

Effects of Coach Class on Student Achievement

by Scott Hawks

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Abstract

The purpose of this study was to determine if attending coach class would have an impact on high school Algebra 1 students' achievement. The students' grades from second and third quarters were used as the measurement of achievement. The coach classes took place during the duration of the third quarter. Coach classes were available to students before or after school. At the conclusion of the third quarter, the students' second and third quarter grades were compared, and it was found that attending the coach class showed no significant impact on the students' achievements. More research about using coach class to impact student achievement is needed.

CHAPTER I

INTRODUCTION

Math is a subject with which many students struggle. A couple of reasons for this struggle include course load and the conceptual understanding of the material. No matter the reason for the struggle, it is in the student's best interest to find a way to overcome and master the concepts of the course. This could involve doing extra problems, seeking out tutoring with a peer or an educator, or watching tutorial videos online. When students seek out extra help from the teacher, the times that are available to the teacher and student are before school and after school.

If students cannot successfully find a way to master concepts, then they risk failing assessments related to that content or even the course. With graduation requirements and college administration requirements, it is important that students stay on schedule and pass each course. If students start to struggle early in their educational career or early in a math course, they may feel pressured to try and overcome their weaknesses. This may lead to further frustration and struggle and continue the pattern of not being able to master the content.

Statement of Problem

Many teachers offer tutoring in some way to their students. It may be before school, during school, after school, one-on-one, or even group based tutoring. The problem is that some students take advantage of the extra help offered by teachers, but there are still students that are not doing well in the courses. This study examines the impact of coach class on student achievement in a high school Algebra class.

Hypothesis

The study hypothesizes that students participating in coach class will not have statistically significant improvement in achievement as measured by course grades in Algebra.

Operational Definitions

Attending coach class is showing up either before school or after school to receive extra help, complete missing assignments, retake tests, or anything that may help lead the students to a better understanding of the content.

Student achievement is the course grade earned by the student.

Math improvement is increasing achievement results. The amount of improvement is determined by comparing the overall course grades from the second quarter and the third quarter. Improvement is not evidence of students achieving a certain result or even earning a passing grade for the course.

CHAPTER II

REVIEW OF THE LITERATURE

This literature review discusses common problems that are faced by high school math students and examines interventions that can help those students with the math skills required in Algebra 1. Section one looks at the importance of mathematics. Section two examines different problems that are faced by students in high school math classes. The third section discusses interventions to improve students' understanding of high school math content.

Importance of Mathematics

Mathematics is a universal concept that is used in everyday life. Computing can be thought of as one of the main reasons that our civilization exists (Roman, 2004). Mathematics is a huge part of science, technology, and engineering. These world-changing concepts are so closely related that they are often referred to as STEM (Science, Technology, Engineering, and Mathematics). Mathematics is used to determine interest rates, tax returns, the rise and fall of the stock market, and other areas that affect how the economy changes. In fact most modern day technology allows us to use complex tools, such as computers and cars, and are based on mathematical and engineering principles; these are just two examples of things that are subject to safety codes, which are set using mathematics (Roman, 2004). One safety code set with mathematics is how many people can be inside of a building at a time. Occupancy load is determined by taking the square footage of the building and dividing by a value that is determined based on the type of building and what will be occupying the building (Chesnut, 2014). Things that people take advantage of and use every day require mathematics to operate, to build, to create, and even to design.

Students' ability to earn or recover credits is a great predictor of success that the students will have in the future (Afterschool, 2009). Math is a course that has a high course load requirement to graduate high school. In the state of Maryland students must complete at least three credits of math to graduate (MSDE, 2013). The courses are normally sequential and stem from knowledge in the previous course. Having a strong understanding of one course will help prepare for the following course. Another part of schooling that makes math important is the cross curricular aspect of math. Math is used in many other classrooms, even if it not directly mentioned. Science classes use math to balance equations and calculate measurements, while statistics is used across content areas to discuss tables and charts of information and probability as well (Roman, 2004). Standardized testing is another part of school that can sometimes be used as an assessment in a classroom, as a graduation requirement, or even as part of an application to postsecondary education. Many colleges and universities have entrance requirements including SAT and ACT scores, which have entire portions of the test devoted to math skills (EdSource, 2009). A study looked at the correlation between SAT and ACT scores and college grade point average. The study found a correlation value of .37 between SAT and college grade point average (Coyle & Pillow, 2008). The correlation value between ACT and college grade point average was .27 (Coyle & Pillow, 2008). Any correlation value near .1 was considered weak, .3 was moderate, and .5 was considered strong (Coyle & Pillow, 2008). The ACT and SAT provide colleges with an understanding of student potential.

The availability of jobs is not consistent in today's economy and worries many people about their employment status. One of the career fields that is projected to continue to increase is that of careers in the STEM (Science, Technology, Engineering, and Mathematics) field (The Future, 2012). It is also noted that people that have jobs in these fields earn more than those that

have jobs in other fields. People with a bachelor's degree in a STEM-related field earn around \$500,000 more than those in non-STEM-related fields throughout their lifetime (Gotlieb, 2014). STEM careers generally require postsecondary education, and many require a bachelor's degree or higher. While this is not a realistic expectation for all students, this is a key area of growth. An area projected to increase in availability is middle skill jobs that only require an associate's degree (The Future, 2012). What both of these potential skill areas have in common is an understanding of mathematics. The level of understanding of math depends on the job that the person is wishing to pursue, but a basic understanding of math is necessary in order to reach postsecondary education and have access to these increasing job fields. Analysis of data shows that jobs requiring specific education levels, such as a bachelor's or master's degree, have employees that fulfill those requirements (The Future, 2012). With about 40% of high school juniors showing interest in pursuing a future in STEM, students need to be proactive and study all of the STEM fields, including mathematics (Dickman, Schwabe, Schmidt, & Henken, 2009). Math is a skill that will help students be prepared and qualified for a competitive job force.

Common Problems

There are many reasons that students struggle with math in high school. One of the main reasons is that students fall behind. Falling behind in credit attainment makes it difficult for students to stay on track to graduate (Afterschool, 2009). Math is a very sequential subject. The content covered in a math classroom builds throughout the year, so struggling at the beginning will lead to struggling throughout the year. Low performance in the classroom can cause students to fall behind their peers and throw them off schedule in the progression of their class. Postsecondary schools are seeing low performance as an issue as well with about 50% of students being placed in remedial math (The Future, 2012).

A second reason students struggle relates to the many different types of problems in the math classroom, including skill-based problems and word problems. Word problems are written linguistically but require arithmetic to solve (Zheng, Flynn, & Swanson, 2013). This causes issues on different levels because some students know the skills required to solve the problem but cannot understand the language to understand the problem. There are also students that understand what the word problem means and is asking, but struggle with the arithmetic needed to solve the problem. The content in math courses builds cumulatively throughout the school year with the skills changing as more content is learned. It is important that students practice these ever changing skills to build their confidence and understanding. As a result, many math classrooms require problems to be done in the classroom and at home, often more than students want to complete (Kortering, deBettencourt, & Braziel, 2005). One study shows that students who spend anywhere from 1-120 minutes on homework score 1.8-3.0 points higher on standardized tests than students who spend no time on homework (Fan, Maltese, & Tai, 2012). Since students are unwilling to practice their skills, they are not learning the content that they need in order to grasp the concept. Their unwillingness to do the work leads to further misunderstanding.

Paying attention in any classroom can be a struggle, but one study notes that this is particularly true in mathematics (Kortering et al., 2005). Students have to be engaged in order to get a full understanding of any material in the class and teachers must find ways to engage all students, like relating content to real life. One study found that students do not work as hard for content that is not related to something in their lives (Barnes & Bramley, 2008). When content feels unfamiliar to students, this turns students off because it cannot be related to their lives and will not help them, or at least this is a common student misconception. Part of the problem stems

from students feeling that they do not have any ownership of the material. Students feel like they are forced to learn about a specific content or situation when they would prefer to learn about something else. Students want the context of the problem to be modern that they understand on a personal level and do not have to research for it to make sense.

Mathematics is a language and, just like all languages, to have a full understanding of the language, all of the parts must be known and understood (Kamaruddin & Amin, 2012). Current society is favoring real world application problems. Students say that they prefer this method over other traditional methods because it allows the students to develop critical thinking skills (Kamaruddin & Amin, 2012). Instead of students memorizing formulas to simply get by, this contextual understanding allows them to understand the language and therefore understand the concepts. Teachers should give students real world application problems and should incorporate situations that they encounter in their lives into the problems (Battle, 2007). Word problems not connected to the real world can actually have negative effects on students' learning (Hudson, Kadan, Lavin, & Vasquez, 2010). By making the problems related to the students' lives, the students could have a connection to the material and be more involved in the learning process. In one study there was a 4% increase in number of students that said they would be more engaged if the content was related to the students' lives or real worlds (Barnes & Bramley, 2008).

Interventions

Having students participate in after school tutoring can help them overcome some of the problems they face in math classes. Gaustad (as cited in Karsenty, 2010) says that there are many ways that tutoring can be beneficial to students, including adapting to the student as an individual, providing immediate feedback, preparing the work specifically for the student based

on their needs, and helping students through common misunderstandings. Students who try tutoring have multiple options. Students must make a decision as to what type of tutoring would work best: peer tutoring or adult-student tutoring. Students and parents may struggle with decisions related to the experience of the tutor. People with a better understanding of math make better tutors (Green & Smith, 2010). According to Karsenty (2010), certified teachers are considered the best option for a tutor. It may be in students' best interest to go with an adult tutor unless they know of a peer that has a deeper understanding of the material so that the tutoring process can be effective.

Sometimes students must look at content from a new perspective. In math classes, students see and hear problems, with those two contexts representing a large majority of the course work. Another method that is used is the concrete-representational-abstract (CRA) sequence of teaching (Witzel, 2005). This method not only allows students to see and hear problems but be able to interact with the problems in a tactile method. Students that are taught with the CRA method are taught on a multisensory level. A study shows that students who are taught with the CRA method perform at a higher level than those that are taught with a traditional method using an abstract only teaching approach (Witzel, 2005). This method has been shown to be effective in classrooms that have a high range of student achievement levels (Witzel, 2005). Also manipulatives should be part of the learning experience in math classrooms (Battle, 2007). They can help increase the chances that the students will have a deeper understanding of the material. Hands on learning can engage creative thinking and help students discover mathematical concepts (Hudson et al., 2010). Technology is another aspect of math that is evolving and helping enhance math curricula. Technology is another type of manipulative, providing opportunities for a hands-on approach. There are multiple types of technologies used

in mathematics including calculators and the internet. All of these manipulatives do not replace the learning in the classroom but give different approaches to the learning process. Calculators allow students the opportunity to do computations more accurately, while the internet allows for students to research and be independent learners (Hudson et al., 2010). Using these different tools will be beneficial to students since Common Core will be assessing students using PARCC assessments. PARCC assessments will be completely electronic and will require students to use computers and calculators to solve problems (Dessoiff, 2012).

One strategy to teach new content is by showing examples, but an even more effective strategy is analyzing incorrect examples (Booth, Lange, Koedinger, & Newton, 2013). There are benefits that are specific to looking at incorrect examples and cannot be had with seeing only correct examples. One of the benefits is seeing the procedures as a whole. Students must understand how to solve different types of problems and seeing incorrect examples allows them to see mistakes and avoid those mistakes in the future. Another benefit to this method is that seeing the incorrect method and learning it as the incorrect method will imprint the concept that the method is incorrect on the student, preventing future errors. By learning the correct method and the incorrect method at the same time, students can learn what mistakes not to make and how to solve the problem correctly. The study shows that using examples, either correct or incorrect, benefits students and allows them the opportunity to improve (Booth et al., 2013).

Retaking tests can be helpful in building success in students that may be unsuccessful at taking tests, but can be successful at the required skills. Allowing students to retake tests is actually helping students prepare for the real world. Jobs and careers allow their employees to redo assignments and even encourage retakes. Surgeons, architects, and pilots are just a few examples of people that are encouraged to continually practice and practice until they have

completely mastered the content (Wormeli, 2011). With extra practice, people in these fields are able to correct their own mistakes and reach mastery. One way to incorporate retaking tests in the classroom is by having students submit a plan of relearning (Wormeli, 2011). Students prove they have put extra work into the skill and can demonstrate their progress to the teacher. This should not happen with every test, and if it is documented as happening frequently, then the teacher should look to underlying reasons as to why the student continually retakes tests (Wormeli, 2011).

Summary

This literature review focused on three different aspects of high school math classrooms. The first is the importance of math. Math is used in everyday life and is part of graduation requirements for high school. The second topic looks at common problems in high school math. Students fall behind in course related content, struggle with different types of problems, or are not engaged in the classroom. The third topic identifies possible interventions that can be used with high school math students. Students can become part of after school tutoring programs, use technology in and out of the classroom, try a multisensory approach, be exposed to different teaching styles, or retake tests. The importance of the interventions is to help the students master the content. Math is a subject that many students struggle with for a variety of reasons and implementing some sort of intervention is necessary, considering all students need a general math understanding to be successful in life.

CHAPTER III

METHODS

The purpose of this research was to determine the impact of a coach class on student achievement in Algebra 1. The researcher hypothesized that students' achievement would not be impacted by a coach class.

Design

The study was conducted using a quasi-experimental design. That design utilized a pre-measure, a treatment, and then a post-measure. The pre-measure and post-measure are the second and third quarter grades of the students respectively in Algebra 1.

Participants

This study occurred within a suburban school system in Maryland at a high school with more than 1500 students. The study includes students from Algebra 1 classes. The students' grade levels ranged from ninth grade through twelfth grade.

The study includes 48 students. The students include 31 males and 17 females. There are six males with 504s or IEPs. There are three females with 504s or IEPs. All students in the study are retaking Algebra 1 for either the second or third time. The students are from four different classrooms with class size ranging from 9 students to 17 students.

Instrument

The measures of student achievement were course grades earned by the students in the second and third marking periods. The grades recorded to measure achievement were calculated using weighted categories. The grade is broken down into three sections: class work, homework, and tests. Class work is worth 50% of the grade, homework 15%, and tests 35% of the grade. All

of the assignments that were given were created by the teacher to the standards and goals set by Baltimore County Public Schools.

Procedure

The study took place over the third quarter during the 2013–2014 school year. Coach class was offered before or after school on a regular basis, and students were able to attend whenever they would like. Coach class was not mandatory but was strongly suggested to all students in all classes on a weekly basis.

One part of coach class is the opportunity to retake tests. Students that are not satisfied with a test score are allowed to retake a test during coach class. Students receive no extra help or aides during the retake of the test. Whether the student does better or worse on the retake, the student is allowed to keep the higher score on the test.

Coach class is one-on-one tutoring. When students come to coach class either before or after school, they have the opportunity to receive help on any material they like whether it is old, new, or even future material. Students come into coach class, have a seat, and organize whatever materials they have that are relevant to the concepts they would like to discuss. There is only one teacher in the room, so there may be multiple students wanting to work with the teacher. The students are worked with on a first come, first serve basis. If any student needs an extended amount of time for help, he or she is helped in a way that the student can start working on the concept. This gives the teacher time to get other students started or time to help other students with their concerns. While helping all students, the teacher periodically checks in with any student requiring extended time and provides further instruction in between helping others. The students receive extra instruction on the concepts of their choosing. This includes examples completed by the teacher, guided examples completed by the student and teacher, as well as

independent practice problems that are completed by the student and reviewed by the teacher and student. If multiple students are working on the same concept(s), then they are allowed the opportunity to work together through coach class. This includes working through examples together as well as working on assignments together. They are reminded that they need to be able to complete the concepts on their own even though they are working together.

CHAPTER IV
RESULTS

This study examines the impact of coach classes on mathematics achievement. In particular, the variables of interest were: achievement in mathematics in the second and third marking periods and the number of coach classes attended. A “Growth Grade” was calculated by subtracting the second quarter percentage grade from the third quarter percentage grade. Additionally, a “Group” variable was calculated by finding the standard deviation of the frequency of attendance at the coach classes. The “Group” variable then defines those students with attendance in the lowest standard deviation as low and those with attendance in the highest standard deviation as high. Various statistical analyses were conducted, including: correlation, independent t, and chi square. No statistically significant findings were obtained. Table 1 below illustrates the findings for the correlation. Table 2 for the independent t test is below. Finally, Table 3 has the results of the chi square analysis which is below Tables 1 and 2.

Table 1

Correlation Analysis

		Growth Grade	Number of times attended coach class
Growth Grade	Pearson Correlation	1	.257
	Sig. (2-tailed)		.077*
	N	48	48

*p>.05

Table 2

Independent t test Analysis

		t	df	Sig. (2-tailed)	Mean Difference
GrowthGrade	Equal variances assumed	-.874	46	.387*	-2.9532924

*p>.05

Table 3

Chi Square Analysis

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48.000 ^a	47	.432*
N of Valid Cases	48		

*p>.05

CHAPTER V

DISCUSSION

This study examines the impact of coach classes on mathematics achievement. The results of the data did not show that attending coach class had an impact on mathematics achievement. Therefore, the null hypothesis is retained.

Implications

The results of the study conclude that coach class does not directly impact achievement in mathematics. There are changes that could be made in order to make this study more effective in the future.

The low attendance of the students in coach class makes it difficult to verify the true impact of coach class on achievement. Working with a group of students where the minimum number of coach class attendances could be controlled would allow for more accurate results. Another adjustment to the study could be to adjust the time frame that the study takes place. Coach class was available to the students almost every morning before school as well as once a week after school. Students were always encouraged to attend coach class whenever possible.

Threats to Validity

One threat to external validity is the group of students that were chosen, namely the sample. There was no restriction of the students involved except that they were current Algebra 1 students, which means students with the highest grades, students with the lowest grades, and all students in between were included. Also, a longer period of time might allow for more accurate

data analysis. The coach class's scheduled time is also a threat to validity. Students may not be able to make it to coach class when it is available or at all.

Another type of threat to validity is internal validity; this deals with the design of the study. In the case of the present study, the research design is a pre and post measure with one group, and such a design suffers from several threats. One problem with internal validity is that measurements should be consistent. In this study, the content of the course was different during the different periods that the achievement was recorded. Another threat to internal validity is that there is no control group, which can cause problems because there is no chance to compare results with other data. With the school year changing slightly from year to year and curriculums changing from year to year it would be very difficult to replicate this study.

Connections to Previous Studies and Recommendations

There are studies that show that coach class does impact student achievement. This study does not follow that trend. A study done by Karsenty (2010) showed a significant mean increase in students' scores when helped by a tutor. There are a few major differences between the two studies. First, all of the students involved attended the tutoring sessions the same number of times. Second, the Karsenty (2010) study had criteria by which they chose the students that participated in the tutoring program. The third difference is that the tutors for the tutoring sessions were 18-20 years old (Karsenty, 2010).

Attendance was very low during this study. Holding coach class less frequently might encourage more students to attend a higher percentage of the coach classes. Offering an incentive, such as extra credit or opportunities to redo assignments, for attending the coach classes might also increase attendance. Restricting the study to low-achieving students in a future

study could potentially show more accurate results as to the amount of change in the student achievement. Using these recommendations in a future study might result with coach class showing an impact on student achievement.

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