7-2018

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Glenda Elgersma

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Document Type
Thesis

Degree Name
Master of Education (MEd)

Department
Graduate Education

First Advisor
Patricia C. Kornelis

Keywords
Master of Education, thesis, Khan Academy, measures of academic progress (MAP), mathematics, scores

Subject Categories
Curriculum and Instruction | Education

Comments
Action Research Report Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Education

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Glenda Elgersma

B.A. Dordt College, 1987

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Department of Education
Dordt College
Sioux Center, IA
July, 2018

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Glenda Elgersma

Approved:

Pat Kornelis, Ed.D.

Faculty Advisor

07/25/2018

Date

Approved:

Stephen Holtrop, Ph.D.

Director of Graduate Education

07/25/2018

Date

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Abstract

The purpose of this study was to investigate the effectiveness of Khan Academy when utilized as a supplement to core math curriculum and tailored according to scores initially received by students on their MAP test. Through the use of the Khan Academy Mappers site and the alignment of tasks to individual scores, this study compared growth rates for students with access to online practice through Khan and those without access to online practice through Khan. Results indicated a greater increase in MAP scores for students who coupled their core math curriculum with Khan Academy as a supplement.

Although an emphasis on math within the United States has increased since the early 1990s, American students continue to lag behind their international equivalents. According to the 2015 findings from the Program for International Student Assessment (PISA), math literacy scores in the United States were lower than 36 education systems, higher than 23 education systems and at par with 6 others (National Center for Education Statistics, 2015). On the national stage, Smarter Balanced scores from 2016 show growth from the previous year, but average results still indicate that two out of every five students are not meeting the standards (Smarter Balanced Assessment Consortium, 2016).

Our education system, may not however, be as dire as these results initially suggest. Of the nations participating in testing, the United States is marked with the largest number of students living in poverty which portrays an opportunity gap vs. an achievement gap (Zemelman, Daniels & Hyde, 2012). Given knowledge that the 2015 PISA findings are more complicated than numbers alone reveal, the need for schools to be diligent in reaching and engaging students continues.

As attention on math has increased since the early 1990s, the addition of technology to daily living has also increased in the lives of adults and students. The internet was made available to the general public in the mid-1990s and has caused a shift in how adults and students communicate, research and conduct daily life. Between 2000 and 2018, the number of adults online grew from 50 percent to nearly 90 percent (Pew Research Center, 2018). In 2015, 94 percent of children, age 3 to 18, had a computer in their home while 61 percent of children in this same age band had internet access (National Center for Education Statistics, 2018). The growth indicates a shift in how computers and the internet influence day to day life.

Along with an increase of at-home computer use within the 21st century, the United States has also seen a continued increase in classroom technology use and the ability for students to access additional online resources for learning. In 2008, research findings, focused on technology in public schools, indicated that 91 percent of computers within schools were used for instructional purposes and of these computers, 98 percent had internet access (National Center for Education Statistics, 2010). Educators are challenged to keep classroom instruction varied and to keep students actively engaged in their learning. Technology in the classroom has naturally lent itself to supplemental opportunities, higher-order thinking and problem-solving skills. The United States Department of Education, with a mission of promoting student achievement and preparation for global competitiveness by fostering education excellence and ensuring equal access, states, “Online learning opportunities and the use of open educational resources and other technologies can increase education productivity by accelerating the rate of learning; reducing costs associated with instructional materials or program delivery; and better utilizing teacher time” (U.S. Department of Education, paragraph 2). With the goal of future ready schools, the Department of Education acknowledges the need to provide equity in the access of technology to all students.

Districts are wise in considering what technology resources can be used to promote greater learning. The National Council of Teachers of Mathematics when posed with the question, “What is the role of technology in the teaching and learning of mathematics?” responded with the following:

> It is essential that teachers and students have regular access to technologies that support and advance mathematical sense making, reasoning, problem solving, and

> communication. Effective teachers optimize the potential of technology to develop students' understanding, stimulate their interest, and increase their proficiency in mathematics. When teachers use technology strategically, they can provide greater access to mathematics for all students. (National Council of Teachers of Mathematics, 2017)

The response from the National Council of Teachers of Mathematics highlights the means by which technology provides support for student engagement. Students today are surrounded by technology and it is difficult for them to imagine a world without it. For educators, technology is another tool to help improve math teaching and learning.

Teachers and students need to have regular access to technologies that support and advance mathematical sense, reasoning, problem-solving and communication (National Council of Teachers of Mathematics, 2017). It is important that technology is used intentionally and wisely as a quality resource. Knowledge about technology is critical in order to ensure that these resources meet the standard of integrity and accuracy.

When technology is used strategically in the school setting, it assists in providing even greater opportunities in math for all students. One recommended educational resource to student learning is Khan Academy. This resource is a browser-based educational application that focuses primarily on math. The website has drawn its share of advocates and critics. This debate contrasts Khan as a "dream come true" and a positive means for tracking data to a "breakthrough" that is holding progress back and a distraction from the ability to learn problem-solving (Schaffhauser, 2013). Regardless of how one views Khan Academy, it is emblematic of the role of technology in the lives of today's students.

Problem

The gaps in math proficiency give cause for additional instruction and practice to occur within the educational setting. Although recognizing the need for additional instruction and practice, educators often lack sufficient time in their day to adequately assess and differentiate learning for each student. Supplemental instruction and/or practice via an online learning platform can be of assistance. One means for encouraging this supplemental practice is by correlating the Measures of Academic Progress (MAP) RIT scores and Khan Academy exercises. According to the Northwest Evaluation Association (NWEA), teachers are now able to correlate MAP scores to online Khan Academy math practice exercises (Paric, 2017). The data derived from the MAP test, which is used in 10% of schools nation-wide, will help teachers in evaluating the instructional decisions necessary and will gauge the intervention needed. The ability to link data to Khan Academy Mapper allows teachers to quickly and easily differentiate instruction for students with diverse abilities.

Research Questions

The purpose of this study is to determine if the use of Khan Academy assists in improving math MAP test scores. The study researched the following questions:

1) Is there a rise in the number of students whose MAP scores meet or exceed the growth expected by NWEA when they are given the opportunity to use Khan Academy Mappers as a supplement to their core curriculum?
2) Do students using Khan Academy as a supplement to their core curriculum produce a greater percentage of growth in their RIT score compared to those who do not use Khan as a supplement?

3) Is there a correlation between students using Khan Academy as a supplement to their core math curriculum and a rise in MAP scores?

Definition of Terms

For the purpose of this research, the following definitions were used. Unless otherwise noted, the definitions are those of the author.

Computer adaptive test- this computer based test adapts to each individual student and is tailored according to the answers provided by the examinee. When an examinee answers a question correctly, the next question will become more difficult. When an incorrect answer is given, the following question will become easier. Computer adaptive tests adjust according to the examinee's ability level.

Khan Academy - a non-profit, educational website which provides instructional videos and practice math problems for students free of charge.

MAP test- Measure of Academic Progress test. This computer adaptive standardized assessment, managed by the Northwest Evaluation Association (NWEA), is produced for students in grades K-8 and is used for measuring student achievement in math, language usage and reading. It provides quick feedback and assists teachers, parents and administrators in making decisions regarding teaching and learning as a means to improve learning and promote academic growth for students. This test is designed to measure student growth over time.

NWEA - the Northwest Evaluation Association is a research-based, non-profit organization that assists students and teachers with assessment that measures growth. NWEA operates in all 50 states, 3400 school districts and in 145 countries (Northwest Evaluation Association, 2018).

Parent Partnership Program- an alternative learning experience offered via home-based instruction for students whose parents choose this option. This educational option offered in the state of Washington is provided free of charge via various public school districts throughout the state and assists families choosing to educate their children at home through the writing of a learning plan, the monitoring of student progress, the assistance of finding curriculum and the assistance with standardized testing. Parents in these programs are considered the primary teacher while a certificated educator through the public school district is the teacher of record.

Reliability- an index of a test's consistency and stability. Test-retest reliability refers to performance of the test across time, across forms or across its items or parts. Reliability occurs when the same test is given to individuals twice over a period of time (Northwest Evaluation Association, 2018).

RIT scores- the RIT (Rasch Unit) is the means for measuring how much growth a student has made. It is a stable and equal-interval scale for measuring progress and for calculating accurate averages for both classes and schools. RIT was developed to simplify the interpretation of test scores (Northwest Evaluation Association, 2018).

Validity- when a test measures what it intends to measure. It refers to the quality of the measure (Northwest Evaluation Association, 2018).

Literature Review

In an effort to catapult student learning to greater heights in the 21st century, individualized instruction offered through Khan Academy may be considered by instructors and students. NWEA (MAP testing) and Khan have partnered in providing teachers with the ability to input RIT scores in an effort to create individualized math learning plans. This potential catalyst for growth has the ability of providing differentiated education to students and for providing teachers with adequate data for teaching and learning. In this paper, the use of the MAP test for assessment and the role of Khan academy as an online tool was investigated. It was hypothesized that this online resource would assist in ensuring the learning of math skills and would also increase individual MAP scores.

As a means of gathering rich information about student achievement, many schools are transitioning from a yearly conventional assessment to formative assessments given at various points during the school year. This move from an accountability measure to a means for focusing on individual student growth, in hopes of all learners gaining feedback to improve performance, is being embraced by many districts throughout the nation. In a study conducted by Poway Unified School District, the third largest school district in San Diego county with approximately 33,000 students, guiding principles of assessment were discussed and the means by which the Measures of Academic Progress assessment (MAP) could help them achieve them were recognized (Wilson, 2005). These principles included how the prime purpose of assessment is to improve student learning, how assessment must give a picture of student achievement and growth over time and how the assessment data must be responsibly and effectively collected and managed. By embracing a new culture of assessment, Poway and other school districts, through the use of the MAP test, recognized the need for assessment with practical application to learning and student growth.

Simply gathering data through a reliable and valid test is not adequate within any school district. Schools must link data to higher student achievement (Mcintyre, 2005). After collecting, organizing and understanding the data, educators can use data to maximize learning and efficiency. Through this process, educators are able to reorganize class time to ensure higher level of performance through an action plan. Mcintyre (2005) shares how an effective action plan includes understanding the performance of the current cohort in comparison to others, collecting information about individual student performance and identifying areas/skills that teachers are failing to secure. This blended learning will infuse innovation into math instruction and help to improve test scores and enthusiasm for learning (Smith, 2017).

One online innovation, Khan Academy, founded in 2006 as a collection of YouTube videos created by Salman Khan for a cousin who was experiencing difficulty with math, is an interactive site that uses practice problems, analytics and game mechanics (Khan, 2012). This program, expanded from 144,000 users per month in early 2010 to 10 million users per month documented in February, 2014, and now includes more than 5500 instructional videos about science and math and 100,000 individual practice math problems (SRI, 2014). Although used worldwide, 65% of Khan users are from the United States (SRI, 2014).

Since its inception, Khan Academy's website has sparked a great amount of attention and has been endorsed by technology giants such as the Bill and Melinda Gates Foundation and Google (Khan, 2014). In an effort to gain a stronger understanding of its use and potential, a two year study conducted by SRI through the Bill and Melinda Gates Foundation and focusing on 20 schools and 70 teachers was completed (SRI International, 2014). Of the school sites highlighted in the study, each used Khan Academy's resources for a different purpose. One used it as a practice tool, another used it as an intervention, another as an enrichment activity and one as an accountability tool to assist in monitoring student progress. The results supported Khan Academy as a supplement to the core curriculum and noted its influence on student growth. Their data findings included interviews with administrators, teachers, parents and students, surveys completed by teachers and students and standardized test scores. Among the participating teachers in this study, 86% would recommend it to others and 89% planned to use it with their students in the following year (SRI International, 2014). The greatest benefits included the modular problems sets for providing additional practice, the differentiation achieved, the rapid feedback given and the means of self-directed learning (SRI International, 2014). At the conclusion of the study, positive benefits for teaching and learning were noted. Overall, student perceptions about Khan were positive. They maintained a high level of engagement during class time and gained greater levels of independence in learning. Teachers were encouraged through their ability to support students by giving opportunities to practice new skills and concepts. Teachers also reported ease in monitoring students and identifying those who were struggling or ahead of the others in class.

Because Khan is a non-profit organization and does not sell itself to schools, few in-depth, quantitative research projects have been devoted to it. As many schools experience tighter budgets and limited resources, Khan's appeal factor, however, becomes more relevant because it is free. Khan Academy has been introduced and adopted by a number of school districts including the affluent Los Altos School District located in the Silicon Valley. Although considered a high achieving school district, Los Altos in 2011 continued to look for means to improve individual achievement and became part of a pilot study using Khan (Kronholz, 2012). Two fifth grade classrooms and a seventh grade remedial class of twenty students were included in the study. At its conclusion, the study reported how the 7th grade remedial students gained in proficiency by moving from 23% to 41% and the fifth graders advanced from a 91% proficiency rate to a 96% proficiency rate (Kronholz, 2012). Although the focus tends to be on the videos produced by Khan, the Los Altos district's innovative strategy coach says its value lies with its lesser-known components: open-ended and interactive math exercises and the data those produce (Schaffhauser, 2013). The school district is able to use data from Khan Academy as a means to drive curriculum decisions.

Other educators question if this tool can help meet educational challenges that are being faced around the globe, particularly in developing countries. Khan's effect on student engagement with math was observed and compared in a study conducted in 2013 in five Chilean schools. A comparison was made amongst those classes which utilized Khan Academy and those that did not. Researchers attributed increased engagement to the number of problems students were able to complete. The students participating also noted how the gaming, incentive points and rewards were motivating (Light & Pierson, 2014). Prior to this study starting, videos were translated into Spanish. In regards to student engagement, the self-regulation of learning math via Khan was a motivator. Through this study, students demonstrated their ability to "plan, set goals, organize, self-monitor and self-evaluate at various points during the process of acquisition" (Zimmerman, 1990, p.4-5).

Realizing the challenges in education and noting how effective teaching is complex, educators consistently seek a variety of means for meeting the individual needs of students. As Schaffhauser (2013) stated, "Khan Academy has inspired both unconditional love and virulent criticism. But the controversy around the videos has sparked something truly valuable: a national conversation about math instruction and the role of technology, data and teachers in helping students learn." (19)

Methods

Participants

This study began with 78 students in grades 3-8 enrolled in an alternative learning experience called a parent partnership program located in Northwest Washington. Each student in the study completed both the Fall 2017 MAP test and the Winter 2018 MAP test. Students were not chosen randomly but rather were included for the study if they had participated in the

Fall 2017 MAP. One student was excluded from the study due to the use of accommodations given during the administration of the Winter 2018 MAP test and not on the Fall test. With this adjustment, grades 3-6 each had sixteen 16 students participating, seventh grade had seven participating and eighth grade had six participating for a total of 77. The initial treatment group of students using Khan as a supplement to their core curriculum in math began with a total of 50 participants and consisted of seven third-graders, eleven fourth-graders, eleven fifth-graders, nine sixth-graders, seven seventh-graders and five eighth-graders. Based on not meeting the participation requirement for using Khan (360 minutes — 30 minutes a week for 12 weeks) , thirteen students were eliminated from the study. The final treatment group consisted of 37 participants including five third-graders, nine fourth-graders, eight fifth-graders, eight sixth-graders, three seventh-graders and four eighth-graders. The participants in the treatment group consisted of 31.25% females and 68.75% males. They were ethnically represented by 3% Hispanic students, 8% African American students, 8% Asian students and 81% Caucasian students. The control group with a total of 27 participants contained the following: nine third-graders, five fourth-graders, five fifth-graders, seven sixth-graders, zero seventh-graders and one eighth-grader. The participants in the control group consisted of 46.9% females and 53.1% males. Their ethnicity was 100% Caucasion.

Materials

To determine if Khan Academy was a beneficial supplement for student learning, results of the Fall 2017 MAP test were compared to the Winter 2018 MAP test scores. This assessment tool, offered to all students in the parent partnership program, can be completed in the fall, winter and spring. Parents are given the option, however, of whether they will or will not have the child(ren) participate. Efforts are made by the test provider (NWEA) to select test items which can be matched to the content standards. NWEA also highlights criteria used in ensuring the test's reliability and validity. The rigorous test-retest approach is completed over a longer time frame and showcases the test's reliability. The fall and spring tests are not identical, but they are comparable in the difficulty level of the items. Content validity begins at the design level in which careful consideration is given to content, derived from the standards at each grade level and included on the test (Northwest Evaluation Association, 2018). Scores indicate a student's instructional level and are reported via the Rausch Unit (RIT).

Many online supplements are available but this action research focused on Khan Academy due to its alignment with the standards and direct correspondence to the MAP test. The instructor's ability to identify developing areas and instructional levels are simple with the inputting of the RIT scores.

Design

This quasi-experimental study compared fall and winter math MAP scores of students whose parents opted for using Khan as a supplement and those who opted out of using Khan as a supplement to their core curriculum. The control group consisted of 27 alternative learning students in grades 3-8 who participated in the Fall and Spring MAP testing but did not access Khan Academy online. The experimental or treatment group consisted of 37 third through eighth graders who spent at least thirty minutes of supplemental practice time on Khan Academy each week. The Khan Academy concepts to be studied were aligned with state standards and were determined by individual MAP scores received and inputted into the Khan Academy Mappers site. The independent variable was the time spent on Khan Academy while the dependent variable was the change in RIT scores on the MAP test. The NWEA projected potential growth from the fall to the spring. This research analyzed whether students using Khan

Academy met the projected growth and if their average growth was greater or less than those who did not access the online resource.

Procedure

Based on the opportunity to input MAP scores on Khan Academy Mappers, the study utilized the comparison of fall and spring scores to determine Khan's impact. During the final week of September, a hundred students enrolled in the parent partnership program participated in MAP testing. In December, a parent's consent form (appendix A) was sent to all families who had participated in the Fall MAP testing. Parents were given the option to participate in the study by agreeing to an additional 30 minutes of weekly math studies for their child via Khan Academy and MAP testing in the late winter or by waiving their willingness to participate in the additional weekly math studies but still committing to MAP testing in the late winter.

After receiving the forms back from parents, fifty students were included in the treatment group while twenty-seven were included in the control group. Spreadsheets were created and included the student name, grade level, overall math MAP score and the lowest score in the RIT range of each MAP math test subheading. With the information provided, the instructor set up an account and class. Next, a switch was made to a new website**,** khanacademy.org/mappers where individual scores based on the grade band and the lowest score in the RIT range for each subheading for each student was added. Khan then generated the number of tasks required for each student to accomplish in each area. Students now had access to and the ability to log into their own accounts on khanacademyorg/mappers using the username and password information sent to them by the instructor.

The study period lasted from December 15 to March 17 during which time the experimental group of participants spent a minimum of 30 minutes per week on khanacademy.org/mappers. During this time, emails were sent bi-weekly to each participant highlighting the time spent on Khan or the number of tasks being covered. This was done as a means to encourage those participating and to remind them that their participation was part of a research project. Late winter MAP testing then occurred during the week of March 20. Additional columns were added to the spreadsheet initially created and testing results were entered for each student.

Results

Data Analysis

The data was analyzed through the MAP scores generated through NWEA. The Fall MAP scores and late Winter MAP scores were compared.

Research question one. The first research question presented asked if the use of Khan Academy as a supplement to a core math curriculum could cause more students to meet or exceed the recommended growth predicted by NWEA. The Fall MAP scores were entered into the Khan Academy Mappers site and generated tasks targeted towards areas requiring practice were given. The results, illustrated in Figure 1 and Figure 2 (below), indicate that the treatment group out-performed the control group in the number of students that met or exceeded the projected growth goal. Nearly one-half (48%) or 12 of 25 met or exceeded the predicted growth in the control group while 24 of the 37, or nearly 2/3 (65%), met or exceeded the predicted growth in the treatment group.

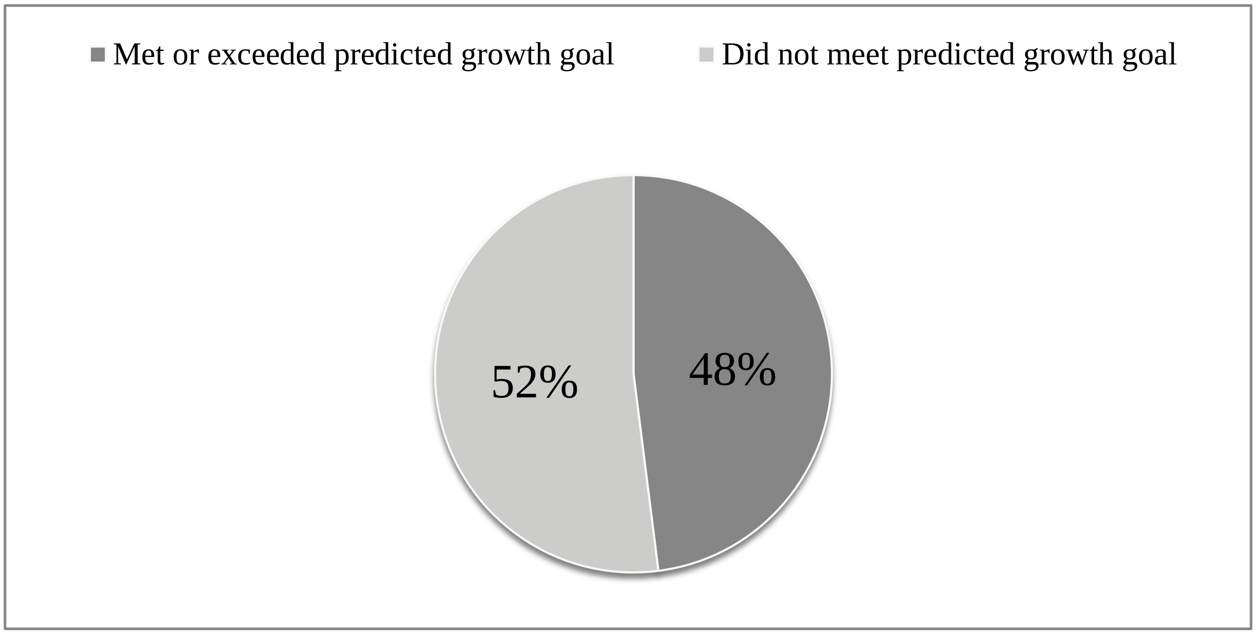

Figure 1. Percentage of students in control group that met or exceed projected growth

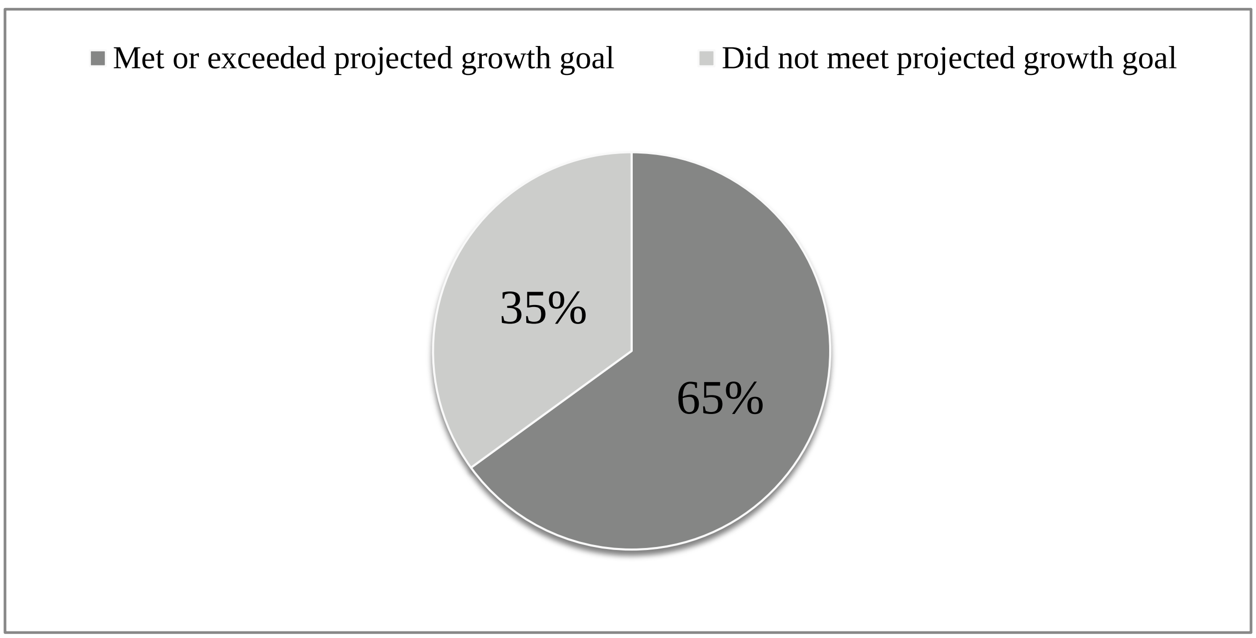

Figure 2. Percentage of students in treatment group that met or exceeded projected growth

Research question two. The second research question focused on whether a student's use of Khan Academy as a supplement would generate or produce a higher percentage of growth in RIT scores compared to those not using Khan Academy. The percentage of overall growth illustrated in figure 3 was calculated to demonstrate the possible potential of Khan Academy's use as a supplement. This percentage was arrived at by averaging the fall and winter RIT scores of the 27 participants in the control group and 37 participants in the treatment group, finding the difference between those scores for each group, dividing it by the fall average and then multiplying by 100. Average RIT scores for the control group in the fall was 219.23 and 229.69 in the winter while average RIT scores for the treatment group in the fall was 215.96 in the fall and 233 in the winter. These results indicated that the control group averaged a 4.77% increase in scores while the treatment group averaged a 7.89% increase in scores between the fall and winter. Due to the small number of students in the study, however, it is not sufficient evidence through the comparison of these two groups.

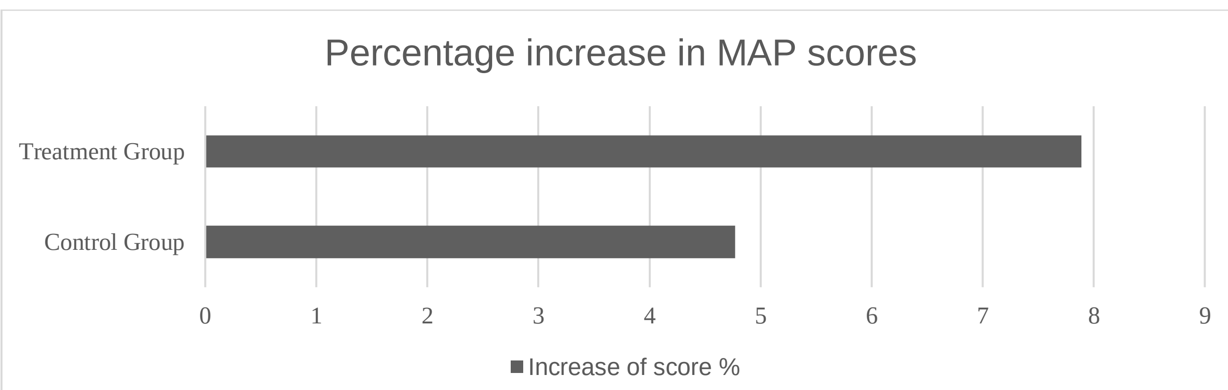

Figure 3. Percentage increase in MAP scores for treatment group and control group

Results, as illustrated in figure 4, were broken down further as an analysis of growth in specific grade levels. Due to a lack of students eligible for the control group in seventh grade, the findings were inconclusive. In addition, the growth of one student in the eighth grade control group skewed the results in this grade band as well. Excluding those two grade bands from the analysis, it can be noted that more participants in the fifth control group succeeded in meeting or exceeding the predicted RIT growth on the MAP test while more participants in third, fourth and sixth grade exceeded the predicted RIT growth on the MAP test.

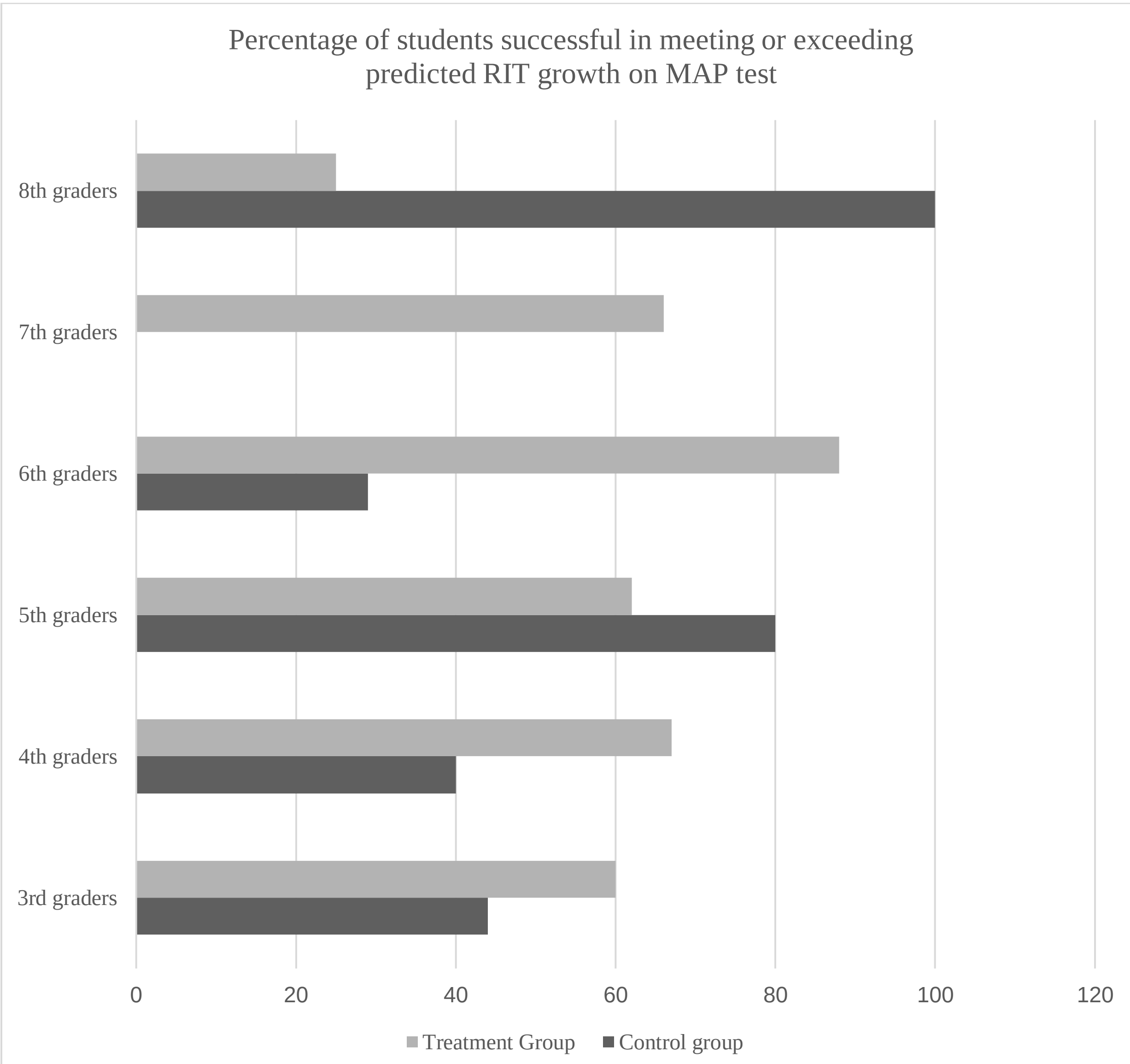

Figure 4. Percentage of students by grade level successful in meeting or exceeding predicted RIT growth on MAP test

When comparing scores with hopes for a growth model, it is beneficial to not only recognize the percentage of students that met or exceeded the projected growth, but to also analyze the percentage by which this growth increased. The information in figure 5 is a breakdown of the RIT score average percentile growth that occurred at each grade level. The control group results are as follows: third grade averaged from 211 in the fall to 221 RIT in the winter equal to .75%, fourth grade averaged from 208.5 in the fall to 220 RIT in the winter equal to 5.52%, fifth grade averaged from 225 in the fall to 236.5 RIT in the winter equal to 5.11%, sixth grade averaged from 222 in the fall to 232.5 RIT in the winter equal to 4.73%, seventh grade did not yield any control group results and the one student in eighth grade grade grew from 246 in the fall to 250 RIT in the winter equal to 1.63%. The treatment group results are as follows: third grade averaged from 208 in the fall to 230 RIT in the winter equal to 10.58%, fourth grade averaged from 203.5 in the fall to 216.67 RIT in the winter equal to 6.47%, fifth grade averaged from 222.8 in the fall to 250 RIT in the winter equal to 12.21%, sixth grade averaged from 223.71 in the fall to 235.29 RIT in the winter equal to 5.18%, seventh grade averaged from 224 in the fall to 236 RIT in the winter equal to 5.36% and the one student in eighth grade grade grew from 221 in the fall to 233 RIT in the winter equal to 5.43%. The treatment group out-performed the control group in each grade band.

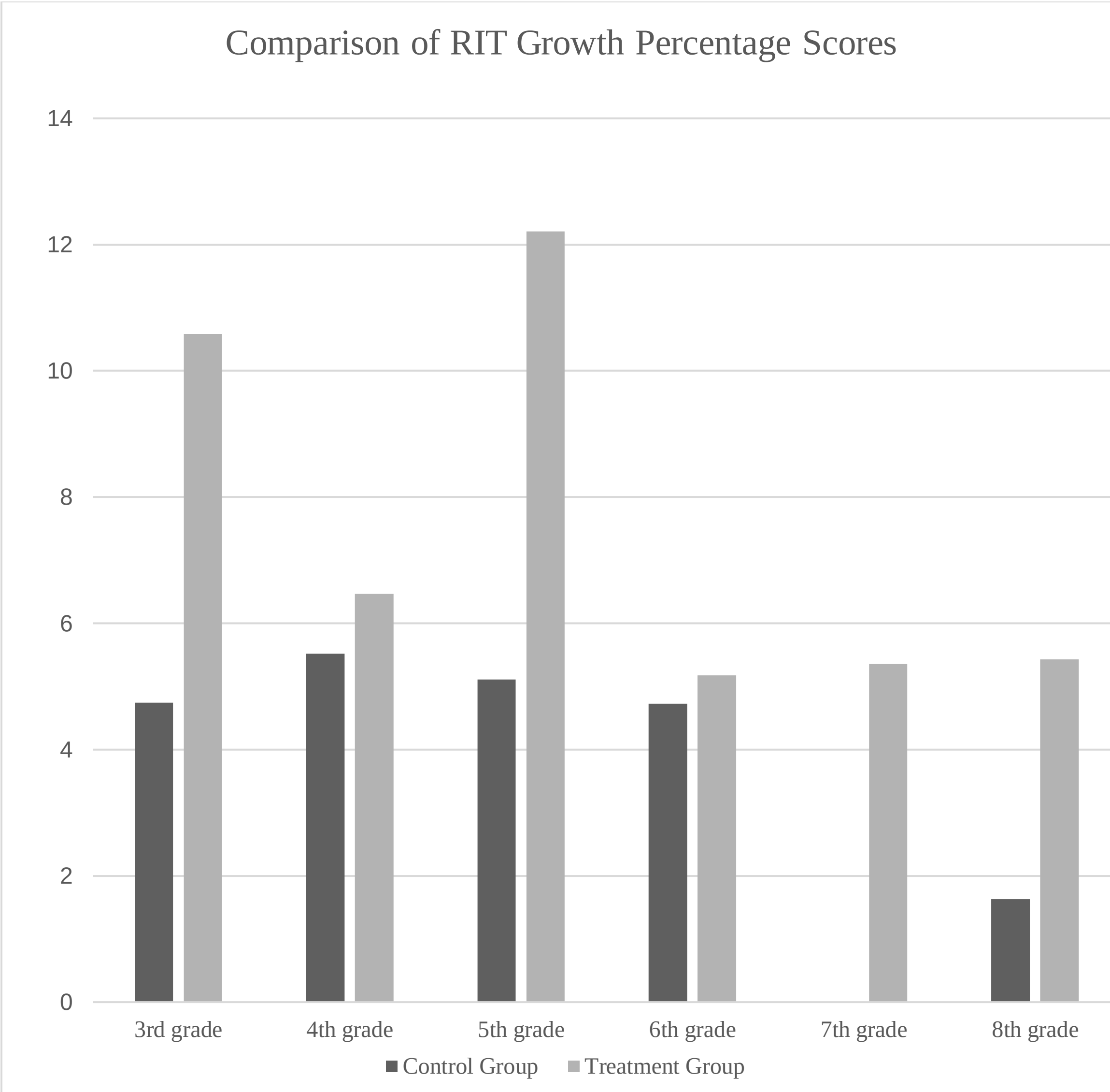

Figure 5. Comparison of RIT growth percentage scores shown by grade level

The NWEA presents MAP test results for classes broken down into subgroups indicated by percentile scores and based on the RIT scores. The breakdown for those groups is as follows: low percentile range of less than 21, low average percentile range of 21 - 40, average percentile range of 41 -60, high average percentile range of 61 - 80 and high percentile range of greater than 80. Using these subgroups for placement, students meeting or exceeding the projected growth may have moved from one subgroup to another. Tables 1 and 2 show the breakdown of students in the control group and the treatment group who met or exceeded projected growth following their participation in the fall MAP testing and the winter MAP testing. The low/average and average students in the control group both moved to the high average group. In the treatment group, the low student remained low, three of the students in the low-average group moved. One moved to average and two to high-average. Four of the five average students moved to high average and five high average students moved to the high sub-group. Growth occurred in both the control group and treatment group.

Table 1

Control group of students who met or exceeded projected growth divided into NWEA established sub-groups

CONTROL GROUP	Low %ile < 21	LowAvg %ile 21-40	Avg %ile 41-60	HighAvg %ile 61-80	High %ile > 80
Fall	0	1	1	4	7
Winter	0	0	0	6	7

Table 2

Treatment group of students who met or exceeded projected growth divided into NWEA established sub-groups

TREATMENT GROUP	Low %ile < 21	LowAvg %ile 21-40	Avg %ile 41-60	HighAvg %ile 61-80	High %ile > 80
Fall	1	4	5	7	7
Winter	1	1	2	8	12

It is important to analyze results however of all students, both those who met or exceeded the goal and those who did not meet or exceed the project growth goal. Tables 3 and 4 show the breakdown of all students in both the control group and treatment group. The mode (High group) remains consistent in both tables. The low/average and average students in the control group both moved to the high average group. In the control group, six students moved down one sub-group or level and four moved down by two levels. One student increased by two levels. In the treatment group, five of the students dropped by one level. Nine increased by at least one level and two students increased by two levels. It is important to bear in mind that these subgroups cover 20 percentage points so students could score on or near a breakdown point.

Table 3

All control group students divided into NWEA established sub-groups

CONTROL GROUP	Low %ile < 21	LowAvg %ile 21-40	Avg %ile 41-60	HighAvg %ile 61-80	High %ile > 80
Fall	1	1	3	9	13
Winter	1	4	4	9	9

Table 4

All treatment group students divided into NWEA established sub-groups

TREATMENT GROUP	Low %ile < 21	LowAvg %ile 21-40	Avg %ile 41-60	HighAvg %ile 61-80	High %ile > 80
Fall	1	6	9	9	12
Winter	3	2	7	9	16

Research question three. The third research question considered for those who met or exceeded the 360 minutes required for participating in the treatment group sought to determine if there was a positive correlation between improvement in math scores and the time spent working on Khan Academy. Figure 6, showing the scatterplot comparing time spent and the increase of scores received, indicates a correlation coefficient of .62757. Although there is a positive correlation, it is not necessarily a strong one and would suggest that further study would need to be done. It is not significant enough to give positive results in answer to the research question.

Figure 6

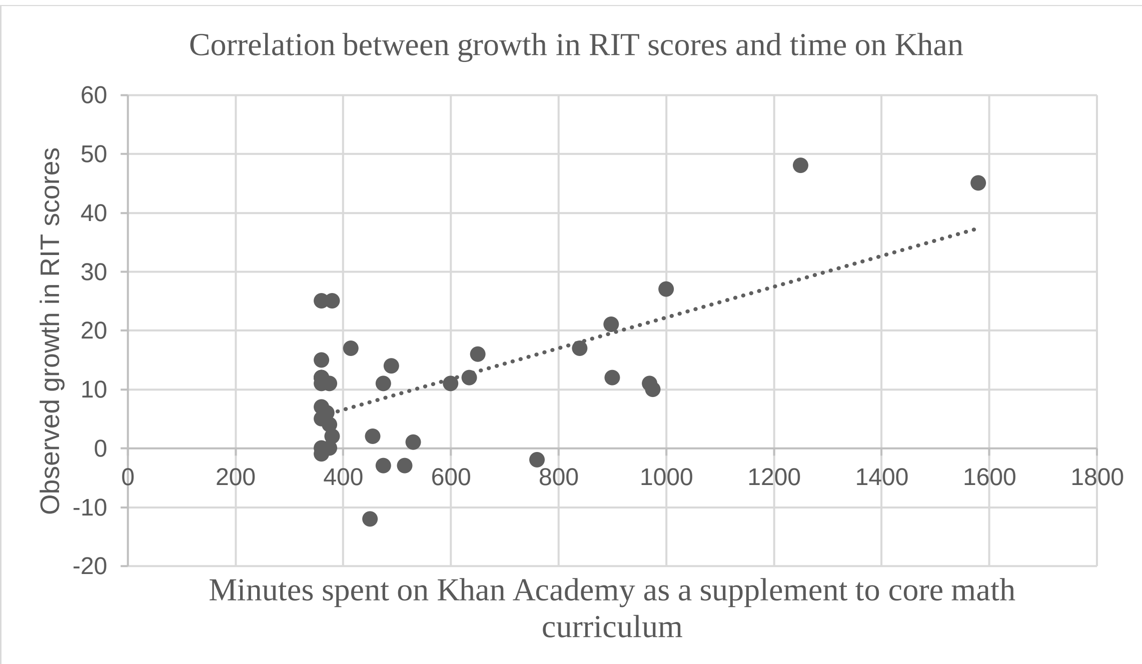

Figure 6. Correlation graph showing minutes on MAP and growth in RIT score

Discussion

Overview of the Study

The purpose of this study was to determine if connecting MAP testing results in math to Khan Academy would assist students in meeting or exceeding the projected growth goal determined by the NWEA and to determine if a correlation existed between growth achieved and the time spent on Khan Academy. This study was completed due to the debut of a recent program via NWEA and connected to Khan Academy called Khan Academy Mappers. To determine the answers to these proposed questions, student scores from the Fall MAP test and the Winter MAP test were compared. The control group took the tests and completed their core math curriculum while the focus or treatment group took the tests, completed their core math curriculum and also spent a minimum of 30 minutes each week on supplemental math practice through Khan Academy Mappers with tasks produced via their MAP math scores. Test scores for these two groups were then compared and analyzed further.

Summary of Findings

The first research question presented asked if the use of Khan Academy as a supplement to a core math curriculum could positively affect students and possibly cause more students to meet or exceed the recommended growth predicted by NWEA. Following the analysis of the data received via NWEA and Khan Academy, the researcher recognized that a greater number of students met or exceeded the projected growth goal following their supplemental work with Khan. The increase rose from 48% meeting or exceeding the projected growth goal to 65% meeting or exceeding the projected growth goal.

The second research question contemplated if the use of Khan Academy as a supplement could produce or generate a higher percentage of growth in student RIT scores. Results showed that the treatment group averaged more than 3% higher overall on their growth percentage.

In addition, the researcher recognized a positive, but not strong, correlation between the amount of time spent on Khan and increased scores on the MAP test. Due to variables outside the researcher's control such as core curriculum and other potential supplements also being used, the results, although showing a correlation, are not sufficient for making any conclusions.

Recommendations

Based on the results of the Khan Academy Mappers study, the researcher suggests that all staff at the parent partnership in Northwest Washington continue the use of Khan Academy as a supplemental resource for students in the alternative education setting. Further, this researcher recommends that staff set up a Khan Academy coaching site in order to observe the tasks completed and provide all students with another means for receiving instruction and practice. It showcases differentiation of learning and enabling students who are proficient with specific concepts to continue on. Finally, this researcher also recommends consistency in achieving 60 supplemental minutes per week because a positive correlation is reflected between the amount of time spent on Khan and the RIT scores.

Limitations of the Study

Due to the uniqueness of an alternative education parent program, there were a number of variables outside the researcher's control. These included, but were not limited to the core curriculum worked on in the home, additional math supplements used, the daily consistency of time on Khan, the amount of direct instruction by the parent and the individuality of the students themselves.

The MAP test for this study was conducted remotely by students in their homes. Giving the test at school would guarantee fairness to all students. Giving the test in a classroom setting would ensure the locus of control remaining with the classroom teacher.

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Appendix A

Parental Consent Form for MAP/Khan Academy Research

Dear Parents,
I am nearing the completion of my studies towards a masters degree in Teacher Leadership. As a final step in this process I am required to conduct an action research project. I have chosen to focus on Khan Academy and its ability to assist students in their growth and understanding of math skills. One means of measuring growth could be an increase of RIT scores on the MAPmtest.

Because your child took the MAP test in the fall, I would like to give you the opportunity to include him/her in this study.

What will this involve?

1. Participation in the Fall MAP testing. (student responsibility -- finished)

2. Transferring of RIT scores received on the MAP test to the Khan Mappers website (my responsibility)

3. Beginning the week of December 11 and continuing through March 17, (12 weeks) a minimum commitment of 30 minutes each week towards individualized targeted areas in math. (student responsibility)

4. Bi-weekly encouragement email. (my responsibility)

5. Participation in the Spring (March) MAP testing. (student responsibility)

Your child(ren)'s participation is optional but highly encouraged as it will provide you with the maximum benefit of both MAP testing and Khan Academy. All personal information will be kept private. I am, however, very excited about the opportunity to partner with you and encourage continued individualized growth in math. I appreciate your consideration for participation in the study as this is an important project, not only for my continuing education, but also for understanding best practices in teaching and student learning.

I would appreciate a reply email by Friday, December 2 stating one of the three options.

1. Yes, I am willing to participate in this study. I do so, however, with the understanding that I can withdraw at any time and my results will not be used.

2. No, I am not willing to participate in this study but will agree to MAP testing again in the spring as a means of measuring growth.

3. No, I am not willing to participate in this study and will not agree at this time to MAP testing again in the spring as a means of measuring growth.

If you have any questions about the study, please contact me at XXX during school hours) or email me at XXX
Thank you very much for your help.