

Effect of Digital Media on Acquisition of Numeracy Skills among Preschoolers in North-East Senatorial District of Jigawa State, Nigeria

Immaculata G. Umoh, Abubakar S. Muhammad, Madu Ijeoma Gloria and Enewan E. Udo

Department of Early Childhood and Special Education, Faculty of Education, University of Uyo, Uyo.

Abstract

This study investigated the effect of digital media on acquisition of numeracy skills among preschoolers in North-East Senatorial District of Jigawa State, Nigeria. To achieve this purpose, three specific objectives and corresponding research questions were also raised to guide the study. Three null hypotheses were postulated to guide the study. A quasi-experimental design, specifically the non-randomised pretest and post-test control group, was employed and used for this study. The population of this study consisted of all 2,401 preschool children in functional Early Childhood Care Education (ECCE) centres established within public primary schools in Jigawa North-East. A multi-stage sampling technique was used to select a sample size of 240 ECC II pupils from four intact classes. Number Work Achievement Tests (NWAT) were used as instruments for the study. The instrument's validity was determined by validates. Kuder Richardson Formula 20 was used to determine the internal consistency of the Number Work Achievement Test (NWAT), which yielded reliability coefficient indices of 0.73. Mean analysis and standard deviation were used to answer the research questions, while analysis of covariance (ANCOVA) was used to test the hypotheses. The study revealed that pupils exposed to computer-assisted instruction (CAI) performed better overall in their' acquisition of numeracy (ability to count numbers, identify numbers, add numbers) than those exposed to the chalk and talk method. Based on the findings of this study, the researcher recommends, among others, that teachers should be encouraged to use computer-assisted instruction (CAI) in teaching preschool pupils' numeracy skills.

Keywords: Digital Media, Computer Assisted Instruction, Numeracy Skills, Preschool, Information Communication Technology (ICT).

Introduction

The world today is in the digital age. Thus, with the advent of information and communication technology (ICT), digital media came into being as the by-products of the modern technology revolution, having a significant impact on every aspect of human endeavours, including the educational process. The term 'digital media' denotes any communication medium that operates with the use of any of the various encoded machine-readable data formats. Digital media can be created, viewed, distributed, modified, listened to, and preserved on a digital electronic device such as the computer (in all its known categories). On this premise, 'digital' and 'media' can be separately defined. Thus, the word

'digital' can be described as any data represented by a series of digits, while the word 'media' can be referred to as a medium of digitised information broadcast through a screen and speakers (Lopez-Behar et al., 2019). As noted by Rayburn (2012), digital media include software, digital images, digital video, video games, web pages and websites. It also includes social media, digital data and databases, digital audio such as MP3, MP4, electronic documents, and electronic books.

Digital media for children are electronic manipulatives that often use context-sensitive sensors embedded within learning materials driven by well-designed computer programmes, video games, handheld media applications in cell phones and other wireless (on-line) mobile devices, as well as electronic toys. Lopez-Behar et al. (2019), advocates of modern information and communication devices, generally believed that the application of computers and other ICT-related digital media in classroom instructional delivery could be very beneficial to the development of children's intellectual and reasoning skills. In this realisation, learning activities for early childhood can be prepared and designed by educators using various electronic media. As noted by Nurani and Pratiwi (2020), the use of technology in early childhood can be integrated through play activities and must be considered properly and used in accordance with the learning objectives that have been determined by the curriculum. Thus, the use of digital media is an option for preschool teachers to keep up with technological advances. Specifically, the computer, which is believed to have the tendency to stimulate young school children to perform tasks otherwise not developed until the later stages, In fact, one special thing about the computer (as a digital medium) that it offers to everyone is the instant gratification received when a button or key is pressed and an outcome is provided. Thus, in the case of children, when they press a button and can predict the outcome, they feel comfortable and in control. In this connection, some children may get very attached to the computer, especially if they are playing games. In this realisation, Aladejana (2013) also posited that the combination of text, sound, and colourful moving images can be used to provide challenging and authentic content that will engage and motivate children in the learning process.

Numeracy is the ability to reason and to apply simple numerical concepts (Rittle-Johnson et al., 2019). Basic numeracy skills consist of comprehending fundamental arithmetical operations like addition, subtraction, multiplication, and division (Brooks and Pui, 2010). In line with this assertion, therefore, numeracy has to do with knowledge of numbers. For instance, if one can understand simple mathematical equations such as $2 + 2 = 4$, they would be considered to have possessed at least basic numeric knowledge. Substantial aspects of numeracy also include number sense, operation sense, computation, measurement, and geometry. According to Reyna et al. (2009), fundamental numeracy (rudimentary) includes understanding of the real number line, time, measurements, and estimations, as well as fundamental skills. There are also computational skills (the ability to perform simple arithmetic operations and compare numerical magnitudes). Thus, numeracy skills is the number sense that should be developed in children at an early stage of life in order to develop them into numerically literate adults with the ability to manage and respond to the

mathematical demands of life. By contrast, a lack of numeracy skills (innumeracy) can have a negative impact on the life of an individual. Hence, the first couple of years of childhood are considered to be a vital part of life for the development of numeracy and literacy. As noted by Melhuish et al. (2008), age is accounted for when discussing the development of numeracy in children. Children under the age of five have the best opportunity to absorb basic numeracy skills. After the age of seven, the achievement of basic numeracy skills becomes less influential (Melhuish et al., 2008).

In fact, primary education in Nigeria is the education given to children aged between the ages of 6 and 12, with the inculcation of permanent numeracy as one of its cardinal objectives. Similarly, the teaching of the rudiments of numbers, shapes, and forms through play is one of the key objectives of pre-primary education in Nigeria (FRN, 2013). The fact that the play-based method of instruction has been strongly recommended as the best strategy for teaching preschool children means that digital learning media can contribute to young children's learning of numbers. Many aspects of early informal mathematics learning, such as enumeration, arithmetic problem solving, spatial reasoning, and geometric knowledge, develop during the preschool years. Consequently, the use of digital media or technological software that can be used to teach children early numerical skills is on the rise. In fact, research findings have shown that computer-based learning programmes, when integrated into preschool classrooms, can enhance children's number sense and knowledge, as well as develop mathematics competency and other related thinking and reasoning skills in young children (Starkey et al., 2014).

Number identification is the ability to identify a number that corresponds with a quantity. Starkey et al. (2014) This is also called number representation or number recognition. Generally, number sense (identification or recognition skill) refers to a person's ability to understand, relate to, and connect numbers (Melhuish et al., 2008). Number sense encompasses a broad understanding of the concept of numbers. The National Mathematics Advisory Panel (2008) defines it as an ability to identify numbers and understand quantities associated with each number, count numbers, and add and subtract numbers. Children with strong number sense think flexibly and fluently about numbers. Children can visualise and talk comfortably about numbers. Number bonds are one tool to help them see the connections between numbers. In fact, inculcating number identification skills is one of the objectives of pre-primary education in Nigeria. To this effect, preschool children need number identification skills to make number sense and to solve mathematical problems in school and at home. Therefore, it is important for teachers operating at the pre-primary and primary levels of schooling to understand how digital media (as a form of instructional aid for the 21st century) can help to improve children's acquisition of number identification skills.

Counting is the act of memorising numbers in the correct order (1, 2, 3, 4, 5, etc.). Many preschool children can count up to 10, and some can count numbers up to 20 or higher. One-to-one correspondence is the skill of pairing or matching objects so that one object equals one number. That is, when a child says, "one," he or she counts one object, and when a child

says, "two," he or she counts one more object after the first object. Thus, number-counting skills are the ability to identify numbers and count such numbers with corresponding quantities of objects (Akinola, 2015). Learning the rudiments of numbers is one of the objectives of pre-primary education in Nigeria, and as such, preschool children need number-counting skills to make number sense and to solve mathematical problems in school and at home. Therefore, it is important for teachers operating at the pre-primary and primary levels of schooling to understand how digital media (as a form of instructional aid for the 21st century) can help to improve children's acquisition of number identification skills.

Addition and subtraction for preschoolers should be fun, hands-on activities. Using objects, talk to children about taking one away or adding one more. Children can practice simple addition and subtraction using small toys and blocks. Do not require preschoolers to memorise equations or respond to flash-card equations. These activities are not developmentally appropriate for preschoolers. Many preschool children can nonverbally and mentally perform addition tasks from 1 to 8 (e.g., $1+1$, $1+2$, $2+1$, $2+2$, etc.). However, some of the ideas that early childhood educators can try to develop number-counting skills among preschoolers include the following:

Add and Subtract Everything: Collect a variety of materials that can be used for hands-on addition and subtraction. Plastic bottle caps, old buttons, small blocks, puzzle pieces, and old keys will all work. Collect them in a bag or jar, and pick a time to add or subtract them. During snack time, encourage children to add and subtract goldfish or other small crackers.

Bowling for Addition and Subtraction: Using water bottles or soda bottles, create your own bowling set. Ask children to number each bottle from 1 to 10, and arrange the bottles in a triangular shape at the end of a long hallway or uncarpeted room, with one pin in the front, two behind it, three behind those, and so on. Take turns rolling the ball towards the pins and see how many you can roll over in one try. Count up the numbers on each pin that gets knocked over and the pins that don't get knocked over.

The new thrust in educational delivery in the 21st century emphasised the integration of information and communication technology in classroom teaching. There is a rapid increase in the daily usage of technological tools, especially computers. Today, computers are a big part of the school system and have now managed their way into early childhood schools as well. More and more children learning in the pre-primary lower classes in the primary school are showing tendencies towards becoming extremely familiar with the operation of a computer. This has therefore established a line of thought as to whether the computer (as a form of digital media) could be effective in teaching pre-primary school children (especially those in public schools) the knowledge and information that they would not have received until a later age. Modern innovative technologies have been widely accepted as important tools in life and education throughout the world. As noted by Aladejana (2013), the computer can help transform the learning environment into one that is learner-centred when used appropriately. This realisation has therefore underscored the need for the integration of computers as ICT-related devices in classroom instruction at

every level of education, especially at the early childhood stage of learning, where the foundation for future academic and lifelong learning is built.

A computer is a machine that can be programmed to carry out a sequence of arithmetic or logical operations automatically. According to Wikipedia, modern computers can perform generic sets of operations known as programmes; these programmes enable computers to perform a wide range of tasks. Thus, a computer system is a “complete” computer that includes the hardware, operating systems (main software), and peripheral equipment needed and used for “full” operation. The term ‘computer system’ may also be used to refer to a group of computers linked and functioning together, such as the computer network. Today, there are many higher-quality computer applications, especially for children, that have explicit learning goals and effective learning strategies, developed by experts who understand young children’s developmental needs and abilities. As noted by Lieberman et al. (2009), nowadays, young children have a growing variety of media options. These ranged from the standard display of programmed content on a screen with a keyboard or game controller as an input device to various newer ways of playing. Digital media has also allowed individuals to be much more active in content creation. Anyone with access to computers and the internet can participate in social media and contribute his or her own writing, art, video, photography, and commentary to the internet (Horrigan, 2007). Therefore, the range of digital media for preschool children encompasses computer-assisted learning (CAL), which is an open-ended learning programme that offers children (as users) some control over learning activities.

Mutlu (2017), who conducted a study on the effects of computer-assisted instruction materials on the approximate number skills of students with dyscalculia, found that the approximate skills of the participants have developed and there has been a significant increase in their speed of answering. In the same vein, Rogowsky et al. (2018) studied playful learning with technology: The effect of computer-assisted instruction on the literacy and numeracy skills of preschoolers. They found significant differences between the groups on post-achievement tests, indicating that playful learning through educational software may enhance literacy and numeracy skills among preschoolers.

Mohammed and Kanpolat (2010) studied the effectiveness of computer-assisted instruction on enhancing the classification skill in second graders at risk for learning disabilities and found the use of CAI enhanced classification skill in the target participants, i.e., second graders at risk for learning disabilities. In the same vein, Khirol et al. (2020), who investigated improving pupils’ recognition of letters and their corresponding sounds using HVAM flash cards, found HVAM flash cards are very helpful to solve the reading problems of preschoolers, as well as being helpful for teachers and parents. Alade et al. (2016) also discovered that participants who either played an interactive tablet-based game or viewed a non-interactive video demonstrated greater knowledge transfer than those assigned to a control condition. Interestingly, interactivity contributed to better performance on near-transfer tasks, while participants in the non-interactive condition performed better on far-transfer tasks. Gyampoh et al. (2020) established that pupils’ performance improved

drastically after the implementation of the intervention (rectangular cut-out number line). Moreover, Ali-Rahman et al. (2017) found positive progress and greater improvement in the students' performance. Most of the students who were interviewed responded that it was easier for them to remember the triangle rather than using the mnemonic as a tool to remember the order of operations. Therefore, there is a need to investigate the effect of digital media on preschool pupils' acquisition of numeracy skills in the North-East Senatorial District of Jigawa State, Nigeria.

Statement of the Problem

The issue of quality in instructional delivery at the pre-primary or early childhood level of schooling is believed by many stakeholders in education to be very essential for the development of cognitive, emotional, social, and psychomotor abilities in young children. Jigawa state government has over the years tried to provide equal access to education among preschool children by establishing pre-primary or early childhood education sections in public primary schools; it also maintained steady payment of teachers salary and provision of instructional facilities, including ICT-related instructional media (such as computers, projectors, and interactive boards), to public schools. Notwithstanding the government's efforts, instruction in public schools operating at the childhood education level in the state is still not of the desired quality. This is informed by the calibre of pupils completing public primary schools on an annual basis, the majority of whom could neither perform simple number works nor communicate effectively. This situation, which has been there for years, was largely attributed by parents to the inability of classroom teachers to provide effective learning experiences to primary school children in the state. It is therefore not certain to parents if teachers in public primary schools are making optimum use of the instructional resources available in the schools. Equally, it is not certain whether teachers are aware of the benefits of applying modern technological devices, such as the computer, to effective instructional delivery. Apart from these, there is the issue of how beneficial computers are for teaching at the childhood level of education and what effects computers will have on the educational and life achievement of pupils in pre-primary schools. These situations are of concern to the researcher as they constitute a problem that requires urgent research attention; hence, the problem of this study is to examine the effect of digital media as computer software programmes (applications) on preschool pupils' acquisition of numeracy in Jigawa North-East Senatorial District.

Purpose of the Study

The main purpose of this study was to investigate the effect of digital media on preschool pupils' acquisition of numeracy skills in North-East Senatorial District of Jigawa State, Nigeria. Specifically, the study sought to:

- i. Determine the difference in the mean scores of preschool pupils' ability to count number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

- ii. Ascertain the difference in the mean scores of preschool pupils' ability to identify number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.
- iii. Determine the difference in the mean scores of preschool pupils' ability to add number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

Research Questions

The following research questions were answered in the study:

- i. What is the difference in the mean scores of preschool pupils' ability to count number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method?
- ii. What is the difference in the mean scores of preschool pupils' ability to identify number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method?
- iii. What is the difference in the mean scores of preschool pupils' ability to add number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method?

Null Hypotheses

The following null hypotheses were raised to guide the study and tested at .05 level of significance;

Ho₁: There is no significant difference in the mean scores of preschool pupils' ability to count number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

Ho₂: There is no significant difference in the mean scores of preschool pupils' ability to identify number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

Ho₃: There is no significant difference in the mean scores of preschool pupils' ability to add number when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

Materials and Methods

The research design adopted for this study was a quasi-experimental research design. Specifically, it is a pretest-post-test, non-equivalent control group design. The population of the study consisted of all 2,401 preschool children in functional Early Childhood Care Education (ECCE) centres established within public primary schools in Jigawa North-East. A sample of 240 ECC II pupils from four intact classes, which represents 10% of the total population was used in the study. In order to obtain a representative sample of 240 ECC II pupils for the study, a multi-stage sampling technique was adopted. The instrument used in gathering data was the Number Work Achievement Test (NWAT). NWAT has two

sections. Sections A and B. Section A contains the pupils' personal data, while Section B comprises 10 items developed by the researcher. The items were scored with 2 marks each, for a total of 20 marks. The Number Work Achievement Test (NWAT) was used to measure the pupils' performance in both the pre-test and post-test. Also, the researcher developed the two lesson plans on computer-assisted instruction (CAI) and the talk and chalk method as treatment packages. The Number Work Achievement Test (NWAT) had a reliability index of 0.73, determined using the Kuder-Richardson Formula-20. The treatment group was taught scientific concepts with computer-assisted instruction (CAI), while the control group was taught the same concepts using conventional method (talk and chalk) with the help of two trained research assistants who were class teachers in the selected classes. The classroom investigation, which lasted for four weeks and was strictly supervised by the researcher. At the end, the Number Work Achievement Test (NWAT) was re-administered as a post-test. The collected data were analysed using Analysis of Covariance (ANCOVA) with pre-test scores as covariates. All hypotheses were tested at the .50 level of significance.

Results and Discussion

Research Question One

What is the difference in the mean scores of preschool pupils' ability to count numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method?

Table 1: Mean and Standard Deviation scores of preschool pupils' ability to count numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method

Group	n	Pretest $\bar{X}$	SD		Posttest $\bar{X}$	SD	Mean Difference	
Computer Assisted Instruction (CAI)	122	1.00	1.18		4.04	1.27	3.04	
Chalk and talk method	118	1.20	1.25		1.08	1.24	- 0.12	

Source: Field Data (2023).

The result in Table 1 revealed the pretest and posttest means of experimental group (those exposed to Computer Assisted Instruction) of 1.00 and 4.04 with their respective standard deviations of 1.18 and 1.27 respectively. The result further shows the pretest and post-test means of control group (those taught with Chalk and talk method) of 1.20 and 1.08 with a respective standard deviation of 1.25 and 1.24. Comparing mean differences of those in the experimental group with those in the control group implies there is difference in the mean scores of preschool pupils' ability to count numbers when taught using computer assisted

instruction (CAI) and those taught using chalk and talk method. The result also implies that pupils exposed to computer assisted instruction (CAI) have the highest mean difference.

Research Question Two

What is the difference in the mean scores of preschool pupils' ability to identify numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method?

Table 2: Mean and Standard Deviation scores of preschool pupils' ability to identify numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method

Group	n	Pretest $\bar{X}$	SD		Posttest $\bar{X}$	SD	Mean Difference	
Computer Assisted Instruction (CAI)	122	1.34	1.37		4.14	1.38	2.80	
Chalk and talk method	118	1.32	1.28		1.10	1.15	- 0.23	

Source: Field Data (2023).

The result in Table 2 revealed the pretest and posttest means of experimental group (Computer Assisted Instruction) of 1.34 and 4.14 with their respective standard deviations of 1.37 and 1.38 respectively. The result further shows the pretest and post-test means of control group (those taught with Chalk and talk method) of 1.32 and 1.10 with a standard deviation of 1.28 and 1.15. Comparing mean differences of those in the experimental group with those in the control group implies there is difference in the mean scores of preschool pupils' ability to identify numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method. The result also implies that pupils exposed to computer assisted instruction (CAI) have the highest mean difference.

Research Question Three

What is the difference in the mean scores of preschool pupils' ability to add numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method?

Table 3: Mean and Standard Deviation scores of preschool pupils' ability to add numbers when taught using computer assisted instruction (CAI) and those taught using talk and chalk method

Group	n	Pretest $\bar{X}$	SD	Posttest $\bar{X}$	SD	Mean Difference
Computer Assisted Instruction (CAI)	122	1.24	1.36	4.14	1.34	2.90
Chalk and talk method	118	0.93	1.13	1.32	1.31	0.99

Source: Field Data (2023).

The result in Table 3 revealed the pretest and posttest means of experimental group (those exposed to Computer Assisted Instruction of 1.24 and 4.14 with their respective standard deviations of 1.36 and 1.34 respectively. The result further shows the pretest and post-test means of control group (those taught with talk and chalk method) of 0.93 and 1.32 with a standard deviation of 1.13 and 1.31. Comparing mean differences of those in the experimental group with those in the control group implies there is difference in the mean scores of preschool pupils' ability to add numbers when taught using computer assisted instruction (CAI) and those taught using talk and chalk method. The result also implies that pupils exposed to computer assisted instruction (CAI) have the highest mean difference.

Hypothesis One

There is no significant difference in the mean scores of preschool pupils' ability to count numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

Table 4: Result of Analysis of Covariance (ANCOVA) of the significant difference in the mean scores of preschool pupils' ability to count numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	567.653 ^a	2	283.826	200.002	.000
Intercept	635.028	1	635.028	447.481	.000
Ability to Count Numbers	40.527	1	40.527	28.558	.000
Methods	548.015	1	548.015	386.166	.000
Error	336.331	237	1.419		
Total	2516.000	240			
Corrected Total	903.983	239			

a. R Squared = .628 (Adjusted R Squared = .625)

Source: Field Data (2023).

Data presented in Table 4 show that treatment as main factors had a significant effect on the mean scores of preschool pupils' ability to count numbers. $F = 386.166$, $P = .000$. This is because the F-value of 386.166, which is significant at .000 probability level and also

significant at 0.05 level of significance. This also shows that the hypothesis of no significant difference in the mean scores of preschool pupils' taught counting of numbers using computer assisted instruction (CAI) and those taught using chalk and talk method is rejected. The adjusted R squared of .625 suggests further that 62.5% of total variance on the dependent measure was contributed by the treatment condition.

Hypothesis Two

There is no significant difference in the mean scores of preschool pupils' ability to identify numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

Table 5: Result of Analysis of Covariance (ANCOVA) of the significant difference in the mean scores of preschool pupils' ability to identify numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	576.539 ^a	2	288.270	184.618	.000
Intercept	649.402	1	649.402	415.900	.000
Ability to Identify Numbers	20.063	1	20.063	12.849	.000
Methods	554.666	1	554.666	355.228	.000
Error	370.061	237	1.561		
Total	2632.000	240			
Corrected Total	946.600	239			
a. R Squared = .609 (Adjusted R Squared = .606)					

Source: Field Data (2023).

Data presented in Table 5 show that treatments as main factors had a significant effect on the mean scores of preschool pupils taught identification of numbers. $F = 355.228$, $P = .000$. This is because the F-value of 355.228, which is significant at .000 probability level and also significant at 0.05 level of significance. This also shows that the hypothesis of no significant difference in the mean scores of preschool pupils' ability to identify numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method is rejected. The adjusted R squared of .606 suggests further that 60.6% of total variance on the dependent measure was contributed by the treatment condition.

Hypothesis Three

There is no significant difference in the mean scores of preschool pupils' ability to add numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method.

Table 6: Result of Analysis of Covariance (ANCOVA) of the significant difference in the mean scores of preschool pupils' ability to add numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	480.427 ^a	2	240.214	136.342	.000
Intercept	969.944	1	969.944	550.529	.000
Ability to Add Numbers	1.551	1	1.551	.880	.349
Methods	464.778	1	464.778	263.802	.000
Error	417.556	237	1.762		
Total	2724.000	240			
Corrected Total	897.983	239			

a. R Squared = .535 (Adjusted R Squared = .531)

Source: Field Data (2023).

Data presented in Table 6 show that treatments as main factors had a significant effect on the mean scores of preschool pupils taught addition of numbers. $F = 263.802$, $P = .000$. This is because the F-value of 263.802, which is significant at .000 probability level and also significant at 0.05 level of significance. This also shows that the hypothesis of no significant difference in the mean scores of preschool pupils' ability to add numbers when taught using computer assisted instruction (CAI) and those taught using chalk and talk method is rejected. The adjusted R squared of .531 suggests further that 53.1% of total variance on the dependent measure was contributed by the treatment condition.

Discussion of Findings

The findings obtained in research question one revealed that there is a difference in the mean scores of preschool pupils' ability to count numbers when taught using computer-assisted instruction (CAI) and those taught using the chalk and talk method. This is possible by comparing the mean differences of those in the experimental group with those in the control group. In testing hypothesis one, the finding revealed that there is a significant difference in the mean scores of preschool pupils' ability to count numbers when taught using computer-assisted instruction (CAI) and those taught using the chalk and talk method. The findings of this study is in line with the work of Mutlu (2017), who conducted a study on the effects of computer-assisted instruction materials on the approximate number skills of students with dyscalculia and found that the approximate skills of the participants have developed and there has been a significant increase in their speed of answering. In the same vein, Rogowsky et al. (2018) studied playful learning with technology: The effect of computer-assisted instruction on the literacy and numeracy skills of preschoolers. They found significant differences between the groups on post-achievement tests, indicating

that playful learning through educational software may enhance literacy and numeracy skills among preschoolers.

The summary of data analysis for research question two indicated that there is a difference in the mean scores of preschool pupils' ability to identify numbers when taught using computer-assisted instruction (CAI) and those taught using the chalk and talk method. This was so because we were comparing the mean differences of those in the experimental group with those in the control group. Similarly, hypothesis two indicated a significant difference in the mean scores of preschool pupils' ability to identify numbers when taught using computer-assisted instruction (CAI) and those taught using the chalk and talk method. The above finding is in line with Mohammed and Kanpolat (2010), who studied the effectiveness of computer-assisted instruction on enhancing the classification skill in second graders at risk for learning disabilities and found the use of CAI enhanced classification skill in the target participants, i.e., second graders at risk for learning disabilities. The finding of this study agrees with that of Khirol *et al.* (2020), who investigated improving pupils' recognition of letters and their corresponding sounds using HVAM flash cards and found HVAM flash cards are very helpful to solve the reading problems of preschoolers, as well as being helpful for teachers and parents. Alade *et al.* (2016) is in support of the findings of this study, which discovered that participants who either played an interactive tablet-based game or viewed a non-interactive video demonstrated greater transfer of knowledge than those assigned to a control condition. Interestingly, interactivity contributed to better performance on near-transfer tasks, while participants in the non-interactive condition performed better on far-transfer tasks.

Analysis of research question and hypothesis three revealed mean differences between those in the experimental group and those in the control group, and there is a significant difference in the mean scores of preschool pupils' ability to add numbers when taught using computer-assisted instruction (CAI) and those taught using the chalk and talk method. This finding is in line with Gyampoh *et al.* (2020) study on improving the performance of basic school pupils in addition and subtraction of integers using a rectangular cut-out number line and establishing that pupils' performance improved drastically after the implementation of the intervention (rectangular cut-out number line). Moreover, this finding agrees with Ali-Rahman *et al.* (2017), who researched developing students' mathematical skills involving order of operations and found positive progress and greater improvement in the students' performance. Most of the students who were interviewed responded that it was easier for them to remember the triangle rather than using the mnemonic as a tool to remember the order of operations.

Conclusion

Based on the findings of this study, the conclusion reached was that pupils exposed to computer-assisted instruction (CAI) performed better overall in their' acquisition of numeracy skills, such as the ability to count numbers, identify numbers and add numbers, than those exposed to the chalk and talk method. There was a significant difference in

pupils' acquisition of numeracy skills when taught using computer-assisted instruction (CAI) and those taught using the chalk and talk method.

Recommendations

Based on the conclusion of the study, the following recommendations were made:

1. The study found the use of computer-assisted instruction (CAI) effective in enhancing meaningful learning in numeracy and life skills; thus, teachers should be encouraged to use computer-assisted instruction (CAI) in teaching preschool pupils' numeracy and life skills.
2. The State Ministry of Education should provide adequate information technology equipment, such as computers and software, which are the basic equipment needed for the implementation of computer-assisted instruction as a method of teaching.
3. Both the state and the federal government should organise workshops, seminars and talk shows for preschool teachers on how to use computer-assisted instruction in the teaching and learning process.

References

- Akinola, O. (2015). *Therapies for children with arithmetic problems. A handbook for pre-primary and lower primary schools*. Vol. 1. Centre for Learning Disabilities & Audiology, Jos, 53p.
- Alade, F., Lauricella, A. R., Beaudoin-Ryan, L. & Wartella, E. (2016). Measuring with Murray: Touchscreen technology and preschoolers' STEM learning. *Computers in Human Behaviour*, 62, 433–441
- Aladejana, F. (2013). The child in the 21st century: can ICT change the face of learning? *Journal of Early Childhood Association of Nigeria (JECAN)*, Special Edition, 3(1): 1-17.
- Ali-Rahman, E. S., Shahrill, M., Abbas, N., & Tan, A. (2017). Developing students' mathematical skills involving order of operations. *International Journal of Research in Education and Science (IJRES)*, 3(2), 373- 382.
- Federal Republic of Nigeria (2013). National Policy on Education, Lagos: NERDC Press
- Gyampoh, S. A., Nyarko, J. & Agyeman, K. D. (2020). Improving the performance of basic school pupils in addition and subtraction of integers using rectangular cut out number line: A case of a Ghanaian basic school. *IOSR Journal of Mathematics (IOSR-JM)* 16 (3), 21-28.
- Horrigan, J. (2007). A typology of information and communication technology users. (Available at: <http://web.archive.org/201401121918/http://www.pewinternet.org/Reports/2007/A-Typology-of-Information-and-Communication-Technology-Users/Summary-of-Findings.aspx>)
- Khirol, A. A. N., Vaishnavi, P., Wan, N. F. W. N. Y., Zaheer, Z. U. R. N. F. J. & Nor, F. A. (2020). Improving pupils' recognition of letters and its corresponding sounds using HVAM flash cards. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 6 (1), 66-70.
- Lieberman, D. A., Dermartino, C. & So, J. (2009). Young children learning with digital media. *Computer in Schools*. 26(4): 271 – 283.
- Lopez-Behar, D., Tran, M., Mayaud, J. R., Froese, T., Herrera, O. E. & Merida, W. (2019). Putting electric vehicles on the map: A policy agenda for residential charging infrastructure in Canada. *Energy Research & Social Science*, 50, 29–37.
- Melhuish, E. C., Phan, M. B., Sylva, K., Sammons, P., Siraj-Blatchford, I. & Taggart, B. (2008). Effects of the home learning environment and preschool centered experience upon literacy and numeracy development in early primary school. *Journal of Social Issues*. 64(1): 95-114.

- Mohammed, A. A. & Kanpolat, Y. E. (2010). Effectiveness of computer-assisted instruction on enhancing the classification skill in second graders at risk for learning disabilities. *Electronic Journal of Research in Educational Psychology*, 8(3), 1115-1130.
- Mutlu, Y. (2017). The effects of computer assisted instruction materials on approximate number skills of students with dyscalculia. *TOJET: The Turkish Online Journal of Educational Technology*, 16 (2), 119-136.
- Nurani, Y. & Pratiwi, N. (2020). Digital media for the stimulation of early childhood self help skills. *Advances in Social Science, Education and Humanities Research*, 487: 240 - 245
- Rayburn, D. (2012). Streaming and Digital Media Understanding the Business and Technology. *Taylor & Francis*. 264p. Accessed on 26th July, 2020 from: <https://books.google.com/books?id=yC.4xW63Je0C&q=digital+media+definition&pg>
- Reyna, V. F., Nelson, W. F., Han, P. K. & Diekmann, N. F. (2009). How numeracy influences risk comprehension and medical decision making. *Psychological Bulletin*, 135(6): 943–973.
- Rittle-Johnson, B., Zippert, E. L. & Boice, K. L. (2019). The roles of patterning and spatial skills in early mathematics development. *Early Childhood Research Quarterly*, 46, 166-178.
- Rogowsky, B. A., Terwilliger, C. C., Young, C. A. & Kribbs, E. E. (2018). Playful learning with technology: the effect of computer-assisted instruction on literacy and numeracy skills of preschoolers. *International Journal of Play*, 7:1, 60-80.
- Starkey, P., Klein, A., & Wakeley, A. (2014). Enhancing young children's mathematical knowledge through a pre-kindergarten mathematics intervention. *Early Childhood Research Quarterly*, 19, 99-120.