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The Effects of Technology on Reading Fluency in a First Grade Summer School Classroom

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Abstract

The purpose of this action research project was to determine if the technology app EPIC! is more effective in helping first-grade students increase their oral reading fluency skills compared to a teacher-assisted, non-technological intervention. Before the interventions began, the students completed three oral timed reading passages at the first-grade level by FASTbridge. This score was used as a baseline for the data. The intervention lasted for two weeks. The experimental group completed stories on the application EPIC! for 15 minutes each session, while the control group completed research based educational games with the researcher. Both were done in addition to all students receiving regular classroom reading instruction. A post-test was then given to determine how all students' fluency skills were affected by the intervention using three FASTbridge passages at the first-grade level. The data collected was used to determine how many words per minute a student read on the pre-test versus the post-test. The findings indicated that students in the teacher-assisted, non-technological intervention improved fluency scores by seven more words correct per minute compared to the experimental group using EPIC! only increased fluency by one more word correct per minute.

Keywords: reading intervention, oral reading fluency, first-grade, technology

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From a very young age, children are increasingly using digital media (Kucirkova, 2019). The infusion of technology in American society has caused rapid changes in educational environments. Internet access has infiltrated classrooms across the country, and researchers have begun to look at how technology has changed the way students access information (Hess, 2014). Kucirkova (2019) states, "This phenomenon, coupled with the undisputable benefits of children reading print books, makes it imperative to identify the benefits and limits of children's digital books." Using technology in the classroom to improve students' reading abilities is something that continues to be questioned. This is due to the fact of the many platforms. These aspects of reading are really improving through the use of technology rather than being teacher taught. The findings of studies on the topic arrive at mixed results, with researchers following different theoretical and methodological approaches and reaching different conclusions, as highlighted in two recent literature reviews (Kucirkova, 2019; Reich, Yau, & Warschauer, 2016).

Research on the use of children's digital books has grown over the past two decades into a multidisciplinary and methodologically diverse area, with a focus on qualitative or quantitative research techniques and books produced commercially or by researchers (Kucirkova, 2019). Reports have shown mixed reviews on whether digital books are more beneficial then print books (Kucirkova, 2019 Pg. 209).

Reading is probably the most important academic skill because it is the basis on which many other academic activities are built (Gibson et al. 2014). It is particularly important to help young readers acquire critical reading skills such as reading fluency. Gibson agrees (2014) reading fluency is defined as the ability to read connected text with speed, accuracy, and proper

expression (as stated in Bursuck & Damer, 2011). A way to assess a student's proficiency in

reading fluency is by measuring the rate at which they read connected text passages out loud.

This measure is referred to as oral reading fluency (ORF) and rates are typically measured using

novel or unfamiliar text passages during one-minute timed tests (Gibson et al 2014). Fluency can

be taught using many different strategies; the use of technology can be used to help motivate

students to become more fluent in reading.

Many lower elementary students are not at their expected fluency level for their age.

There are many different interventions teachers use to improve student fluency: fluent reading

modeling, repeated reading, phrased reading, reader's theatre, poetry books, and the list goes on.

Most teachers have access to all of these interventions listed above and many more. It is the

discretion of the teacher to decide which intervention will ultimately help the students to succeed

the most in reading fluently.

The purpose of this action research paper is to look at how Epic! (an iPad app) will

improve reading fluency for first grade students. Students completed four-to-five 15-minute

sessions each week for two consecutive weeks. The digital application Epic! was used to help

motivate and potentially improve oral reading fluency skills. The research question is the

following, how does technology engagement, specifically the application Epic! affect first grade

students' oral reading fluency skills?

The literature review contains articles ranging between 2014-2021. The articles were

found using the proquest database from the DeWitt online library through Northwestern College

these articles utilize a variety of search terms, such as fluency in lower elementary, reading in

summer school, first-grade fluency, technology in reading, motivation using technology, fluency

in lower elementary, digital books in elementary, and the effects of computerized learning. The

core of this literature review focuses on how fluency is affected through technology and summer school. The literature review will contain numerous theories on fluency in lower elementary, motivation using technology, the affects technology has on students, and how summer school plays a part in struggling readers' academic skills. The intention of the study is to identify how Epic! will affect first-grade students' fluency skills.

Review of the Literature

According to Bayless et al (2018), education has become an interesting topic for scholars due to the changing factors and trends in the area. Although scholars have studied various aspects of education, including the role of technology in transforming the practice, there are significant areas which require further research. This paper examines early intervention, summer school, technology in education, and the manner in which technology motivates students.

Early Intervention

Early interventions are strategies parents and educators use to improve students' reading fluency and other academic skills at a young age. Afterschool programs have become some of the early interventions embraced in the United States. According to Bayless et al. (2018), afterschool programs (ASPs) in the United States have been implemented in low-income neighborhoods to enable at-risk youth to access educational support services to increase academic skills. However, the effectiveness of ASP's has prompted debates due to the fact some believe they fail to improve the learning outcomes of students. However, studies have found participation in ASPs is associated with improvements in broader academic performance indicators such as grades or test scores (Bayless et al. 2018). Some ASPs also have demonstrated positive long-term effects on academic achievement during high school and college (Bayless et al. 2018). These features show after school programs have developed into early intervention

programs, specifically to improve academic achievement or reading fluency of learners. The programs are there to help students to become more fluent in literacy and their reading skills by targeting each child's difficulties or areas of struggle in various contexts.

Another type of intervention used are computer-assisted reading programs. Messer and Nash (2018) studied the impacts of a computer-assisted reading program as an early intervention in a randomized controlled trial with 78 English-speaking, seven-year-old children. After ten months, the experimental group had significantly higher standardized scores than the control group on decoding, phonological awareness, naming speed, short-term phonological memory, and executive loaded working memory (Messer & Nash, 2018). The results of their study indicate computer assisted reading programs were suitable in raising students' educational achievement by comparing results from standardized testing. The results also indicate early intervention is an essential part of helping students to improve their reading capabilities when it comes to fluency and accuracy. Computerized assisted reading programs also play a large role in motivating students to accept different ideas which are made to better their overall academic performance.

On a related note, Relevant and Culturally Engaging Stories, otherwise known as RR (RACES Reading), is a computerized intervention program made specifically for student to have more effective and actively engaging material included in their learning. This has become a great tool for teachers to use during intervention time and in different learning situations. A study conducted by Telesman et al. (2019) on five first-grade African American students at risk for reading failure demonstrated a functional relation between the use of RR and student gains in oral reading fluency (ORF) and comprehension. The following data suggests RACES Reading provides an appropriate intervention context to improve learner's academic performance. The

researchers found all five students show an upward trend from baseline through intervention when reading novel comprehension passages. Sixty percent of learners show an increase in fluency of more than 200% (Telesman et al. 2019).

The findings of many studies show early intervention supplies ideal tools lead learners to improved academic performance. Nonetheless, researchers accept the effectiveness of early intervention programs depends on the commitment of teachers and parents as well as the alignment of the program with children's interests. According to Telesman et al. (2019), reading achievement has significant implications for students' future success, and addressing reading concerns early and comprehensively should be paramount. Therefore, early intervention programs are there to help raise the reading comprehension scores of students to increase their ability in order to navigate challenges in school contexts. Telesman et al. (2019) explain how maze scores on comprehension passages also increased significantly for four out of five students when using an early intervention program. Despite the effectiveness of intervention programs, researchers have not reached a consensus on a standardized early intervention program.

Summer School

Summer schools are increasingly becoming integral in improving the reading outcomes of learners. Christodoulou et al. (2017) conducted a study in a summer outreach program to determine the efficacy of an intensive reading intervention implemented during the nonacademic summer involving 47 children with reading disabilities or difficulties (RD). The research established direct evidence of widening differences in reading abilities between students with RD who do and do not receive intensive summer reading instruction (Christodoulou et al. 2017). This study indicated summer school is and has become an important part of a child's academics in order to help improve student's reading abilities and outcomes. After completing research

Christodoulou et al. (2017) results show improvement in many areas after completing both the pre-test and post-test. The experimental group demonstrated gains in real-world reading, untimed pseudo reading, and oral fluency reading. While the control group showed little to no improvement in the same areas.

Similarly, Bayless et al. (2018) learned the READ intervention, in which students received books to take home for the summer paired with a teacher-scaffolded intervention, effectively increased reading comprehension for students attending high-poverty schools. This study took place in a summer reading program in Denver, Colorado. These findings show summer schools have become an important part of raising students' commitment to academics and helping to raise their overall academic success. Data demonstrated 66% of participants showed improvement in increased reading comprehension (Bayless et al. 2018). Regardless of it being a vacation period for learners, failing to provide summer school and tutoring for struggling students during summer holidays can have unfavorable effects on their academic performance due to summer break increasing the reading difficulties they are already facing.

Other researchers have also found summer reading programs to be beneficial. Albee et al. (2019) demonstrated a three-year summer intervention, "Dig into Reading," for pre-first-grade through pre-third-grade students. The intervention provides significant mechanisms for improving learners' literacy skills. This took place in River School District in a Midwestern Town. According to Albee et al. (2019), "the results of the Dig into Reading intervention showed participating students retained at least 30%–67% more reading ability based on reading level than students in the baseline group who did not participate" (p. 291). These findings show the benefits of summer schools in achieving the academic improvement of young learners. Likewise, they emphasize summer reading programs help learners continue their fluency and

comprehension skills because they allow students to recollect many ideas they have been

introduced to in the regular school year. Tutoring is not always offered all year round, according

to Bayless et al. (2018), tutoring is offered throughout the academic year but not during the

summer months. Not offering tutoring all year round has disagreeably affected the academic

performance of students.

　Thus, summer schools and summer intervention programs support the value of creating

and offering to raise the reading scores of different learners. The authors make it clear providing

tutoring during the summer months is not only effective but also creates appropriate ways for

improving the academic performance of students. The authors raise the idea of having

intervention programs in schools to boost the educational outcomes for all students.

　Bayless et al. (2018) demonstrate how after school programs can create interventions

which act as summer schools. For instance, an ASP that creates interventions can embed GR8

Readers (a reading intervention program) into the ASP to help children build a home library and

increase reading skills and enjoyment through access to age- and content-appropriate books

(Bayless et al. 2018). The idea behind the home library is for students to read more frequently

during summer months in order to improve their reading scores and learning outcomes regarding

reading and literacy. Although ASP's have been criticized in different contexts, they have

become integral in promoting learners' academic outcomes and boosting their comprehension

and reading skills in different contexts. Instead of using summer months to give students a break

from academic activities, parents, teachers, and academic institutions should work together to

encourage students to do more summer reading or participate in academic intervention programs

(Albee et al. 2019). Providing after school programs for struggling students will improve the

academic outcome of learners to develop programs to retain their skills and academic prowess during the summer months.

Technology in Education

Technology has become a revolutionary trend in education because it has changed the normal practices characterized in the education sector. Technology shapes how instructions are delivered as well as the interactions between learners and educators. Thus, this section outlines the role of technology in education and the revolutions it has created.

Many features of technology have been introduced into the education world to improve academic performance and nurture the skills and capabilities of learners. For example, computerized reading programs are increasingly revolutionizing the education sector. According to Kasperski et al. (2019), "computerized reading training programs, which provide a personalized learning environment, matching the reading profile of each participant, may be beneficial not only for children's progress in reading but also for their reading self-concept (RSC)". The author demonstrates how technology has become integral in boosting children's academic progress and increasing their self-awareness in academic settings. Kasperski et al. (2019) employed a sample of 130 Hebrew-speaking students (all native speakers), 69 (53.1%) boys, and 61 (46.9%) girls, in the second and third grade (56 and 74, respectively). The study took place in three classrooms in Northern Israel. The research findings "support a direct link between reading training and RSC. Reading training and RSC is demonstrated by training reading using a computer-based program adapted to the reader's level and pace, it is possible to obtain gains in RSC" (Kasperski et al. 2019). These findings indicate computerized reading programs not only inspire learners to overcome their reading difficulties but also individualize the reading process to match their capabilities and skills.

Technology has also spearheaded the introduction of digital books to redefine learning practices. Digital books, such as e-books, story apps, picture book apps, and interactive stories, are narratives presented on touch screens with multimedia and interactive features (Kucirkova, 2019). The growing popularity of digital books has transformed education in many ways. In a Canadian study of 17- to 26-month-olds that compared electronic books and print books, children learned more new words and displayed more engaged and socially desirable behavior when reading the digital books (Kucirkova, 2019). Kucirkova holds digital books are technological revolutions which are steadily redefining the interactions between students and reading materials. Digital books also redefine how students process information from different books.

Similarly, a review of the utility of digital books for supplementing literacy teaching outlined the positive benefits of digital books for children's emergent literacy skills (Kucirkova, 2019). The positive benefits demonstrate how digital books have increased the relevance of technology in education because they create mechanisms centered on improving learning outcomes. Based on the findings of Kucirkova, digital books should be implemented in every aspect of formal and informal learning to improve the willingness of students to learn and increase their participation in academic activities.

Moreover, computer- and tablet-assisted interventions are increasingly becoming revolutionary forces in the education domain because of what they seek to achieve. Papadakis et al. (2018) used a sample of 365 students from 21 kindergarten classes who were randomly assigned to two intervention groups and a business-as-usual control group. According to Papadakis et al. (2018), "computers and especially tablets, when combined with the use of developmentally appropriate software into the children's daily routines, may provide a

substantial contribution to early childhood students' comprehension of numbers" (p. 1849). The study's findings demonstrate how technology has created appropriate learning conditions and environments which map the learning needs of students into academic contexts to boost their academic outcomes. The study's findings not only demonstrate how technology is revolutionizing learning but also provide insights into the devices which are redefining learning practices. Kim (2015) also shows the correlations between technology and improved academic performance using a sample of 143 children from Korean kindergartens. Kim (2015) outlines how technology increases students' comprehension and reading skills because it introduces them to conventional English words and receptive vocabulary and improves their ability to identify new vocabularies or apply them. Thus, the existing literature provides significant insights into the ideal role of technology in the education sector.

Technology has become integral in education because it redefines the reading fluency and comprehension of learners. According to Gibson et al. (2014), a repeated reading intervention on oral reading fluency (ORF) and comprehension on generalization passages for eight first-grade students with reading risk demonstrated a supplementary computerized fluency intervention could improve reading fluency and comprehension capabilities. The findings of Gibson et al. (2014) study have motivated educators and parents to realize the value of computerized tools in learning, including the goals they seek to achieve in different contexts. In Gibson et al. (2014) study the results show these students increase in oral reading fluency from phase l starting at 23.1 words correct per minute and then improving in phase ll to 39 words correct per minute. Gibson et al. (2014) hold that ORF and comprehension increase with the application of a supplementary computerized fluency intervention because it provides repeated tasks to shape the mastery skills of learners.

Besides computerized programs, the use of electronic technology and dynamic testing is used to overcome the limitations of conventional static testing and adapt more closely to children's individual needs (Touw et al. 2019). The use of electronic technology has created virtual and e-learning environments that have significantly improved the academic performance and learning outcomes of children. Touw et al. (2019) conducted a study in the Netherlands which indicated students who needed fewer graduated prompts can solve series completing problems accurately, this predicted the child's performance on mathematics and reading tests would be higher.

Thus, the acceptance of electronic technology has transformed teaching practices and instructional strategies, leading to improved academic performance and enhancing learners to interact in academic activities. The findings demonstrate the role of technology in education is steadily evolving to improve its relevance and effectiveness to the learners' interests.

How Technology Motivates Students

Technology has been linked to student motivation in learning and academic domains. The e-learning environment it creates has increased motivation and the interests of children in education. For example, digital books provide an appropriate form which increases learners' motivation through the interactions they have with the text. Similarly, interactive features incorporated in books have enabled children to understand the main storylines and the link between the story and other games. Digital books motivate learners because they create personalized reading experiences through embedded algorithms (automatic personalization) or a reader's active contribution of content (agentic personalization) (Kucirkova, 2019). Personalized interactivity and multimedia features position the child as a collaborator, storyteller, or author of

the story and support a positive reading atmosphere at home (Kucirkova, 2019). These elements

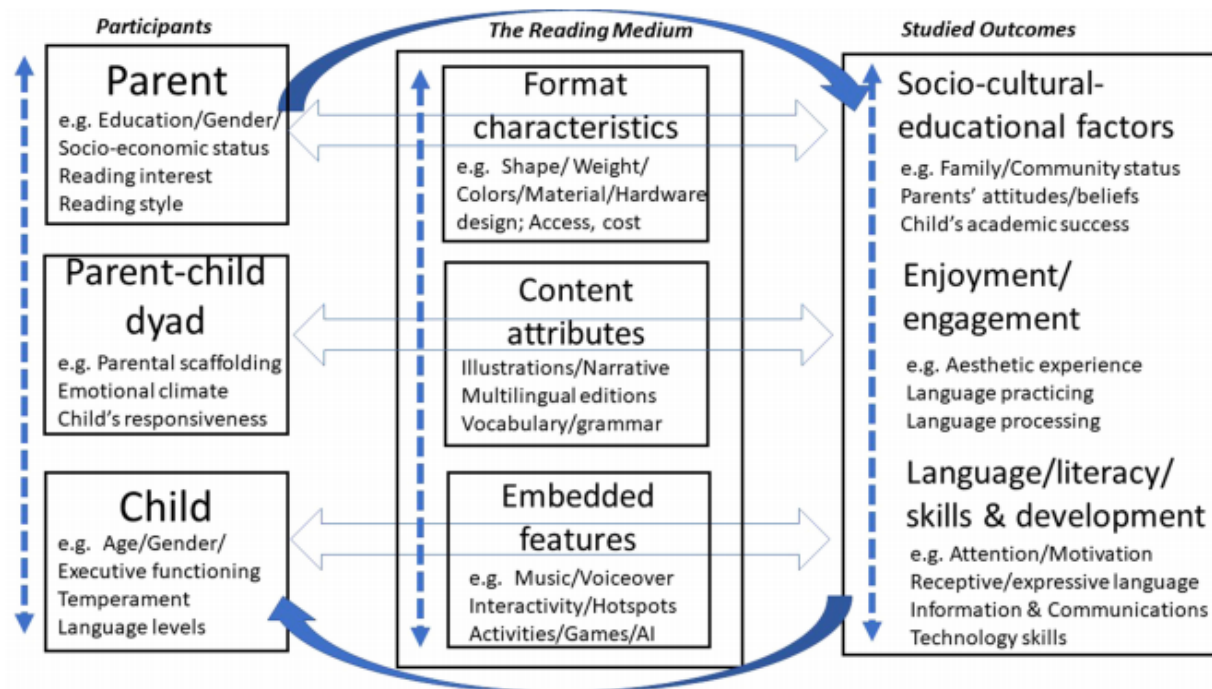are outlined in the dynamic e-reading model diagram below. (See Figure 1.)

Figure 1. A dynamic model of children's e-reading. Retrieved from Kucirkova, (2019).

Technology is also a great motivator for learners because of the dynamics it introduces in

the learning environment. According to Touw et al. (2019), teachers often use interactive boards,

video support, tablets, and mobile technology to assist their teaching in present-day education

settings. These interactive boards, video support, tablets, and mobile technology have increased

students' motivation because they create an engaging learning environment to improve their

interests in learning. For example, interactive boards and technologies set students' individual

needs in the learning contexts to improve their interests in learning and increase their motivation

to tackle diverse reading challenges. Touw et al. (2019) mentions how focus on technology for

students can introduce a student-centered system, which problem solving and critical thinking

are encouraged and students are able to address personal learning needs. Individualized computer

instruction encourages motivation and increases student's commitment to learning and addressing academic challenges.

The introduction of video games has also increased student motivation and shaped their interests in learning. Educational games can construct real-life learning situations and achieve meaningful learning in the process of interactions between learners and games (Zeng, Parks, & Sheng, 2019). Zeng et al (2019) conducted a literature review in which they found educational games to be an exciting and attractive learning environment for young students, games made learning more fun and interesting which led to students improving in reading and mathematics. Thus, games inspire motivation because they improve learners' critical thinking skills by allowing them to map real-life situations in addressing academic challenges. Games stimulate learning motivation because students are obsessed with playing video games; using academic games increases learners' motivation levels and willingness to tackle academic problems.

Methods

Participants

The participants in this study were first-grade students at South O'Brien Elementary School in a rural community in Primghar, Iowa. The school district is made up of 89% Caucasian students, 8% Hispanic students, 2% multi-racial, and 1% African American. Forty-four percent of students come from a low-income household. Sonnenschein et al. (2010) indicate how students from low-income and minority families often have more limited exposure to text and prior experiences. Limited exposure to text may indicate these students have less access to appropriate reading leveled texts and may also affect reading fluency.

This action research project was conducted at South O'Brien Elementary in a first-grade classroom. The following information was gathered using the schools JMC database. The students in this action research project consist of ten first-grade students, four students were girls and six students were boys. Nine of the students were considered Caucasian, one student is multi-racial. Three students are on IEPs (individualized education plan) in speech, reading, and math; they received special education services from a speech therapist and the elementary special education teacher during the regular school year. Four students are in a small title reading group. The remaining three students do not receive reading guidance other than what is offered in the regular classroom.

Intervention

To conduct this action research project students were split into two groups, one of which was the control group; this group used intervention fluency games and repeated readings. The experimental group completed an intervention using the iPad application EPIC! The intervention was done four times a week for fifteen minutes during a two-week time period.

Measures and Data Collection

The measurement tool being utilized was a formative assessment passage taken from the FASTbridge website. FASTbridge is a website used by teachers in Iowa to help determine a child's reading score. Three curriculum-based measurement reading passages was used as a baseline to determine where the students began before the intervention. The same passages were used to determine the growth students made after the intervention was completed.

The application EPIC! was used as the independent variable for five of the students in 2020-2021 summer school. The dependent variable was fluency or correct words read per minute. Fluency is measured using three FASTbridge CBMreading assessment passages. These passages are at the first-grade level, and each passage is given to the student to read for one-minute. The researcher pays attention to any miscues, mistakes, or replaced words while the student reads. The FASTbridge website then generates a score on how many words correct per minute each student read using the number of words read minus the number of mistakes made for each passage. The data collected is quantitative.

Validity and Reliability of the Measurement tool

The CBMreading passages used from FASTbridge learning can be considered reliable via researched evidence which this evaluation shows reading improvement/development and predicts scholar overall performance on tests. The layout of the assessments and the passages can be aligned with sensitivity and application. Salvia et al. (2013) states that reading screening assessments should correspond of at least .80, tests utilized for progress monitoring should correspond of at least .70, and assessments used to make decisions regarding special education eligibility should have at least .90. Using the CBMreading passages for the measurement tool is a valid and reliable choice (Soutor, 2015).

IRB Approval

It was determined IRB approval would be needed in order to complete this action research project because this intervention was done in addition to summer schooling. The federal code 46.104 (2018) indicated any research conducted in a common educational setting, and specifically normal educational practices does not have adverse impact on students' opportunity to learn. Due to federal code 46.104 IRB approval was needed because it is not considered normal practice. A permission slip was sent home with each participant notifying the parent of the action research project taking place in the first-grade summer school classroom. Permission slips were given to all twelve of the students with ten being returned prior to the study taking place. IRB approval was granted from the Institutional Review Board at Northwestern College.

Findings

Data Analysis

The independent variable in this action research project was using the iPad app, EPIC!. The dependent variable used was the FAST CBMreading passages to evaluate how students' fluency skills grew over the two-week time period. The results show how the control group compares to the experimental group using correct words read per minute (WPM). The researcher shows pre-test results from each group in Table 1 and post-test results in Table 2. Lastly, the researcher shows the average scores of both groups comparing the pre-test results to the post-test results in Table 3.

The data shown below in all three tables indicates that students in the control group made more growth in fluency than the students in the experimental group, this group used EPIC! as the intervention. The students in the control group show growth on average in all three CBMreading passages. Their pre-test average scores are as follows: passage 1: 44.6, passage 2: 45.8, and passage 3:37.4. The average scores of their post-test are as follows: passage 1: 49, passage 2: 53.2, and passage 3: 48.8, numbers that demonstrate growth on all three passages. On the other hand, the experimental group shows fluency growth in two of the three passages but only slight growth compared to the control group. Their average scores on the pre-test are as follows: passage 1:42.2, passage 2:44.4, and passage 3:37.2. Their average scores on the post-test are as follows: passage 1:43.8, passage 2:45, and passage 3:36.4.
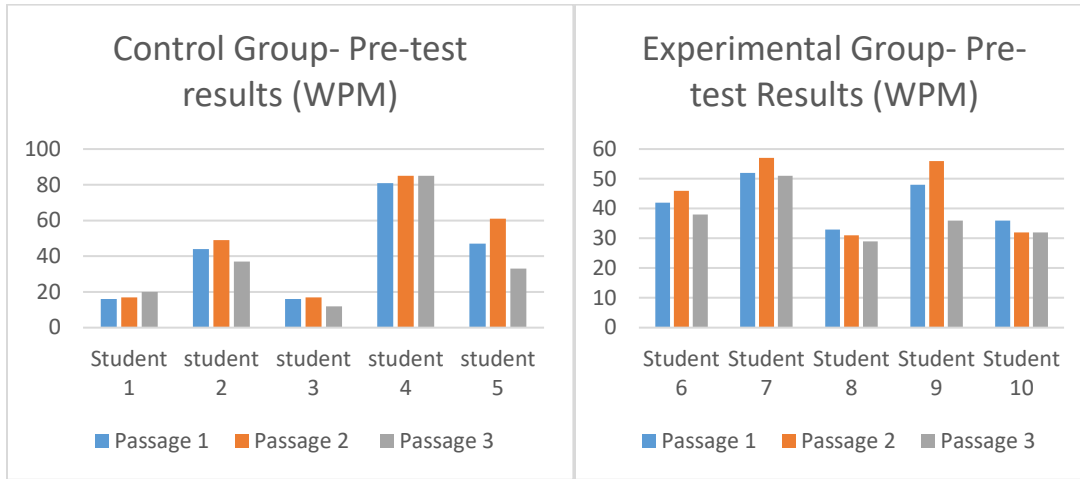
Table 1: Pre-test Results
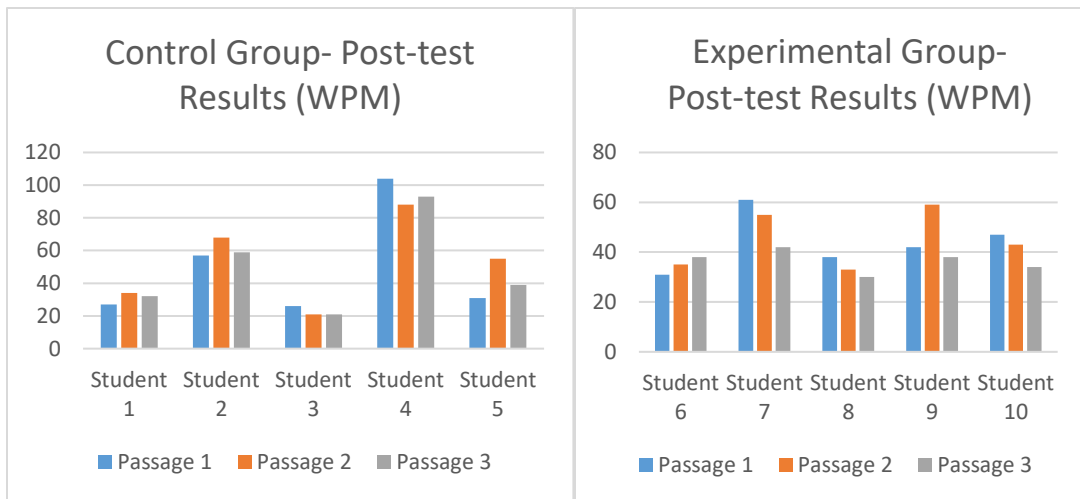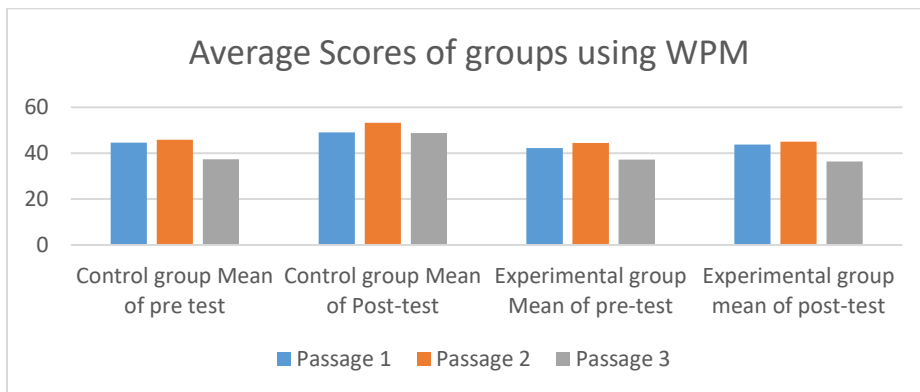

Table 2: Post-test Results

Table 3: Average scores from pre-test compared to post-test results

Discussion

Summary of Major Findings

The purpose of this study was to explore how the iPad application EPIC! could improve fluency skills in first grade students. The results of the pre-test to the post-test show statistically that students made more improvements in fluency if they were a part of the control group (the group that did not use EPIC!). However, the students in the experimental group still made slight improvement in passage one and passage two, though no improvement in passage three. Results indicate that students in the experimental group show only slight improvement in fluency of about +1 word correct per minute while the control group on average shows about +7 words correct per minute. Despite what the data suggests, the control group shows slightly higher scores on all three passages on the pre-test than the students in the experimental group (group using EPIC!). The control groups slightly higher scores could indicate that these students have slightly higher fluency skills.

It is necessary to address that the results from the CBMreading passages are specifically measuring words read correct per minute, which means that all replacements, mistakes, and mispronunciations are counted against the student. The data suggest that the iPad application EPIC! can only slightly help to improve reading fluency in young students while fluency games played with peers and supervised by a teacher can help to improve fluency in comparison to EPIC!

Limitations of the Study

There are various limitations to the study that could affect the reliability and validity of the results. The sample group of the study was relatively small; the results may not speak for all subjects outside of the study. Another limitation that should be considered is researcher bias due

to the fact of the researcher also being the lead teacher. The researcher could have given

unintended instruction that could sway the results of the fluency testing measures.

The FAST CBMreading passages can also be considered somewhat of a limitation

because it often flusters students because it is a one-minute timed reading. This pressure may

result in the student rushing through the passage and missing words they may not usually miss.

Another potential limitation of the study is the behavior of the students because the study all took

place during summer school. Students may have less interest in doing their best because this was

implemented into summer school classes rather than during the regular school year.

Further Study

Further study should be conducted with a larger sample group to determine the outcomes

of more students in the first grade. A larger sampling may show that the iPad application EPIC!

is not sufficient for students to use when it comes to improving fluency skills. It is also necessary

that future research be conducted to not only measure fluency but also accuracy. With data

showing performance in multiple areas, the researcher could identify what areas the students are

growing in and what the students are struggling with. Future research may also be conducted

during the regular school year rather than during the summer vacation months, potentially

modifying the efforts that the students are willing to give and resulting in different findings.

Conclusion

There are many different types of iPad applications which can be used to enhance young learners' reading skills. This study examines the effects of using the application EPIC! on first-grade student's oral fluency skills. This study was designed to help classroom teachers decide how to improve students' fluency skills using iPad applications. This action research has helped to provide useful information and feedback needed for educators to better their strategies to teach fluency at a young age.

The findings of the study indicate that fluency games done with the teacher are more effective at improving fluency skills compared to using the iPad application, EPIC! Although, this action research shows that the application EPIC! may not be sufficient for advancing fluency, it provides a starting point for future research and shows how fluency games played with peers can improve reading skills compared to an iPad app.

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