

Math Fluency Intervention Using Technology

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Introduction

Orientation to the Topic

Developing and investigating strategies to increase mathematics fluency in children is imperative with the implementation of the Common Core standards. What is mathematical fluency? Math fluency is the ability of a student to recall quickly addition, subtraction, multiplication, and division facts (Frawley, 2012). With all of the technology available, it is important to establish a relationship between math fluency and technology in order to ensure students have this skill.

Many educators are using technology as an intervention tool in their classrooms. Technology devices such as iPads are relatively inexpensive and versatile for student and classroom use. Technology allows for students to learn and deeply understand mathematical concepts while using technology. It is important to use the technology resources I have available in my classroom to increase fluency with all of my students. I am currently teaching third grade math. I have been teaching math for four years. In my experience, I have realized students have minimal fluency in math when it comes to addition and subtraction. Without being fluent in addition and subtraction, students will have a difficult time with mathematics in third grade. With the new Common Core standards, students are expected to be fluent in basic addition and subtraction facts by this time. It is important to outline the reasons why students are not fluent and determine methods which will increase fluency in early grades and prepare them for upper elementary math.

With the changing world of education, it is important for educators to begin to change also. By using technology in the classroom, it is possible to greatly increase students' math fluency which will benefit them throughout their lives.

Purpose Statement

The purpose of this research is to determine effective instructional technology programs that will promote students' math fluency. All teachers wonder how much time and planning these interventions take. Once a program has been determined and directions given to students, the teacher has a minimum amount of time invested into the intervention. With the technology playing the role of the facilitator, the student will be working individually to increase fluency.

With Common Core standards increasing in rigor, students must have the basic skills before they can be expected to excel at a higher level. By providing these simple math fluency interventions, students will be ready to reach maximum potential in a short amount of time.

Research Questions

During this process, there are several questions which will be important to answer. First, will Renaissance Accelerated Math be successful for students when conducting technology interventions? Renaissance Accelerated Math is a program in which the teacher chooses objectives or standards students need to work on. Then, students complete practices and tests to master those standards. The work can be set up as standardized testing format or student response. Depending of the type of learner, the program may need to be adjusted. Also, students with special needs would need to be accommodated also. Renaissance Accelerated Math is set up to accommodate all learners. Next, a time frame will need to be established. Most of this will depend of the educator. The interventions will take place 10 to 15 minutes per day for five

weeks. In addition to this, the educator will need to determine the technology available to them. With this being said, the experimental group will use laptop computers during their interventions. The control group will use iPads for their intervention time. Renaissance will automatically track the growth of students and show it using various reports.

Importance of the Study

This study is extremely important to any educator teaching mathematics. The study will reveal whether or not conducting an intervention using Renaissance Accelerated Math will help students achieve higher levels of mathematical fluency. This study could change the way educators are teaching. It could also provide educators with other resources to help students achieve maximum fluency. It is important for educators to use technology in the most productive ways. By using technology to provide interventions for students trying to obtain math fluency, students could have a better chance of success in mathematics. In order for these interventions to be successful, it is important for educators to choose appropriate programs which will help their students achieve goals. Also, providing a schedule for the intervention is also imperative. With the many types of technology in classrooms today, providing math fluency interventions using technology should be both successful for the student and the teacher.

Definition of Terms

Renaissance Accelerated Math is the math program used for the study. The program can be used as a progress monitoring tool to help increase students' fluency in mathematics.

Intervention specialized one on one session where students' focus on a subject area where they need specific help.

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Intervention Specialist is a certified teacher trained to help students' focus on reading and math

Literature Review

Sarama and Clements (2004) outlined the importance of students developing math fluency at an early age. They indicate this goal will enable students to be more successful in the future. Research also shows a direct link between technology interventions and improvements in mathematics (O, Jenkins, Wesley, Donehower, Rabuck & Lewis, 2013). How does technology based interventions such as Renaissance Accelerated Math influence math fluency?

Technology and Math Fluency

In the process of mathematics, two things should be considered. First, teachers need to help children build their computational fluency; secondly, teachers need to allow students to focus on and have a deep understanding of problem solving (Kuhn & Dempsey, 2011).

According to a study conducted by Kuhn and Dempsey, if students find something which is exciting i.e. using an iPad, they will be more engaged and find it more relevant to their lives.

According to a second study by Cholmsky (2011), he suggests students need fluency in math in order to free up other working memory which allows them to focus more of the problem solving aspect of math. Cholmsky (2011) suggests using a technology program called Reflex Math helps students who are having trouble mastering their math facts achieve them. By using this technology, students are doing four things: participating in fun, engaging lessons, lessons which are adapted to their needs, progress monitoring, and ultimately mastering facts.

Adding to the study by Cholmsky (2011), Duhon, House, and Stinnett (2012), also investigated the effects of computer based instruction in mathematics. Their findings indicated students had higher achievement in all areas of mathematics when using computer based interventions. In a comparison of teachers who used pencil and paper techniques to help students

become fluent in math facts vs. teachers who used technology, the students using technology were more successful in their math fact fluency. Schwartz (2005) identifies many instructional strategies teachers can use to help their students build the basic blocks of math. These instructional strategies can be used with technologies such as iPads or classroom computers. There are many tutorials and programs such as FASTT Math (2012), which will allow students to be successful in building fluency using the basic instructional strategies such as counting on that many educators are teaching.

Literature on Math Foundation

There are many opinions from educators indicating the foundations of math skills students need in order to be successful. I chose to focus on the skills students learn in elementary school. To be specific, the skills I chose to address are the fluency skills students have in addition and subtraction. According to an article from the National Council of Mathematics Teachers (2007), the council urges teachers to focus on the early math skills in order to ensure the success of students. To name a few, these skills included reasoning, problem solving, and fluency. Schwartz (2005) also identified many instructional strategies which are essential to success of children in early mathematics. Another article from the NCTM suggests developing a positive attitude and essential math skills from pre kindergarten through second grade is imperative in the success of children in mathematics. It is important for children to know what math is, how it is important, and how it affects them. The article, "The Basics of Math" identifies specifically things children should be able to do in primary math. One objective which is mentioned each year from kindergarten through second grade is computation of addition and subtraction problems efficiently. Another objective is mastering basic math facts.

Methodology

Overview of Research Design

The research method being used for this study is quantitative research. Quantitative research measures the views from a particular sample. Usually, the sample population is chosen randomly. With this being said, the sample population chosen for this study will be random. Selecting a sample is important. In this study, a random sampling method will be used. In random sampling, all individuals have an equal chance of being selected. The population in which the sample will be chosen from is any elementary school student. The desired sample size will be no less than ten students and no more than twenty students. The participants will be randomly assigned a number for data tracking purposes.

Data Sources/Instrumentation/Procedures

The first element in experimental design is to distribute a pretest. The pretest will be taken using laptops or iPads. The pretest will be self-developed based on Common Core standards. The pretest will determine the amount of math intervention using technology, students would need. Pretest results would determine the area the student needs the most intervention in. After the intervention was complete, the posttest would be administered to determine if the intervention was successful. Matching will also be used based on pretest scores and overall ability. In this design, there will be a control group and an experimental group. The experimental group will be given the intervention one time a day for ten minutes each of the five days in the classroom. The control group will remain in the classroom and practice math fluency facts using traditional methods such as on paper. The experimental group and the control group will be determined at random. The experimental treatment will be the students who are pulled out of the

classroom and will be coached by an intervention specialist; whereas, the students who are in the control group will work independently in the classroom. Depending on the success of students, the intervention times could be increased or decreased.

This study is focused on students receiving the interventions. Periodically, a survey will be distributed to the population to gain insight on interest and progress. This will be completed in an interview format where the researcher will collect the responses. This will help to observe student behavior during the interventions. The behaviors and results will be compared between the experimental and control group. Some of the questions to be asked during the interview include the following: Do you feel the fluency check on the iPad is helping you? Are you interested each time you use the iPad, or do you get bored? Do you feel like you should be spending more time on iPad practicing or less time.

Participants

The participants of this study will be students ranging in age from eight to ten. These students will be a mix of boys and girls. The demographic of the school is ninety-eight percent white students with the remaining being Spanish. For the study, all of the participants will be white. The sample size participating in this study will be twenty children.

Proposed Analysis

The data being collected during this study will be quantitative data. There will be two groups of students: one controlled and one experimental. The control group will remain in the classroom practicing math fluency using traditional methods such as pencil and paper practice. The experimental group will be pulled out of the classroom and given the intervention using

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iPads or laptops. In order to help connect the success of the intervention, an interview will take place periodically to determine if the location of the intervention makes a difference in the success of the students.

References

Basics of mathematics. (2002). Retrieved from

<http://www.pbs.org/wgbh/misunderstoodminds/mathbasics.html>

Cholmsky, P. (2011). Reflex math. Retrieved from

http://www.reflexmath.com/assets/doc/Reflex_White_Paper.pdf

Creswell, John W. (1994) Research Design: Qualitative and Quantitative Approaches; Sage Publications; California.

Developing a solid math foundation. (2004). Retrieved from

<http://www.todays-learners.com/developing-a-solid-math-foundation/>

Duhon, G. J., House, S. H., & Stinnett, T. A. (2012). Evaluating the generalization of math fact fluency gains across paper and computer performance modalities. *Journal of School Psychology, 50*(3), 335-345 inclusive. Retrieved from

<http://www.sciencedirect.com.proxy.kennesaw.edu/science/article/pii/S0022440512000179?>

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Falloon, G. (2013). Young students using ipads: app design & content influences on their learning pathways. *Computers & Education*, 68, 505-521 inclusive. Retrieved from <http://www.sciencedirect.com.proxy.kennesaw.edu/science/article/pii/S0360131513001577?>

Frawley, Chris (2012). Innovations and Perspectives. Retrieved from <http://www.ttacnews.vcu.edu/2012/02/developing-math-fact-fluency/>

Godzicki, L., Godzicki, N., Krofel, M., & Michaels, R. (2013). Increasing motivation & engagement in elementary & middle school students through technology supported learning environments. Retrieved from <http://files.eric.ed.gov/fulltext/ED541343.pdf>

Helmenstine, T. (2013). *What is a control group?*. Retrieved from <http://chemistry.about.com/od/chemistryterminology/a/What-Is-A-Control-Group.htm>

Hudson, S., Kadan, S., Lavin, K., & Vasquez, T. (2010). Improving basic math skills using technology. Retrieved from <http://files.eric.ed.gov/fulltext/ED512698.pdf>

Kuhn, M., & Dempsey, K. (2011). End the math wars. Retrieved from <http://files.eric.ed.gov/fulltext/EJ954321.pdf>

O'Malley, P., Jenkins, S., Wesley, B., Donehower, C., Rabuck, D., & Lewis, W. (2013).

Effectiveness of using ipads to build math fluency. Retrieved from

<http://files.eric.ed.gov/fulltext/ED541158.pdf>

Pavlekovic, M., Kolar-Begovic, Z., & Kolar-Supera, R. (2013). Mathematics teaching for the

future. Retrieved from <http://files.eric.ed.gov/fulltext/ED542544.pdf>

PR Newswire. (04, 2012). All new fast math: Next generation helps students achieve math fact

fluency. Retrieved from

<http://ehis.ebscohost.com.proxy.kennesaw.edu/eds/detail?sid=c4e9d776-b9ce-4fca-94c5>

[b002b08f037f%40sessionmgr4&vid=5&hid=17&bdata=JnNpdGU9ZWRzLWxpdmUmc2N](http://ehis.ebscohost.com.proxy.kennesaw.edu/eds/detail?sid=c4e9d776-b9ce-4fca-94c5)

[vcGU9c2l0ZQ%3d%3d#db=bwh&AN=201204250959PR.NEWS.USPR.NY94595](http://ehis.ebscohost.com.proxy.kennesaw.edu/eds/detail?sid=c4e9d776-b9ce-4fca-94c5)

Sarama, J. & Clements, D. (2004). Building Blocks for early childhood mathematics.

Retrieved from http://gse.buffalo.edu/org/buildingblocks/writings/bb_ecrq.pdf

Schwartz, S. (2005). Teaching young children mathematics. Retrieved from

<http://www.questia.com/PM.qst?a=o&d=113141063>

What is important in early childhood mathematics. (2007, September). Retrieved from

<http://www.nctm.org/about/content.aspx?id=12590>

Webb, J. (2013). The ipad as a tool for education. Retrieved from

<http://www.naace.co.uk/publications/longfieldipadresearch>

Appendices

Student Survey

Did you like using Accelerated Math?

Was Accelerated Math easy for you?

Did you like using Accelerated Math each day?

What do you think you learned from using Accelerated Math? _____