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THE EFFECTIVENESS OF INTEGRATING INTERACTIVE TECHNOLOGY IN READING COMPREHENSION: A CASE STUDY OF JAMAICA'S GRADE SCHOOL

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ABSTRACT

Aim/Purpose	There is growing number of countries embarking on large-scale, government-supported initiatives (e.g., Antigua & Barbuda, Australia, Brazil, India, Jamaica, Kazakhstan, Pakistan, Russia, Turkey, and the United Arab Emirates) to distribute tablet devices to students in the K-12 schooling sector. The review of the government-supported initiatives concluded that the majority of these initiatives have been driven not by educational frameworks or research-based evidence but by the tablet hype. The goal of this study is to provide research-based evidence by investigating if the learning experience for grade-three learners with interactive technology improves knowledge and skills in reading comprehension compared to learning in the traditional chalk and talk environment.
Background	Prior studies provided limited evidence based mainly on data from developed countries about the influence of the use of interactive technology on reading comprehension at lower grade school level.
Methodology	Employing a mixed-method case study research approach, this study aims to investigate the effects of integrating interactive technology in reading comprehension and examine the perspectives of students. This case study employed a sample of 30 public school third-grade students located in a relatively poor residential area in St Catherine, Jamaica as well as the two classroom teachers. Thirty students were divided into two groups – an experimental group, which included 16 partici-

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	pants and a control group, which included 14 participants. The intervention program was carried out over a period of eight weeks.
Contribution	This study has provided (a) additional data to show evidence for the effectiveness of interactive technology in reading comprehension and (b) research based evidence for the distribution of computer devices to students in the K-12 schooling sectors.
Findings	We found empirical support for the positive effects of technology-based approaches for addressing reading comprehension and vocabulary skills. Our results were based on the pre-test and post-test assessments. Additional data was collected using a survey questionnaire which was given to the students before and after the intervention. The change from pretest to posttest was significantly different between the two groups as measured by the Mann Whitney U test.
Recommendations for Practitioners	The empirical support for the effects of technology-based approaches for addressing reading comprehension and vocabulary skills identified in this study will assist teachers with strategies and programs that should improve students' motivation as well as their grades.
Recommendations for Researchers	For future studies, we recommend focusing on a longer intervention period and using a larger sample size that would likely yield more definitive and generalizable results.
Keywords	interactive technologies, reading intervention, comprehension, grade school, Jamaica

INTRODUCTION

Reading comprehension is widely seen as key to understanding written communication, which is especially important to students in the later elementary grades. It shapes students' ability to understand what is read, provides the skills necessary to participate in the 21st century workforce (Snow & Sweet, 2003), and exerts pervasive effects on literacy outcome (Bowman, Donovan & Burns, 2001; Strickland & Shanahan, 2004). Many of the recent studies focusing on different but related strands, e.g., the effects of summary writing on reading (Gao, 2013), the role of mediation in EFL (Grabe & Zhang, 2013), and reading and writing together (Ulusoy & Dedeoglu, 2011), claimed that reading and writing complement each other and include the two skills simultaneously in instruction (Hodges, Feng, Kuo, & McTigue, 2016). Others have argued that reading comprehension is an essential skill that requires more than just the reading of words but also the ability to think critically about the words as well as attaching meaning to text during the process of cognitive activities (Jonassen, Campbell, & Davidson, 1994; Pikulski & Chard, 2005).

One of the most salient trends for more than a decade has been the rising importance of integrating technology into the classroom and its effects on the performance of students in reading comprehension. Integration of technology into the classroom and its effects on reading comprehension have been well studied in independent literature, but empirical studies linking the two phenomena have mostly focused on evidence from developed countries. As pointed out in a recent study by Nogry and Varly (2018), integration of technology into classroom among children in low income countries remains understudied. A review of the literature on the "Integration of technology into the classroom: effects on reading comprehension" concluded that "while there is much research that has been conducted using computer technology, more is needed to properly ascertain its effects on supporting and improving reading comprehension" (Stearns, 2012, p. 32). Harper and Milman (2016), Harris and Al-Bataineh (2015), and Harper (2018) reported compelling empirical evidence to support how one-on-one technology benefits student achievement as well as lack of evidence to support this connection. Zheng, Warschauer, Lin, and Chang (2016) reviewed 65

journal articles and 31 doctoral dissertations published from January 2001 to May 2015 that examined the effects of one-to-one laptop programs on teaching and learning in K-12 schools. They reported little consensus about the contribution of the programs to educational outcomes. As pointed out in a recent study (Luo, Lee, & Molina, 2017, p. 247), “prior literature provided a limited evidence base for incorporating computer adaptive learning technologies to improve reading comprehension in the context of early childhood education.”

Two empirical trends involving the connection between interactive technology and reading comprehension motivate our analysis. First, technology is constantly changing and has begun to change education. Both developed and developing countries continue to make huge investments in new technologies in the education sector (Delgado, Wardlow, McKnight, & O'Malley, 2015). Second, there is growing number of countries embarking on large-scale, government-supported initiatives (e.g., Antigua & Barbuda, Australia, Brazil, India, Iran, Jamaica, Kazakhstan, Pakistan, Russia, Turkey, and the United Arab Emirates) to distribute tablet devices to students in the K-12 schooling sector. The review of the government-supported initiatives concluded that “the majority of these initiatives have been driven by the tablet hype as opposed to educational frameworks or research-based evidence” (Trucano, 2015). It is therefore important to conduct empirical research on the progress being made in the use of technologies in education, in both developed and developing countries.

This paper provides an empirical link between technology and reading comprehension. In doing so, it explores the possible effects of interactive technology on comprehension with a focus on low-social-economic students (low-SES). More specifically, the study examines the effects of interactive technology in reading comprehension and achievements of low-SES, compared to traditional learning setting in Jamaica. Reading comprehension has become a fundamental skill for success in many developing countries such as Jamaica. One major challenge is that standard tests given at various levels from kindergarten to high school revealed that students are performing below an accepted level (Thwaites, 2013). In a document entitled “The National Literacy Program,” it was highlighted that more than 40% of students at the grade four level were failing the literacy assessment given by the Ministry of Education up to 2009. As a result, the Ministry of Education has developed policies to deal with the challenge. Since then the Ministry has embarked on a number of programs aimed at improving students’ performances in literacy. These have included employing literacy specialists and literacy coaches to assist teachers with strategies and programs that should improve students’ motivation and grades (Thwaites, 2013). Contrary to the few studies in the developing nations that focused on tertiary education (e.g., Chiraz, 2016), we provide evidence based on using computer technology as the sole treatment for comprehension reading in grade school (Savage, Abrami, Hipps, & Deault, 2009).

REVIEW OF LITERATURE

This paper is related mostly to three strands of literature. Beginning with the effectiveness of integrating interactive technology in reading comprehension, researchers have tried to connect technology and reading comprehension (e.g., Chambers, et al., 2008; De Jong & Bus, 2004; Ertem, 2010; Fry & Gosky, 2007; Glenberg, Goldberg, & Zhu, 2011; Hernández Camelo, Trujillo Torres, Cáceres Reche, & Soler Costa, 2018; Higgins & Raskind, 2005; Holland, 2016; Korat, 2007; Korat & Shamir, 2007; Lysenko & Abrami, 2014; Messer & Gilly, 2018; Mostow et al., 2003; Pearman, 2008; Twyman & Tindal, 2006). Many of these studies consider the effects of computer technology as the treatment for comprehension skills and strategies as well as instructional software aimed at providing individual instruction for word-attack or fluency skills. While the majority of these studies have shown systematic correlation between technology-based approaches and improved reading comprehension, it is not clear from their results what the sources of the positive growth in reading comprehension are. It is possible that the sources of the underlying improvement may have been from word-attack, phonics, fluency skills, and/or various combinations of any two or more of these skills that can affect reading comprehension (Blythe, 2006; Chambers et al., 2008; Higgins & Raskind,

2004; Savage et al., 2009; Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010). Despite confirmatory findings from laboratory experiments (e.g., Fu, 2013), the interpretation of the empirical result is not always straightforward. Measuring the effects of integrating interactive technology on student learning of reading comprehension poses a daunting challenge for research design, since credible identification requires the ability to isolate sources of endogenous and exogenous variations in the technology effect of the relevant peer group (see, e.g., Al-Ruz & Khasawneh, 2011; M-C Lin, Wang & I-C Lin, 2012; Tezci, 2011).

Second, this study draws on research focusing on the influence of using laptops outside of school on student achievement as well as the potential of technology reducing achievement gaps related to students' socioeconomic status (Harper & Milman, 2016). Recent studies have documented systematic positive correlation between using laptops for homework in core subject areas with Reading and Math achievement scores (Shapley, Sheehan, Maloney & Caranikas-Walker, 2010), Math and Hebrew classes (Rosen & Manny-Ikan, 2011), achievement gap in geometry between high-achieving and low-achieving participants. (C. P. Lin, Shao, Wong, Li, & Niramitranon, 2011), improved literacy achievement (Suhr, Hernandez, Grimes, & Warschauer, 2010), and Math test scores (Clariana, 2009). Only a few studies have reported outcomes that are not statistically significant or show that there is a negative correlation between technology-based approaches and response to texts (Tancock & Segedy, 2004), English or Science achievement (Hur & Oh, 2012), changes in students' learning (Björkvall & Engblom, 2010), and students' math achievement (Carr, 2012).

Third, this study relates to the fast-growing literature on changes in students' learning experiences with laptop technology (Lei & Zhao, 2008), nature of classroom activities (Shapley et al., 2010), powerful and deeper learning experiences (Mouza, 2008), meaningful teaching moments (Maninger & Holden, 2009), implement research-based best practices more frequently (Lowther, Inan, Ross, & Strahl, 2012), students communicating more with teachers (Storz & Hoffman, 2013) and using technology to improve student learning (McKnight, O'Malley, Ruzic, Horsley, Franey, & Bassett, 2016). Finally, this paper complements these studies by providing empirical evidence from a developing country on how the use of interactive technology can improve students' reading comprehension at the grade-three level.

METHODS

RESEARCH HYPOTHESIS

The key assumption of this study is that one of the possible solutions for narrowing the social gap can be achieved through the use of interactive technology. The main hypothesis tested in this study is that an eight-week long learning experience with interactive technology will improve knowledge and skills in reading comprehension of low-SES compared to learning in the chalk and talk traditional environment. Based on this hypothesis, two research questions were developed for this study. They are as follows:

- What is the extent to which the use of interactive technology can improve grade three students' participatory level in reading comprehension?
- What is the extent to which interactive technology can impact the mastery of reading for meaning in a reading comprehension lesson of grade three students?

DESIGN AND PROCEDURE

Two methods were used in this study. First, the study was based on the quantitative methodology using experimental design (participation or non-participation in the program). Pre-test data were collected before the beginning of the intervention to provide baseline data, while post-test data were collected right after the completion of the eight-week long reading comprehension program. Second, the study was also based on qualitative methodology using a questionnaire to collect data.

PARTICIPANTS

The school where the research was conducted is located in a relatively poor residential area in St Catherine, Jamaica. Most of the students live in nearby communities, and they get to school mainly by taxi or walk. The school is government owned and faces many challenges as it lacks some of the basic resources to facilitate educational activities. The majority of the students are from a low-socio economic background. This is evident as over fifty percent of the students are on the government feeding program – the Programme of Advancement Through Health and Education (PATH). This research, however, was conducted in the computer lab since it was quiet and students were better able to concentrate and stay on task. The students’ normal classrooms were quiet but not suited for this research because they had neither internet connections nor electricity to carry out the activities.

The population of this study comprised of 165 grade-three students of the case school. The sample used in this study was 30 grade-three students, which included 18 boys and 12 girls in the age range of 7-8 years old. These students were chosen because they were identified to have some form of weaknesses in reading comprehension based on assessments that were previously conducted by the school authority. Initially, the sample was divided into two groups of 15 students (experimental) and 15 students (control). However, one of the students in the control group showed more interest in the experimental group. As a result, the experimental group included 16 students (ten boys and six girls) and the control group included 14 students (nine boys and five girls).

The intervention program was carried out over a period of eight weeks. The students in the sample were informed about the basic details of the study. Students in the control group were taught using the “chalk and talk” approach. Those in the experimental group were taken to the computer lab and were taught with the aid of interactive technology. These classes were conducted during the three (3) sessions per week allotted on the timetable for Language Arts. It is important to note that both the control and experimental groups were taught the same topics in two different physical facilities but close to each other.

Topics taught during the eight-week period of intervention are as indicated in Table 1. The experimental group utilized the computers and other technological gadgets provided by the researchers at the computer lab. Therefore, lessons were structured using these interactive technologies (see Appendix A for comprehension task performance record; Appendix A1 for Sample Comprehension Task; Appendix B for Plan of Action; Appendix C for Sample lesson plans and resources available, and Appendix D for questionnaire). It is worth noting that a small number of students in the experimental group have access to devices at home. Also, the 16 students introduced to technology did not routinely get to use technology in their school during the intervention period since the lab has very few computers.

Table 1. Topics covered during the eight weeks of the experiment.

Period	Content taught
Week 1	Reading for meaning, fluency, and enjoyment
Week 2	Understanding Comprehensions
Week 3	Context Clues
Week 4	Cause and effect
Week 5	Facts and Opinions
Week 6	Main Ideas
Week 7	Elements of a story
Week 8	Summarizing

DATA COLLECTION INSTRUMENTS

Data was collected using a variety of instruments which included a teacher-made identical pre-test and post-test (Gay & Airasian, 2003) as well as a questionnaire (Creswell, 2005). A pre-test was administered to identify the skill level in basic reading comprehension of each group. The results from the pre-test were used as a benchmark against which any progress would be measured. After the eight weeks of intervention, the post-test was administered. This test was in the form of a reading comprehension where students were required to read a passage and answer six questions based on the passage.

QUESTIONNAIRE

The Students’ questionnaire was used to capture essential data regarding students’ interest in reading comprehension (Creswell, 2005; Gay & Airasian, 2003). The majority of the questionnaire items were close-ended, which captured issues relating to the two research questions. There were, however, a few items that were open ended, in as far as a student ticked the option ‘other (specify)’ which allowed a student to dig into other areas that were not represented by the first three choices. These assisted in ascertaining students’ attitude towards reading comprehension and interactive technology. Piloting of the instruments was done with eight (8) grade three students (five boys and three girls) who had similar academic background as the students in the sample. Using information received from the pilot, we were able to make the necessary adjustments to the instruments in order to improve their quality and efficiency. The results from the pilot revealed that a few items on the questionnaire and pre-test/post-test required some form of restructuring, which was done before the final copy of each instrument was printed (Creswell, 2005).

RESULTS

NON-MASTERY, NEAR MASTERY AND MASTERY LEVELS

The results were measured to reflect Non-Mastery, Near Mastery, and Mastery Levels according to the standards set by the Ministry of Education in Jamaica. For the experimental and control groups as a whole, Figure 1 shows that only three (3) students attained mastery level of at least 70% in the Pre -Test as stipulated by the Ministry of Education.

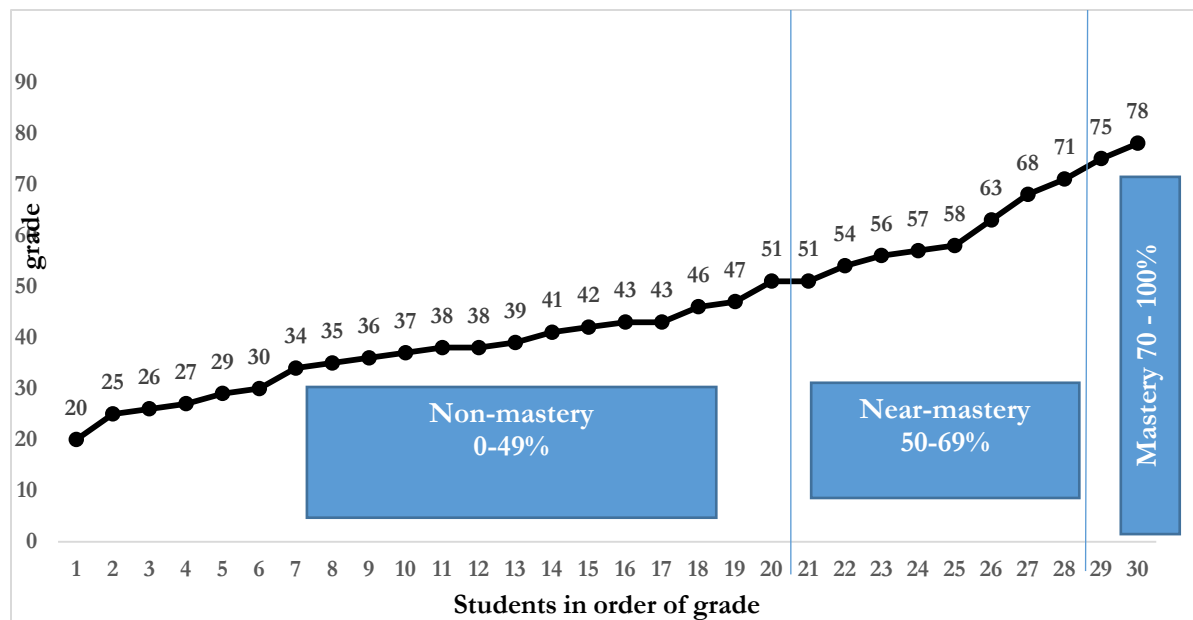


Figure 1. Results from the pre-test.

Table 2 presents the students' performance on the pre-test based on Mastery Level. Panel A presents Non-mastery (0-49%) for both experimental and control groups and reveals that 13 of the 19 students performing below 50 percent were from the experimental group while the other six were from the control group. In Panel B, Near-mastery (50-69%) is presented and shows that two students in the experimental group attained near mastery level while five students attained near mastery level in the control group. Also in Panel C, the Mastery level is presented. It shows that within the experimental group, only one student was able to attain mastery while two students attained mastery in the control group.

Table 2. Students performance on the pre-test based on Mastery level

Experimental group		Control group	
		Panel A	
Non Mastery	(0-49%)		Non Mastery
Student 1	26		Student 17
Student 2	38		Student 18
Student 3	36		Student 22
Student 4	46		Student 23
Student 8	20		Student 24
Student 9	29		Student 27
Student 10	39		
Student 11	43		
Student 12	41		
Student 13	25		
Student 14	34		
Student 15	27		
Student 16	30		
		Panel B	
Near Mastery	(50-69%)		Near Mastery
Student 5	57		Student 19
Student 6	58		Student 20
			Student 21
			Student 25
			Student 26
			Student 28
		Panel C	
Mastery	(70-100%)		Mastery
Student 7	71		Student 29
			Student 30

Students' scores are presented in Table 3. Panel A shows that only six students got scores in the Non- Mastery category of which five were from the experimental group. Panel B indicates that of the fifteen students that fell under the Near Mastery category, seven were from the experimental group. Panel C shows that nine students' scores fell under the Mastery category, of which four were from the experimental group and five from the control group.

Table 3. Students performance on the post-test based on Mastery level.

Experimental Group			Control Group		
Panel A					
Non Mastery	(0-49%)	% Change	Non Mastery	(0-49%)	% Change
Student 9	34	17.2	Student 27	48	29.7
Student 12	43	4.9			
Student 13	45	80.0			
Student 15	44	63.0			
Student 16	46	53.3			
Panel B					
Near Mastery	(50-69%)	% Change	Near Mastery	(50-69%)	% Change
Student 1	53	104.0	Student 17	57	32.5
Student 2	55	54.0	Student 18	58	38.0
Student 3	51	34.6	Student 19	67	31.3
Student 8	55	175.0	Student 20	66	22.2
Student 10	53	35.8	Student 21	66	16.1
Student 11	64	48.8	Student 23	50	42.8
Student 14	54	58.8	Student 24	54	42.1
			Student 26	67	31.3
Panel C					
Mastery	(50-69%)	% Change	Mastery	(50-69%)	% Change
Student 4	72	71.0	Student 22	70	48.9
Student 5	70	22.8	Student 25	75	10.2
Student 6	70	20.6	Student 28	71	12.6
Student 7	78	9.8	Student 29	87	10.2
			Student 30	90	20.0

Additionally, Figure 2 compares the pre-test and the post-test. The figure shows that after the program of intervention, a total of nine students were now scoring in the Mastery category. The Near Mastery category also saw improvement. It moves from seven to 15 students. There was a noteworthy decrease in the Non Mastery category; from the initial 20 students that were in this category, it decreased to only six students.

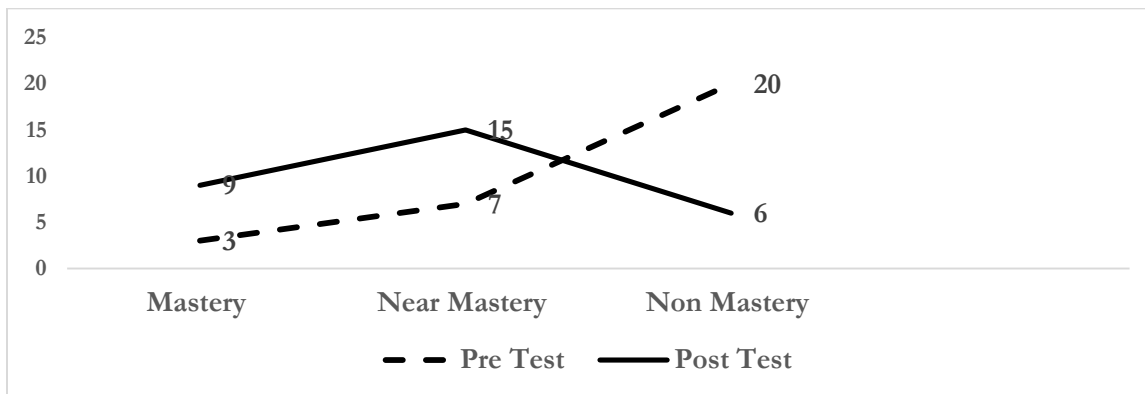


Figure 2. Comparison between Pre Test and Post Test.

Table 4 presents the participants' mean scores of the experimental group on the pre-test ($m = 38.7$) and the mean scores of the control group on the same test ($m = 57.7$). To test for the significance between the mean scores of the two groups, the Mann-Whitney U-Value was calculated.

Table 4. Participants' mean scores on the pre-test Mastery level

Group	N	Mean score	SD
Control	14	52.7	13.9
Experimental	16	38.7	13.8

Table 5 reveals that the difference between the participants' mean scores of the experimental group on the pre- test and the mean scores of the control group on the same test is significant where Mann-Whitney P-Value is 0.05, and this value is less than 0.05. Put differently, our obtained U = 53 is less than 64. Statistically speaking, the difference between the scores of the two groups on the pre-test is unlikely to have occurred by chance.

Table 5. Significance of participants' mean scores on pre-test Mastery level.

Group	N	Mean Rank	Sum of Ranks	Mann-Whitney	
				U-Value	P-Value
Control	14	19.71	276	53	0.05
Experimental	16	11.75	188		
Total	30				

Table 6 presents the participants' mean scores of the experimental group on the post-test ($m = 50.09$) and the mean scores of the control group on the same test ($m = 27.83$). To test the significance between the mean scores of the two groups, the Mann-Whitney U-Value was calculated. Table 7 reveals that the difference between the participants' mean scores of the experimental group on the post-test and the mean scores of the control group on the same test is significant where Mann-Whitney P-Value is 0.05, and this value is less than 0.05. Put differently, our obtained U= 63.5 is less than 64. Statistically speaking, the difference between the scores of the two groups on the post test is unlikely to have occurred by chance.

Table 6. Participants' mean scores on the post-test Mastery level.

Group	N	Mean score	SD
Control	14	27.83	12.61
Experimental	16	50.09	40.01

Table 7. Significance of participants' Mean scores on post-test Mastery level.

Group	N	Mean Rank	Sum of Ranks	Mann-Whitney	
				U-Value	P-Value
Control	14	12.03	168		
Experimental	16	18.53	296.5	63.5	0.05
Total	30				

COMPREHENSION RESULTS

Table 8 presents the comprehensive results, which show that for Question A nine (9) out of the 14 students in the control group scored a mark of zero (0) compared to only two (2) students out of 16 from the experimental group scoring zero. Additionally, the results indicate that 10 out of the 16 in the experimental group scored the full three marks, and four (4) students scored two; while for the control group, one out of the 14 students scored full marks and four scored one (1) out of the total

three marks. Question B results reveal that 14 students from the control group scored zero compared with only five in the experimental group scoring zero. Nine (9) students from the experimental group scored five marks, a student scored one mark, and two (2) students scored four marks. The results of question C show that 13 students from the experimental group scored the maximum of three marks compared to six (6) students from the controlled group. The other eight (8) students in the control group scored zero each, and three (3) students from the experimental group scored one mark each. The results for question D show that all students from both groups scored full marks on this question.

Table 8. Comprehension results.

Question		Possible score					
A. When do you get damp and shiver	Possible score	0	1	2	3		
	Control group (14 Students)	9	4	0	1		
	Experimental Group (16 Students)	2	0	4	10		
B. When are mornings not clear?	Possible score	0	1	2	3	4	5
	Control group (14 Students)	14	0	0	0	0	0
	Experimental Group (16 Students)	5	1	0	0	2	8
C. Why was the captain wide awake?	Possible score	0	1	2	3		
	Control group (14 Students)	8	0	0	6		
	Experimental Group (16 Students)	0	3	0	13		
D. Name a brave person you know	Possible score	0	1	2	3		
	Control group (14 Students)	0	0	0	14		
	Experimental Group (16 Students)	0	0	0	16		
E. Why was the trip getting dull?	Possible score	0	1	2	3		
	Control group (14 Students)	6	0	5	3		
	Experimental Group (16 Students)	0	0	0	16		
F. Why was their course correct?	Possible score	0	1	2	3		
	Control group (14 Students)	6	0	3	5		
	Experimental Group (16 Students)	0	0	0	16		

The results for question E indicate that 14 out of the 16 students in the experimental group scored the full three marks as compared with three (3) out of the 14 from the controlled group; five (5) out of the 14 in the control group scored two marks, and the remaining 6 scored zero. With respect to question F, all the 16 students in the experimental group scored maximum marks while in the control group of 14, five (5) scored maximum, three (3) scored 2 marks, and six (6) scored zero marks. Finally, question (G), asked the students to draw a picture of Wilma's fancy leap. One pupil out of the 16 students in the experimental group scored maximum (10) compared to zero from the control group. A total of 10 students out of the 14 scored six marks and more from the control group while four (4) students scored below 6. A total of 15 students out of the 16 in the experimental group scored 6 marks and more.

QUESTIONNAIRE RESULTS

In order to ascertain a true reflection regarding to a change of attitude towards reading comprehension, only students in the experimental group were given the questionnaire to complete the following questions: Did you find it more interesting to use interactive technology compared to just reading from a book and answering the questions? and Why? The data revealed that of the 16 students in the experimental group, eight said that they found the use of interactive technology to be more interesting rather than just answering questions from a book. Four students said they did not find it more interesting while three said sometimes they found it more interesting to use interactive technology.

Seven of the 16 students in the experimental group noted that the reason why they preferred interactive technology as opposed to reading books was that it was more fun and they remembered more of the story. Five students noted that they enjoyed looking at the stories on the computer rather than just holding a book to read. Two students responded that because they had the opportunity to use the computer to change the pages themselves, while one student preferred interactive technology to books because of the opportunity to use a computer regularly.

When questioned if they would like their teacher to use interactive technology more regularly in the classroom and why, 14 of the 16 students gave a resounding yes while only two (2) students selected no. This suggests that the students in the experimental group enjoyed the lessons and thus the teaching modality may have inculcated a positive attitude towards the use of interactive technology. Additionally, the data revealed that six of the respondents noted that they understood the lesson better because the animals and people in the story looked real. Four pointed to the fact that they had a chance to use the computer to read for themselves, three said because they do not have a reading text book, and the remaining two did not mark a response to this item. The results suggest that learning becomes more fun when the learner is more involved and more so when the process is technology-assisted.

With respect to the question “How would you rate your self-motivation in class during the regular reading lesson compared to the times spent using interactive technology with the use of the computer?” eight (8) out of the 16 students indicated that they felt great, four (4) students selected very good, while two (2) students selected the options good and average respectively. Responses to question relating to their attitude towards reading comprehension before they started using interactive technology during reading classes, show that seven (7) students indicated that they were scared of reading comprehension, five (5) students could not wait for classes to end, and four (4) students did not like attending classes.

When students were asked the question, “Were you frustrated when trying to use the computer effectively while making an effort to understand the reading passage in order to answer the questions correctly?” three (3) students answered yes, 10 students said no, and two (2) students said sometimes. Furthermore, in response to, “How did you feel about using interactive technology to change the pages, watch your favourite character and so on, instead of just flipping the pages of your reading?” the data show eight (8) out of the 16 students were excited, five (5) felt very good, and three (3) good. When questioned if the use of interactive technology assisted in improving one’s attitude in reading comprehension and why, eleven (11) of the students said yes it did, 3 students were not sure, while 2 students answered no or interactive technology did not assist in improving their attitude in reading comprehension.

DISCUSSION

The purpose of this study was to investigate the effectiveness of integrating interactive technology in reading comprehension. It has been suggested that using assistive technology tools helps in stimulating students’ interest (Raskind & Stranberry, 2009). The study by Wright, Fugett, and Caputa (2013), revealed that students are more willing and interested to utilize reading resources when technological advancements are integrated into reading practices. This present study was based on quantitative and qualitative methods. Thirty students were divided into two groups: an experimental group, which included 16 participants, and a control group, which included 14 participants. The experimental program was conducted in four steps. First, both groups were asked to answer some demographic questions. Second, both groups were given a pre-test which was graded and marks recorded. Third, both groups were taught for eight weeks, utilizing chalk and talk for the control group and interactive technology for the experimental group. Fourth, a post-test was administered to both groups and marks recorded. Finally, the experimental group was given a questionnaire about their experience of using technology in reading comprehension.

According to the results presented in Tables 4 and 5, it could be concluded that there was significant difference between the mean scores of the two groups on the pre-test where Mann-Whitney P-Value obtained is less than 0.05. Similarly, according to the results presented in Tables 6 and 7, it could be concluded that there was significant difference between the mean scores of the two groups on the post-test where Mann-Whitney P-Value obtained is less than 0.05. The statistical evidence provides an answer to the first research question: will students' ability to comprehend what they read improve if interactive technology is used? Implied is that there was a significant difference between reading comprehension outcome of students who were taught reading comprehension by using technology and those who were not. Secondly, the results presented in Table 8 reveal that students taught reading comprehension by using technology consistently did better than those who were not. Thirdly, questionnaire results indicate an overall positive effect on students' attitude toward reading comprehension. That is to say that interactive technology improves grade-three students' attitude toward reading comprehension. Fourthly, the present study provides empirical support for previous studies that claimed that technology-based approaches are as effective as using non-technology based approaches (De Jong and Bus, 2004; Korat & Shamir, 2007; Mostow et al., 2003; Twyman & Tindal, 2006). It also supports studies that provided evidence to show that computer based approaches yielded better results than non-technological approaches (Ertem, 2010; Fry & Grosky, 2007; Glenberg et al., 2011; Higgins & Raskind, 2005; Pearman, 2008). Finally, generalization of the findings is limited because of some of the limitations of this study which include the small sample size and the relatively short term of the intervention.

CONCLUSION

Firstly, we find a significant difference between the reading comprehension outcomes of students who were taught reading comprehension by using interactive technology and those who were taught by the traditional chalk-and-talk. This finding is in line with prevailing literature (e.g., Glenberg et al., 2011; Korat & Shamir, 2007).

Secondly, the present study focused on using computer technology as the sole treatment for comprehension skills and strategies and has provided empirical support for the effects of technology-based approaches for addressing reading comprehension and vocabulary skills.

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APPENDIX A. COMPREHENSION TASK PERFORMANCE RECORD

Name: _____

Date: _____

Title of Passage: _____

Questions	Marks	Student's Grade	Student's Percentage
When do you get damp and shiver?	3		
When are mornings not clear?	5		
Why was the captain wide awake?	3		
Name a brave person you know.	3		
Why was the trip getting dull?	3		
Why was their course correct?	3		
Draw a picture of Wilma's fancy leap.	10		

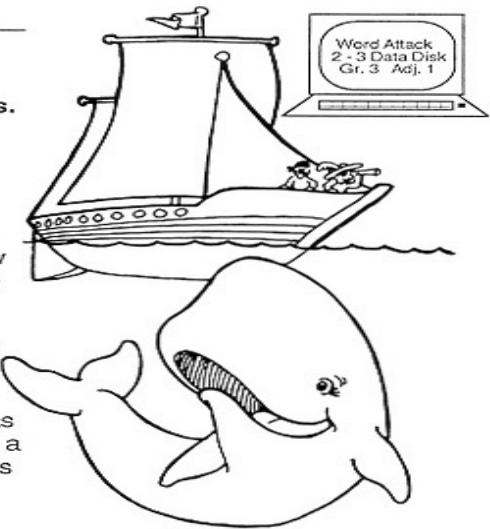
APPENDIX A1. SAMPLE COMPREHENSION TASK

Name _____

Read the story and answer the questions.

"Brrr! This **damp** air makes me shiver," said Peg-Leg Pete. "I sure do hope we spot Wilma soon." It was a **clear** morning and Captain Cork was wide **awake** as he looked through his spyglass. He and his **brave** crew had been sailing for many weeks. They were hoping to see their friend, Wilma the Whale. The trip was getting pretty **dull** with nothing but ocean to look at. The Captain knew they were on the **correct** course because they had seen Wilma many other times.

Suddenly there was a loud splash. It was Wilma! As everybody cheered, Wilma made a **fancy** flip in the water as if to say hello. It was great to see her again.



a) When do you get **damp** and shiver? _____

b) When are mornings not **clear**? _____

c) Why was the captain wide **awake**? _____

d) Name a **brave** person you know. _____

e) Why was the trip getting **dull**? _____

f) Why was their course **correct**? _____

g) Draw a picture of Wilma's **fancy** leap. Use another piece of paper.

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APPENDIX B. PLAN OF ACTION.

Grade: Three

Unit Title: Relating to others outside of Jamaica

Topic: Reading Comprehension

Duration: Eight Weeks

Attainment Targets

1. Give and receive information.
2. Know and use basic language skills and the convention of spoken and written language.
3. Apply relevant decoding skill to the reading process.
4. Respond critically and aesthetically to a variety of stimuli.
5. Use recognizable handwriting and appropriate spelling and vocabulary to write for a variety of purposes.

Objectives

By the end of this intervention, students should:

- become knowledgeable to the computer as a technological device that aids in Reading Comprehension.
- recognize the value of how this technology can be used to improve achievement in Reading Comprehension skills.
- with the aid of the computer, exhibit a greater interest in the learning/teaching of Reading Comprehension
- be able to answer questions at the different comprehensive levels.

Resources

Lop-top stories, projector, crayons, pictures, blank paper, hand outs and a song.

Skills: Reading, writing, speaking, viewing, analyzing, listening, thinking, questioning, retelling, sharing, drawing and colouring.

Teaching Learning Activities

Reading, writing, sentence construction, viewing, touching, drawing and colouring.

Theme of story

Week One-Eight

Wilma the Whale

APPENDIX C. SAMPLE LESSON PLANS.

Subject: Language Arts

Unit Title: Relating to others outside Jamaica

Grade: 3

Date:

Duration: 1hour

Subtopic: Reading Comprehension

Objectives: At the end of the lesson students will be able to:

- Read with understanding based on what they had viewed on the projected screen.
- Share ideas about what was read using SJE language to express themselves
- Read story from the computer and answer questions based on what was read.
- Talk freely about what they have observed on the computer, make inference, using SJE language.

Materials: computer, projector, speakers and books

Skills: reading, touching, speaking, writing, expressing themselves

Vocabulary: computer, favourite, express, character.

Activities: Student will:

- Sing the song “Time for story time”
Time for time (repeat)
Time for story time today.
Let us gather, let’s be quiet
wonder what we will, do today.
- A volunteer will start the computer. The whole group will language in a discussion with the teacher about what was read before. They will elaborate on all that they remembered about the previous lesson. They will once more read the story from the computer. The teacher will pause at different intervals so that students can make inferences and comment on important events in the story. They will be encouraged to talk about the plot, their favourite character/s and also say what they think will happen based on what they remembered from the story from previous lessons. At the end of the lesson, a discussion will follow after which they will do seated work answering questions,(written)

Assessment: Students will

Take their books to the teachers table. The teacher will observe their work and elaborate where necessary. The teacher will make an assessment of their work and give feedback before the post test.

Subject: Language Arts

Unit Title: In what ways are we similar or different from people to whom we relate outside Jamaica.

Grade: 3

Duration: 1hour

Subtopic: Reading Comprehension

Objectives: At the end of the lesson students will be able to:

- Read fluently from the computer and answer questions based on what was read.
- Draw inferences based on the story on the computer.
- Talk about their favourite or their worse part of the story giving reasons for their answer.
- Interact with the computer by using the pause/play button as directed by the teacher.

Materials: computer, projector, speakers and books

Skills: reading, writing, speaking, touching, answering questions and expressing

Vocabulary: computer, projector, speakers, library and books.

Activities: Students will:

Be taken to the computer lab, where they will be engaged in a reading lesson on the computer, this will be projected on a white screen. They will sing the song “Time for story time” This will be done while they are getting seated. The teacher will begin the lesson by showing the title of the story on the screen. The students will instructed to read the title. They will be introduced to the different parts of the computer as will be necessary for the lesson, important parts such as, the start/pause key and the speaker button. The students, especially those who had no prior knowledge, will be given a practice exercise to familiarize themselves with the technology; this will be done for about 5 minutes. The lesson will afterwards be continued with a volunteer pressing the start button. They will read the story from the screen. Randomly a student will be chosen to press the pause key. At this junction students will be given the chance to make inferences, another student will be given the chance to press the start key, the story will continue. As the lesson continues students will get the chance to interact with the computer until the story is completed. At the end of the story a discussion will follow, after which they will answer some comprehension questions based on what was observed and read on the screen.

Assessment: Students will be called individually where the teacher will take a quick look at the response and give feedback where necessary.

APPENDIX D. STUDENTS' QUESTIONNAIRE

Instructions: Kindly place a tick beside your response to the questions below. If you choose **other**, you are to write out your response on the line provided.

(1a) Did you find it more interesting to use interactive technology compared to just reading from a book and answering the questions?

- A) Yes B) No C) Sometimes

(1b) Why?

- A) Because I got to use the computer to change the pages by myself.
 B) I enjoyed looking at the stories on the computer rather than just holding a book to read.
 C) It was more fun and I remembered more of the story.
 D) Other (specify) _____

(2a) Would you like your teacher to use interactive technology more regularly in the classroom?

- A) Yes B) No C) Sometimes

(2b) Why?

- A) I understand the lesson better because the animals and people in the story look real.
 B) Because I get to use the computer to read for myself.
 C) Because I do not have a reading text book.
 D) Because I do not get bored and get into trouble.
 E) Other (specify) _____

(3) How would you rate your self-motivation in class during the regular reading comprehension lesson compared to the times spent using interactive computer technology?

- A) Good B) Very good C) Great D) Poor E) Very poor F) Average

(4) What was your attitude towards reading comprehension before you started using interactive technology in the reading comprehension class?

- A) I did not like attending classes. B) I could not wait for classes to end.
 C) I was scared of reading comprehension. D) I enjoyed reading comprehension.
 E) Other (specify) _____

(5) Were you frustrated trying to use the computer effectively while making an effort to understand the reading passage in order to answer the questions correctly?

- A) Yes B) No C) Sometimes

(6) How did you feel about using interactive technology to change the pages, watch your favourite character and so on?

- A) Good B) Very good C) Excited D) Bored E) Other (specify) _____

(7a) Do you think that using interactive technology has helped to improve your attitude to reading comprehension?

- A) Yes B) No C) Not sure D) Other (specify) _____

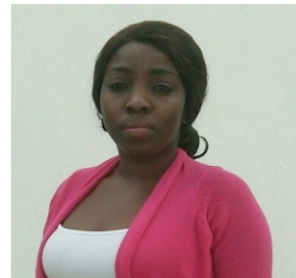
(7b) Why?

- Because I am now eager to go and read a story and try to answer the questions on my own.
- Because I do not think it has changed my attitude towards reading comprehension.
- Because I am not sure if it has helped to improve my attitude towards reading comprehension.
- Because I was frustrated trying to use the computer to help me read and answer the questions correctly.
- Other (specify) _____

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