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# Using iPad applications to promote fluency in mathematics and improve attitudes toward studying

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## Introduction

Third grade can be a difficult year for students because they are introduced to multiplication and division. The first phase is multiplication where fluency or speed is often the emphasis of instruction. Students tend to be measured by performance on timed tests. Unfortunately, this practice can lend itself to negative attitudes and emotions toward school, mathematics, and studying for children. This study investigated learning multiplication facts by playing games on iPads improves third grade students' fluency and attitude toward studying mathematics.

### Background of the Problem

The use of technology in the classroom has been tested several times with varied results, especially in the case of laptops. Between the years 1996 and 2005, more than ten billion dollars were spent on laptop programs across the country (O'Dwyer, Russell, Bebell, &Tucker-Seeley, 2005). Students often have access to technology both at school and at home. With students using technology more and more often and the introduction of the iPad or tablet into the market, the researcher found the idea of using iPad game applications to study interesting.

### Significance of the Study

This study investigated the impact of multiplication game applications on the iPad in one group of four, third grade students' accuracy, fluency, and attitudes toward studying mathematics. The intent was to determine whether the students' attitudes toward studying would improve from studying in a new and interesting manner, and to determine whether their scores on timed multiplication tests would improve. The research question

addressed in this study was, "Does using iPad game applications to study promote fluency in mathematics and improve attitudes toward studying?"

## Literature Review

Several states and school districts have approached the challenge of incorporating technology into instruction differently. One of the most popular ways to teach with technology was to give laptop computers to students. The literature review explores the various successes and failures of laptop programs around the country for various age groups. MP3 players and iPods are also discussed. These have been used both in higher education and in elementary education for different purposes.

## Laptop Programs

The idea of giving students laptops to use for academics is not new, and there is always a feeling of hope associated with the results. Between 1996 and 2005, federal, state and local agencies invested more than ten billion dollars in computer-based education (O'Dwyer, Russell, Bebell, &Tucker-Seeley, 2005). Sometimes technology is added to a school to level the playing field between the students with low and high socio-economic status.

Schools in Liverpool, New York found that, after seven years, the laptops had no impact on student performance (Hu, 2007). The laptops became more of a problem than a solution as the students began to use them for pornography and to cheat on assignments. Originally meant to be the answer to dilemmas for students and teachers, the technology was constantly breaking, leaving students without laptops and the district with repair costs. In fact, in one school, the yearbook room had to be repurposed to be a makeshift in

house repair center (Hu, 2007). It seems that what was given with good intentions turned out to be an avenue to increase cheating and raise costs.

While this was the case among high school students, one study in Maine found that laptops were helpful for younger students with special needs (Harris & Smith, 2004). The laptops helped with many issues ranging from organization to writing quality. The special education teachers involved in the study felt that the laptops lessened the challenge of writing with a pen, so their writing became comparable to that of their peers (Harris & Smith, 2004). While these results were obviously positive for several students, the teachers showed reservations about the overall effectiveness of technology in the special education classroom. It only amplified feelings of distractedness, anxiety, and frustration in children who already had tendencies in these areas. Teachers said that the nature of the child's disability did not directly coordinate with their ability to use the computers in a productive way, meaning that it is difficult to predict whether a laptop will be helpful or just another source of frustration for the students (Harris & Smith, 2004). With these exceptions aside, special education teachers said that the laptops improved student performance in the following areas: behavior, motivation, engagement/interest, working independently, and retaining material. They even increased the students' interaction with other students and their teachers.

In the fourth grade, it is common for students' language arts grades to slip downward (Suhr, Hernandez, Grimes, & Warschauer, 2010). This is especially common among children with low socio-economic status, and among non-white children (Suhr, Hernandez, Grimes, & Warschauer, 2010). In order to avoid this, one group chose to use

laptop computers. By the time the students were in fifth grade (year 2 of the study), it was clear that the laptop group had not suffered from the fourth grade slump and that they were improving and maintaining skills much better than their peers who had not received laptops. Practicing skills like editing papers on computers helped students raise their overall language arts test scores over time (O'Dwyer, Russell, Bebell, & Tucker-Seeley, 2005). The laptops in upper elementary grades are very helpful for language arts purposes; they help with skills like writing, reading, and editing.

These studies have shown that laptops in the classroom have the ability to be extremely helpful, but occasionally they add another distraction. With the new technology available today, it is important to note whether the technological interventions in the past have worked.

## MP3 Players and iPods

In many ways, the iPod is the predecessor to the iPad. By using podcasts, nursing professors have dealt with the issue of having too many students and not enough teachers (Maag, 2006). This allows college students to take their professors' lectures out of the classroom. Students can review while they walk around campus or they can download more podcasts with more in-depth lessons on specific topics (Maag, 2006). Foreign language professors can also use this technology to test students on pronunciation and speaking. Students simply record themselves speaking and turn the recordings in electronically. Teachers can also record native speakers and send it to students so they can practice while they are doing other things. It is even possible to access phrases and words via podcast or MP3 while travelling, so anyone, not just students, can benefit from this type

of educational technology (Maag, 2006). Using the iPod for more than just entertainment is extremely positive. In these cases, college students are using them not only to study the information their professors have given them but also to seek new information. It is important for students to have an understanding and capability to seek new and specific information via whatever methods are available. In the past, students were limited to the books in their local library. Now, there are lessons available everywhere they go.

The iPod has also been used to promote creativity among college students studying music and dance (Dale, 2008). For music, students performed and used the iPod to record themselves. They could then send it to their teachers and classmates via podcasts. The dance students made a short video of their choreography that they could share with their peers and teachers using the devices as well (Dale, 2008). One professor said, "This technology has allowed them to venture into areas that they wouldn't have gone before in quite the same way" (Dale, 2008, p. 6). In this case, the iPods helped them broadcast their work to their classmates, and in turn they could see their peers' work. This fosters collaboration and the creation of new ideas. It is also important for music and dance students to be up to date on the latest innovations in new sounds and movement. The iPod puts access to this directly in their hands.

One researcher used iPods for literacy and numeracy with two girls, ages 5 and 7. His research is anecdotal, but he was able to use the simplest applications that come from the factory like the stopwatch feature to get the girls to use vocabulary like, "You ran it in 9.2 seconds" and to recognize the words "stop" and "start" (Ricci, 2011). These young girls were playing with a basic feature, but because of how easy it was to use the touch screen on

the iPod, they were learning at the same time. Ricci's (2011) research on this topic shows the natural way that children pick up on words and numbers when they realize that the words and numbers are relevant to them. The girls were running and timing each other, so they thought it was fun to see how fast they were going. In this way, they learned a few new words and gained an early understanding of decimals. After the running activity, the girls explored the alarm feature. They had to read the settings to see if they wanted to hear the alarm sooner or later, then they counted down with the screen until the alarm went off. All of these activities happened in a very loosely constructed learning environment. The researcher did not set out with the goal of teaching the girls to count backwards or to see if they could learn decimals, but the girls ended up learning these skills from playing with the iPod (Ricci, 2011). He says that it is important to be fluid in these activities so the learning will happen naturally, but a few constraints need to be in place to ensure effectiveness and safety. He then allowed them to look at the weather application. The girls already had an interest in the weather, so this was very successful. They were learning to recognize the names of the days of the week and to connect the number of degrees with what they needed to wear each day. Again, the material was relevant and interesting to the students and they were learning about the different ways that numbers and letters affect them personally (Ricci, 2011). When a child is having fun, they are instantly more engaged. Using a touch screen is exciting and new for young children, so it follows naturally that it should be included in classroom learning. This study shows that the iPod has educational uses in the home, not just in the classroom. These girls were playing, not studying, but they still learned several lessons. There were no flashcards and no quizzes, but a five year old

came away with an understanding that negative numbers in the context of weather mean that it is cold outside.

## iPads

The iPad is built for accessibility. Due to its light but strong structure, it is portable and a great alternative to heavy textbooks. All children, especially those with special needs, easily use it. The way the iPad works is very similar to the iPod and iPhone. Each activity or capability of the device is available through an application. There are thousands of applications and many of them are free, which is great for schools and families with tight budgets. The iPad has been helpful in the world of special education because it enables students to participate better in class (Edyburn, Higgins, & Boone, 2005) and because it helps compensate for academic underachievement (Messinger-Willman & Marino, 2010).

The iPad has these positive aspects, however it is not without flaws. Just like the laptops in the classroom, there is a possibility of students getting off task and/or cheating. Using iPads in the classroom requires teachers to have a greater knowledge of the applications and use of the devices and it may make schools take a closer look at classroom management (Tadros, n.d.). The same can be said for parents who allow children to use the devices at home. As with any situation involving children and the Internet, adult supervision is required.

In one study, children between the ages of two and eight years old played with iPads to see if the touch screen was appropriate for young children's use. The researchers found that not only did the devices fascinate the children, but also they were learning in several ways while they played. The types of learning included learning about the game and how

to play it; mastering the educational goals of the games (matching, etc.); and using what they learned to play other games and at different levels (Cohen, n.d.).

Some schools have already integrated the iPad into classrooms. Stonewall Elementary in Fayette County, Kentucky has provided iPads to four second and third grade classes. The teachers were interested in testing the technology for their students and they applied for grants. There are almost enough iPads for each student to have his/her own. They use the devices for every subject. During mathematics, the students can draw geometric shapes and play educational games. They also use them for research and to practice spelling (McCrea, 2011). The school considers this a successful test and is interested in using iPads more in the future.

## Methodology

In order to determine whether the participants' attitudes toward studying and their mathematical fluency improved, the researcher conferred with classroom teachers, and administered timed multiplication tests and attitude surveys. All of these measures were taken at the beginning and end of the study. For the seven weeks between pre-testing and post-testing, the students played multiplication games of their choice on iPads twice a week in their regular classroom while their peers were at ancillary classes or recess.

### Setting

This study was conducted at a small private school in Fayetteville, Arkansas. The students' families pay tuition yearly for a co-ed, nonsectarian education from pre-school through seventh grade. There are 436 children enrolled in the school with an average class size of 17. The majority of the school's enrollment comes from the pre-school and pre-

kindergarten; the grades from kindergarten to seventh grade have between 23 and 36 students. The students are accustomed to low student-teacher ratios averaging 12 to 1. The majority of students at the school are Caucasian, only 15% are students of color. The school provides extra-curricular activities, such as sports and music, on campus.

**Participants**

The participants were chosen based on teacher recommendation and parent permission. The classroom teachers recommended two boys and two girls who were having trouble in math and whom they predicted would benefit from extra practice, attention, and instruction. The teachers were concerned about this particular group of two boys and two girls because they felt that the students had the knowledge necessary to be successful in mathematics, but they lacked the speed or fluency to answer questions quickly on timed examinations. The teachers did not disclose any diagnosed special needs in these students, and the school does not offer special education services.

One boy (Student 1) is the oldest in his family and is known for his difficulty with sitting still. He got along well with his peers during recess and ancillary classes, but he struggled academically. Because of this, he was shy when the entire class was learning, but he was outgoing with a select group of students whom he perceived were on a similar achievement level.

The other boy (Student 2) had trouble in all areas of academics, excluding physical education. He did not have success in the classroom because he had trouble reading and was not able to perform equally to his peers in the amount of time given. He often got

distracted and liked to talk about his life outside of school rather than the task at hand. The boys were very close friends, so they were happy to spend time together.

The girls were also good friends. One girl (Student 3) was not capable of staying focused long enough to finish any of her work in the classroom. Her teacher expressed frustration because the student never finished work on time and often forgot what she was supposed to be doing. She was not intentionally defiant, in fact she wanted to please the adults around her, but she rarely completed a task or followed instructions the first time she was asked.

The last participant (Student 4) was not enthusiastic about spending more time in the classroom, but she completed all of her work. She had a tendency to become frustrated with herself and the slowness of her progress. This became difficult when other students completed tasks before she did. This student never wasted an opportunity to share her feelings of frustration.

**Confidentiality**

Permission to conduct this study was granted by the University of Arkansas Institutional Review Board and the participants' parents. A letter and informed consent form were sent to parents explaining the purpose of the study and the components involved (see Appendix A). The letter served as an introduction from the researcher to the participants' families and a way to establish rapport with them before beginning to work with their children. The informed consent explained that no grades would be given and that students could withdraw from the study if they chose to do so. All the students

participated anonymously; only the researcher had access to the participants' names. All actual names were changed to numbers for writing purposes throughout the study.

**Data Collection**

This study was designed to determine the effectiveness of using iPad game applications to study or practice basic multiplication facts. Data were collected through a multiplication test and attitude survey taken at the beginning and end of the study. Participants played games on their schools' iPads twice weekly while the researcher took anecdotal records and made observations about their attitudes.

**Evaluation Instruments**

The participants completed an attitude survey (see Appendix C) at the beginning and end of the study. Their answers were used to measure their attitude toward studying in order to assess whether the study made any changes in the way they viewed practicing or studying, especially for math. These surveys addressed the students' interest in school, their perceived success in mathematics, and overall attitude toward studying by asking them twelve questions and allowing them to answer by checking a box marked "no", "a little", "neutral", "a lot", or "definitely".

They completed the same timed multiplication test (see Appendix D) on the first and last day of the study as well. This test was evaluated for both time and accuracy to determine the iPads' impact on their overall fluency in multiplication. The test had eighty-one questions on single-digit multiplication facts zero through nine. The students were allowed to use up to twelve minutes for the pre-test and as much time as they needed for the post-test (none needed more than ten minutes).

The researcher made observations throughout the time spent with the participants. This provided qualitative data to compliment the quantitative data presented in the survey and written test. By spending time with the children twice a week and speaking with their classroom teachers each week, she was able to learn about the students and get to know them personally. After seeing them over the course of the study, she had an understanding of each participant's personality and tendencies.

**Data Analysis**

The surveys were analyzed by assigning a numerical value to each of the five possible answers for the questions. The answer "no" received a 1 and the answer "definitely" received a 5. In order to measure the students' attitudes toward school and studying, the attitude survey was written and administered by the researcher both before and after intervention. In order to measure the students' progress in multiplication, the students took an eighty-one-question timed multiplication tests before and after the intervention.

**Interventions**

The researcher met with the classroom teachers prior to the study to discuss scheduling and location. The students would either be in Spanish class, recess, or indoor recess in the art room. The researcher walked them back to their classroom while talking with the students to make them comfortable and learn about them personally.

The first week, the researcher spoke with the students and explained the purpose of the study and the way their meetings would go in the future. The students were to play the iPad multiplication game of their choice quietly for as much time as possible before their

classmates returned from Spanish/recess. Next, the students took the survey. The researcher read the questions aloud to the students. The surveys were collected. The researcher passed out the timed tests while the participants were seated at different tables. The children were encouraged to do the best work possible without asking questions or looking at their peers' papers. They understood that there would not be a grade given for this test.

Throughout the following weeks, the students met with the researcher at the same time every Wednesday and Thursday, except in cases of inclement weather. The study began at the end of October and ran through mid-February because of inclement weather and school breaks for Thanksgiving and winter holidays.

The participants played any of the three following games: Sushi Monster, Bubbles, and Multiplication Birds. The school's iPads were already equipped with these applications and the participants were familiar with them.

Sushi Monster provided the player with the product and he/she had to pick the two factors. The game looked like a sushi restaurant with the monster in the middle of a round conveyor belt on which plates sat (See Figure 1). The monster would eat the sushi with the correct factors and throw the sushi on the floor if it had the incorrect factors. The students earned points for the correct answers and the iPad showed the top scores earned (See Figure 2).


*Figure 1.* Sushi Monster game during play

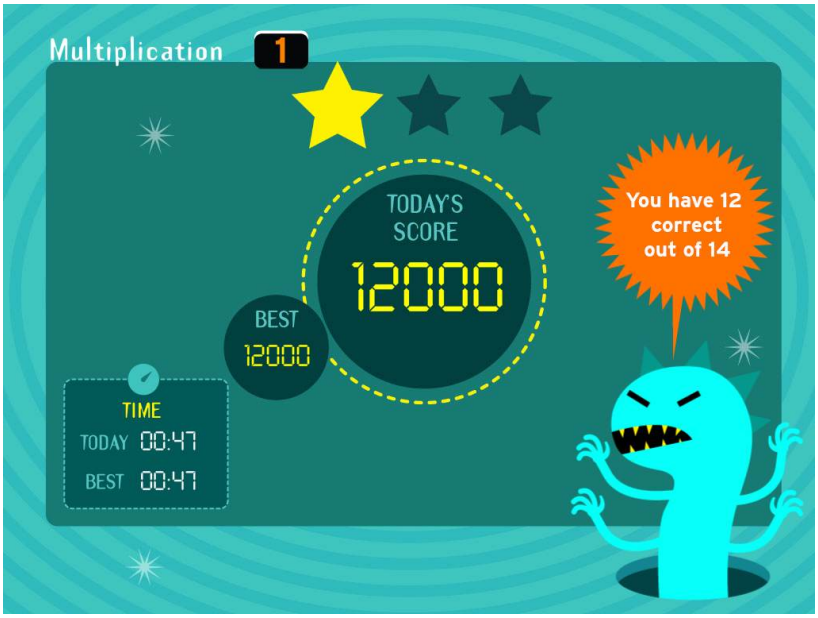


*Figure 2.* Sushi Monster game after play, showing score earned

Bubbles also provided the product. The student picked two bubbles from the provided list (See Figure 3). If they did not know an answer, they could choose to skip to

the next problem. The game kept track of their time but they were not penalized for taking longer.


*Figure 3*. Bubbles game during play

Multiplication Birds showed a bird next to a tree. Each time the student provided the correct product, the bird moved higher. After several correct answers, the bird landed in the nest. If the student provided an incorrect answer, the bird fell and the game had to be restarted.

At the end of the study, the students met with the researcher again to take the same multiplication test and attitude survey. The researcher read the survey questions aloud and the students did the multiplication tests independently.

## Results

This study's purpose was to investigate whether the students' attitudes toward studying improved and to indicate whether their math fluency improved. Their scores on the attitude survey taken at the beginning and end of the intervention were analyzed to determine any changes that had occurred. The responses to each question were assigned a value 1 through 5 that corresponded with the answers "no" through "definitely". Each participant's answers were scored out of 60 because that would be the value if they responded with "definitely" for each question. The means of the pre and post surveys were analyzed using a *t*-test for paired two sample means with an alpha level set at 0.05. This analysis revealed that the difference was not statistically significant between the pre- and post-intervention survey scores, T-stat=0.18, P-value=0.005575. They did not begin to enjoy studying more than they did before the intervention. Questions 6 and 9 received answers of "definitely" both before and after intervention. This showed that the students knew that their parents expected or wanted them to have good grades in school and that they had all gotten experience with an iPhone, iPod, or iPad. There was little change for the other questions; all four students remained consistent in their opinions.

Their fluency improved after the t test showed significant change in their multiplication test scores. Before intervention, the students' average score was 56.15%. After the intervention, the average score was 86.43%. These results were analyzed using a *t*-test for paired two sample means with an alpha level set at 0.05. This analysis revealed a statistically significant difference between the pre-and post-intervention multiplication test scores, *t*Stat=-4.21777, t critical value= 2.4469. The group's accuracy increased after intervention (See Figure 4).

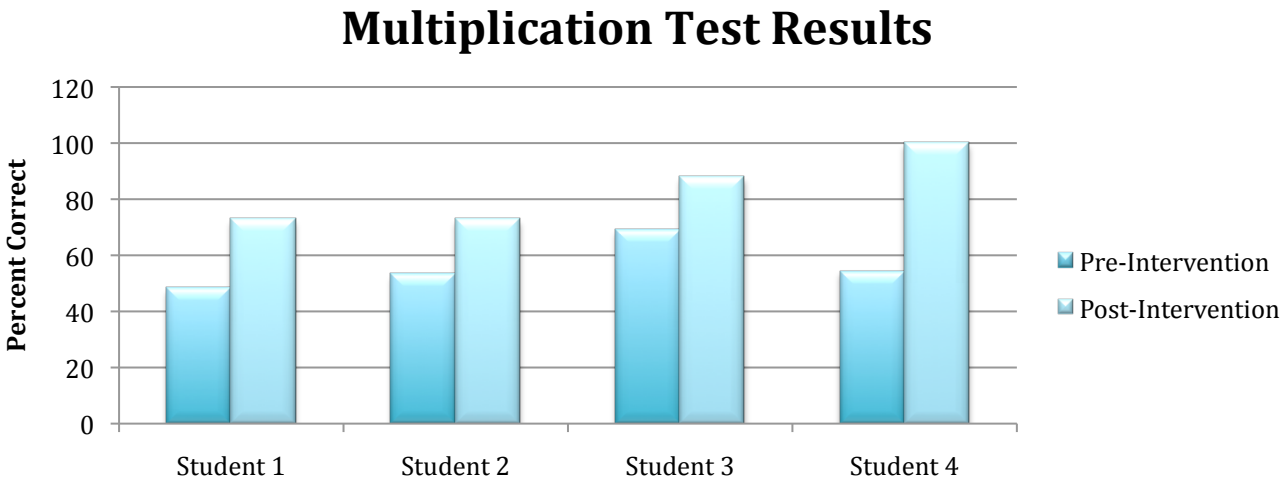


*Figure 4*. Participants' multiplication test results, before and after intervention

This study also considered the number of questions each child attempted to answer and the overall amount of time they needed (See Figure 5). All four participants were able to complete more questions in less time by the end of the study than they could pre-intervention (See Figure 6).

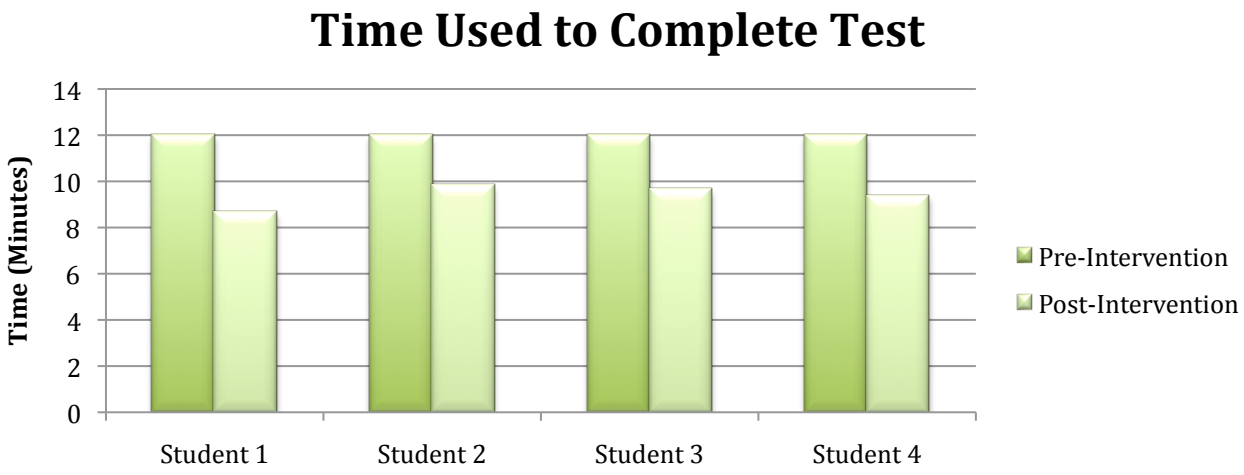

*Figure 5.* Time needed for students to complete test

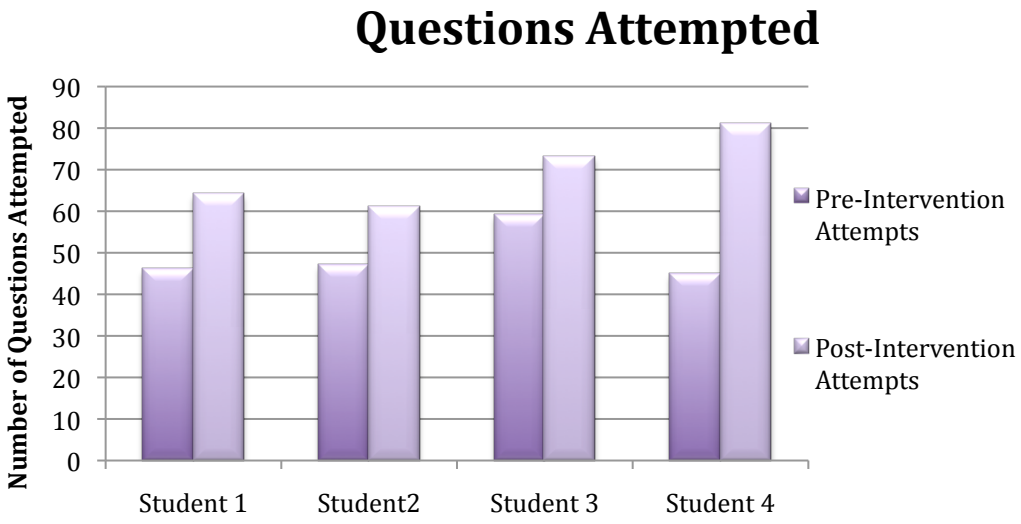


*Figure 6.* Number of questions participants attempted before and after intervention

As shown in the above graphs, Student 4 was able to complete the entire test with 100% accuracy post-intervention. This student began with 54.3% accuracy for the same test. While their attitudes did not significantly change, the students' accuracy and speed in relation to a timed single-digit multiplication exam improved.

## Discussion

### Overview of Results

The results of the data analysis showed that the students' attitude and view toward studying and mathematics did not change in the study. The students understood that their parents expected them to earn good grades and they felt good when they earned good grades, but they did not express a greater interest or more enjoyment from studying outside of the classroom. Although they did not like studying, they were more accurate,

faster, and attempted more problems after the study than at the beginning of the study. These four students were chosen because they were unable to complete their work even when they had a relatively solid foundation in the material. At the end of the study, they all completed the test much faster and one student even earned 100% on her post-intervention test.

**Conclusions**

This study showed that the intervention helped the students with their accuracy and speed in single digit multiplication. The results supported Cohen's (Cohen, n.d.) research in that the touch screen application and easy accessibility were beneficial to young children when playing games. These students were learning the multiplication material and they were learning the way to play the game itself. This study also shared the idea that children will naturally learn numbers and words when they are relevant to them (Ricci, 2011). Like the children in that study, the participants in this study found the numbers and words in the iPad applications relevant because knowing the correct vocabulary would help them win the games.

**Limitations**

As with any study, there were factors over which the research did not have control, which may have affected the results. Inclement weather prohibited the researcher from meeting with the students for several weeks, as did Thanksgiving break, and the winter break between semesters. They only met for seven weeks, but the study took much longer to complete. Another time limitation was that the students were not always able to meet for a full 20 to 30 minutes because they were not on a consistent schedule in their ancillary

classes. There are many fun and interesting multiplication games in the iPad App Store, but several of them cost money. This meant that the students at this school only had access to the free applications because the teachers did not have a budget to buy more. This group of students was lower achieving in mathematics than their peers. If more students had participated in the study, the results may not have shown as much growth.

A positive limitation of the study was that there were a small number of students, so the researcher created relationships with them from spending extra time in a small-group setting. The classroom teachers were very cooperative because they wanted to help their students in any possible way, so they created a comfortable and quiet environment in which the participants could study. The students were close friends and they enjoyed spending time together. This made the entire experience more enjoyable and it made the students feel special because they got extra time to spend together.

**Implications**

This intervention was successful with this particular group of third grade students, so it may work for other third grade students or a larger group of students, as well. Teachers could utilize this method of intervention in other content areas, for example vocabulary or spelling. Students may use other kinds of technology that they find interesting and engaging to play learning games that will benefit them academically.

**Recommendations**

This intervention could be applied to a regular classroom setting during the school day or teachers could use the information gained from this study to set up a center or station in their classrooms in which the students could practice learning games. If there

were a more extensive list of games from which the students could choose to play, the intervention could go on throughout the year. Students may be allowed more time to practice and given opportunities to do so daily so they can benefit from everything this technology has to offer. Any of these approaches would allow for greater consistency in the intervention.

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Appendix A

September 21, 2013

Dear New School Parents,

My name is Kelly Harris and I am a senior honors student in the College of Education and Health Professions at the University of Arkansas. I am working on my honors thesis project by researching mathematics fluency in third graders. Your child will be participating by playing iPad mathematics games for twenty minutes twice a week during school hours for eight weeks. They will take a survey at the beginning and end of the study to assess their study habits and their attitude toward studying. You will have a survey at the end of the study (it should take less than five minutes to complete). The child will also take a timed multiplication test at the beginning and the end of the eight weeks. This way, I will be able to see progress. I will use a number instead of a name on all tests and materials. After the study, I will destroy the link between the names and numbers so the results will remain confidential. This study will not directly affect your child's grades.

I hope that the games will make studying fun for your child. Learning multiplication facts can be difficult, and some children struggle with timed tests. Playing games to practice should help them improve their times and make the process more enjoyable. Ultimately, I would like for your child to be proficient in multiplication and enjoy studying. Please feel free to ask me any questions!

Thank you,

Kelly Harris

**Informed Consent**

*Title:* Using iPad Applications to Promote Fluency in Math and Improve Attitudes Toward Studying

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*Description:* This study will investigate the use of iPad game applications as a means of practicing multiplication. The children will use the school iPads twice a week for twenty to thirty minutes during the school day to practice multiplication facts to improve fluency. We would not be learning extra or new material, simply practicing what the students are already learning in class. At the beginning of the study, the children will take a timed multiplication test and a survey about their study habits and interests in school. At the end of the study, they will take the same test and survey. The parents will take a survey about their child's study habits and interests in school at the end of the study.

*Risks and Benefits:* The children will improve their fluency and speed in multiplication. Learning to answer the mathematics questions quickly can be a challenge, and we will practice in a fun way to help them succeed. Potential benefits include increased confidence and comfort in multiplication, especially on timed tests. There are no anticipated risks in this study.

*Voluntary Participation:* Your participation in this research study is completely voluntary. Your grades will not be directly affected by participation in this study.

*Confidentiality:* Each participant in this study will use a number on his/her surveys and tests and research submitted. After the study, the link between the names of the students and the numbers used in the study will be destroyed. The child's performance in the study will not directly affect his/her grades in school and will not be reported to teachers.

*Right to Withdraw:* You are free to refuse to participate in this research and to withdraw from this study at any time. Your decision to withdraw will bring no penalty to you.

*Informed Consent:* **To be completed by the student:**

I, _____, have read the description, including the purpose of the
(please print)

study, the procedures to be used, the potential risks and benefits, the confidentiality, as well as the option to withdraw from the study at any time, and I believe I understand what is involved. My signature below indicates that I freely agree to participate in this experimental study and that I allow my student to participate.

_____ _____

Signature Date

**To be completed by the student's parent or legal guardian:**

I, _____, have read the description, including the purpose of the
(please print)
study, the procedures to be used, the potential risks and benefits, the confidentiality, as well as the option to withdraw from the study at any time, and I believe I understand what is involved. My signature below indicates that I freely agree to participate in this experimental study and that I have received a copy of this agreement from the researcher.

_____ _____

Signature Date

Appendix C

Student Survey Name_____

Please put an X in the box that shows your answer.

| | No | A little | Neutral | A lot | Definitely |
|---|---|---|---|---|---|
| 1. Do you like school? | | | | | |
| 2. Do you ever study at home? | | | | | |
| 3. Do you like to play learning games? | | | | | |
| 4. Do you like to play computer games? | | | | | |
| 5. Does it make you feel good when you get a good grade? | | | | | |
| 6. Do your parents want you to get good grades? | | | | | |
| 7. Is it fun or interesting for you to study when you are not at school? | | | | | |
| 8. Do you like to play with iPods, iPads, or iPhones? | | | | | |
| 9. Have you gotten to play with a computer, iPod, iPhone, or Ipad before? | | | | | |
| 10. Do you think that games can help you learn? | | | | | |
| 11. Do you like math? | | | | | |
| 12. Do you like timed multiplication tests? | | | | | |

Appendix D

# Multiplication Facts to 81 (A)

Determine each product.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 × 4 | 2 × 9 | 5 × 5 | 2 × 8 | 5 × 1 | 8 × 1 | 4 × 6 | 9 × 2 | 6 × 4 |
| 1 × 3 | 7 × 5 | 3 × 9 | 5 × 7 | 3 × 7 | 7 × 7 | 6 × 9 | 8 × 2 | 9 × 8 |
| 7 × 8 | 4 × 9 | 1 × 4 | 2 × 6 | 1 × 1 | 3 × 6 | 3 × 1 | 2 × 5 | 9 × 9 |
| 8 × 3 | 3 × 2 | 6 × 7 | 1 × 8 | 8 × 9 | 6 × 2 | 2 × 7 | 8 × 5 | 7 × 1 |
| 6 × 8 | 7 × 9 | 9 × 7 | 2 × 4 | 1 × 5 | 6 × 3 | 8 × 6 | 6 × 5 | 7 × 4 |
| 9 × 3 | 2 × 1 | 4 × 7 | 5 × 9 | 2 × 3 | 5 × 2 | 3 × 4 | 5 × 6 | 7 × 6 |
| 8 × 7 | 8 × 4 | 3 × 3 | 5 × 3 | 1 × 7 | 8 × 8 | 4 × 4 | 1 × 2 | 4 × 3 |
| 1 × 6 | 9 × 1 | 7 × 2 | 3 × 5 | 7 × 3 | 9 × 5 | 4 × 1 | 3 × 8 | 1 × 9 |
| 6 × 6 | 2 × 2 | 6 × 1 | 5 × 8 | 4 × 5 | 9 × 6 | 4 × 8 | 4 × 2 | 5 × 4 |

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