fourth grade math benchmark assessments. The math benchmarks are timed tests given three times per year. These assessments were created to measure student performance in math. The benchmarks are developed by the Anne Arundel County Board of Education Instructional Data Division and the Office of Assessment using the standards, indicators, and objectives from the Maryland
Voluntary State Curriculum. The purpose of these divisions is to collect, analyze, and apply instructional data with the purpose of improving the success of the students. The Office of Assessment stays in constant contact with the Maryland State Department of Education to ensure it (the office of assessment) is receiving the most current and up-to-date information regarding state and federal mandated assessments.

These benchmark assessments are created using the CTB McGraw-Hill assessment item bank. The items on the benchmark were selected using p-values. The p-value is directly related to the difficulty level of the specific test item. When determining the p-value the proportion used was $p=$correct student answers/total student answers. The ranges of the p-values were 0.0-1.0. The higher values represented the easier test items hence the lower values represented the more difficult test items. The p-value range only applies to the test items that were selected response. There are brief constructed response questions embedded within the assessment, though those test items are less reliable.

**Procedure**

Student performance on math benchmarks was analyzed over the course of one school year. The first benchmark assessment was administered in late October, the second was in February and the third and final assessment was given in late May. The first benchmark was given in October. All of the fourth grade students were given the benchmark assessment at the same time. The test consists of two sections. Section one is the calculator section of the test and lasts for 30 minutes. Section two also lasts for 30 minutes but students are not permitted to use a calculator. Students are given a five minute break between the two sections at which time the calculators are collected. After the administration of the benchmark the instructor scores the BCR test items. These test items are scored using a rubric, and the students can earn a score of 0, 1, 2,
or 3, three being the highest and zero being the lowest score. The instructor then scans the student’s scantron sheets into Achievement series where the data can be further collected and stored. Once the scores are entered into Achievement series each student is given a percentage score. These scores are described as 0-54.9% basic, 55-82.9% proficient, and 83-100% advanced.

After the first benchmark was given, the students’ scores were analyzed and seven students were selected to participate in the after school math club. The after school math club was held once per week for a total of 22 weeks. Each after school meeting was held for 45 minutes. Each week the math club lesson focused on the skills that had been taught in class that week. The lessons included teacher-directed and student-directed activities. The instructor tried to create as many hands-on activities as possible to help the students master the skills that were needed to be successful on future benchmark assessments.

A typical math club began each week with a small snack for the students. The students were provided with healthy snack options along with a drink. The snack was provided with the purpose of fueling students’ brain and bodies after a long day of school. After snack the students were given approximately ten minutes to practice basic math facts. The instructor than pulled the group to the back table to introduce the lesson for that day. The instructor often used the “I do, we do, you do,” method when practicing skills. After the direct instruction the students were given an activity to work on independently while the instructor monitored the group. At the end the lesson the outcome was discussed and the students were told what they would be focusing on at the next math club meeting. Occasionally students were given homework to work on over the course of the following week.
CHAPTER IV

RESULTS

The purpose of this study was to assess the impact of after school math clubs on the math benchmark achievement of fourth graders. The Anne Arundel County fourth grade Benchmark Assessments were used to assess student performance in math. The students in the study were placed in the math club based on the scores they earned on the first benchmark assessment. AACPS Math Benchmarks 1 and 2 were analyzed for seven students who participated in an after school math club using a t test for paired subjects. The results are presented in Table 1 and Table 2.

Table 1

Bar Graph Display of AACPS Math Benchmark 1 and AACPS Math Benchmark 2

Concepts and Computation & Problem Solving
Some students in the group did, in fact, improve their scores after participating in the math club. Of the seven students in the test group five of the students improved their test scores by at least two percentage points. The two students who did not improve decreased their scores by one to two percentage points. In addition, the two students who did not improve didn’t attend all of the math club sessions. However, the differences between scores were not significant.

The hypothesis that there will be no significant differences in math benchmarks after participating in an after school math club is retained.
CHAPTER V

DISCUSSION

The hypothesis that there would be no significant difference in math benchmark scores after participating in an After School Math Club was supported. While the math benchmark posttest average after participating in the After School Math Club was higher than the pretest, (56.1 posttest; 53.1 pretest), the increase was not statistically significant. Five of the seven students in the group did show higher scores on Benchmark 2; the two students who did not show improvement were not present for every session of the math club.

Implications

This study was important from a teacher’s perspective because, despite the lack of a significant difference, it offers some support that extra instruction through math clubs can, for students who attended on a regular basis, improve test scores. The results indicate that working with small groups of students on isolated skills can, over time, improve their achievement on assessments in the classroom setting. Teachers can use these results to assist in planning within their math classes. For example, the study shows benefit to pre-assessing before each unit of study and forming a group of students based on need for that particular unit.

Threats to Validity

There were several threats to validity in this study. One issue was that there was a small number of students in the test group. A small number of participants in a study reduces the likelihood that a significant difference will be found even if the intervention is effective. Another threat to validity was the fact that material presented on Benchmark 1 and 2 varied slightly. Two of the students within the test group did not attend all of the after school sessions, and the scores for those two students decreased from the first benchmark to the second.
If this study were to be conducted in the future, the researcher should take into account the size of the test group. It would be ideal to have more than seven students in the group. It may also benefit the researcher to use the same assessment as a pre- and post-test and then possibly the data might demonstrate more positive results about the effectiveness of math clubs.

**Connections to Previous Literature**

An analysis of the data demonstrates that some students may benefit from participating in after school math clubs. Motivation plays a large part in a student’s success and when able to work in small groups with a teacher they often become more motivated to achieve a goal. Motivation is an academic engagement that refers to “cognitive, emotional, and behavioral indicators of student investment in and attachment to education” (Tucker, Zayco, & Herman, 2002, 477). Many students are intrinsically motivated to succeed in school, but there are also many who are not. These students who are not intrinsically motivated are the ones in need of more focused attention. By attending math clubs students have a chance to become more motivated in learning and understanding the skills being taught. That, in turn, can sometimes help students achieve the higher scores on assessments.

**Suggestions for Future Research**

To yield more accurate results in the future, it is recommended that a sample group of at least 15 students be used. It is also recommended that the researcher use the same pre- and post-assessment; this could result in more accurate and valid results. Holding math club twice a week versus once a week could produce better results, as well.
References


