MOBILE PHONES USAGE AS SCAFFOLDING STRATEGY FOR CHILDREN'S ACQUISITION OF NUMERIC SKILLS IN PUBLIC EARLY CHILDHOOD CENTRES IN SOKOTO STATE, NIGERIA

[1]ABUBAKAR KABIRU MUHAMMAD

Department of Adult Education and Extension Services

Usmanu Danfodiyo University, Sokoto

kabir.muhd.udusok.edu. ng

08037492683

[2]BELLO USMAN

Department of Early Childhood and Primary Education

Shehu Shagari University of Education, Sokoto

usmanbellobado@gmail.com

08062373169

Abstract

This study investigated the effect of using mobile phones to scaffold the acquisition of number skills among children in public early childhood education schools. The study has four objectives, four research questions and four null hypotheses. The experiment lasted for four weeks using two groups of 80 children each selected from 10 public ECE schools located within Sokoto metropolis. One group was labeled as the experimental group and was taught number counting using mobile phones and the other group was labeled as the control group and was taught the same content using the traditional chalk and talk method. The t-test statistics was used in the analysis of data. The result revealed the existence of significant mean difference in the ability to identify and count numbers between pupils in the two groups, with pupils in the treatment group performing better. The result also shows that there is statistically significant difference in the ability to identify or

count numbers between male and female children in ECE schools. Generally, the result indicated that teaching numeric skills using mobile phones as a scaffolding strategy is more effective than the using the traditional chalk and talk method. The study recommends among other things that, teachers in public ECE schools in Sokoto state should endeavor to use scaffolding strategies in order to foster learning in terms of developing numeric skills among children. Equally, the Sokoto state government should equip all public ECE schools in the state with modern technological tools and ECE teachers should be given free smart mobile phones as motivational incentives to facilitate the use of such devices for effective instructional delivery.

Keywords: Mobile phones, Scaffolding, Strategy, Public ECE Schools, Children, Numeric skills, chalk and talk method.

Introduction

Young children enter preschools or early childhood education centers with a sense of wonder and a love of learning. They have an insatiable appetite for knowledge when they have learning experiences that are engaging and enjoyable. Positive experiences in which children can make choices and explore the environment help them feel competent and confident. How can educators offer preschool children engaging and enjoyable learning experiences that fuel their intellectual engines and build their confidence? How can teachers and care givers connect children's fascination with learning in every domain and make the most of their time engage in cognitive activities? These questions provide basis for the development cognitive, affective and psychomotor domains of preschool children. This level of thinking necessitated teachers commitment towards supporting children's learning through various teaching methods, strategies and techniques. However, the fact that ECE centers serve as foundational schools, the need for teachers in such centers to adopt teaching techniques that are developmentally appropriate for the pre-school children to acquire physical, social, emotional and cognitive experiences cannot be over emphasized.

Pre-primary or nursery education is a component of the Nigeria's Basic Education scheme which is provided in the context of Early Childhood Education (ECE). As pointed out by Aladejana (2013), early childhood refers to the period between zero to eight years of age (0-8 years), while early childhood education (ECE) is the education given in an educational institution to children from birth to eight years old that is in Day care, Crèche, Kindergarten or Nursery and Lower Primary school. Early childhood education is a critical period for developing foundational skills, including numeric skills. In fact, the teaching of rudiment of numbers; letters; colours; shapes; forms, etc, through play, is among the cardinal objectives or goals of early childhood education in Nigeria. However, as noted by Muhammad (2021) many children struggle with numeric concepts leading to poor mathematics performance. Studies have shown that most adult learners having phobia in mathematics have not had a motivation of learning arithmetic concepts at the grassroots level of schooling.

Scaffolding is a teaching and learning strategy in which the teacher and learners engage in a collaborative problem-solving activity with the support and guidance of the teacher to enable learners become increasingly independent. As noted by Sukyadi and Eneng (2013) scaffolding can be referred to as the strategy used by the teachers to facilitate learners' transition from assisted to

independent performance. In the educational setting, scaffolding may include modeling and direct instruction. As noted by Shehu (2023) scaffolding provides means of teaching students how to approach and handle tasks. Therefore, this strategy is expected to be helpful in overcoming the specific problems which have been already displayed by the preschool children in their quest for numeracy skills. Application of scaffolding for inculcation of numeric skills to children entails the instructor or teacher performing the task alone by breaking down the complex numeric concepts into smaller manageable parts and followed by the gradual release of responsibility (GRR) which means the teachers gradually transfer responsibility to the children thereby promoting autonomy and self directed learning. In this connection therefore, the term 'scaffolding' may be operationally define as a strategy used by teachers to help learners become more independent during number work i.e. to perform the number counting and other simple numeric tasks independently. As a teaching strategy, scaffolding is to support children's learning by helping them move from simple learning task to complex learning tasks. It is also a way of helping children learn new skills by building on the skills they already have. In scaffolding, the experienced adults give support to children in different ways and as the children learn new skills, the adults can reduce the amount of support they give.

Mobile phone is a portable telephone that can make and receive calls over a radio frequency link. A mobile phone can be used for multiple of human needs on daily basis and this significance has led to its usage in a variety of diverse contexts in the society. As noted by Pavlik and Mcintosh (2014) the release of technologies such mobile devices allow for easier and quicker access to all things media. Today, mobile devices (smart phones or tablets) are seen by many scholars as potent resources for effective classroom instructions. Globally, there has been a growing trend of using mobile phones for educational purposes, and many groups, especially teachers and students, use these devices for sharing information. As noted by Lepp et al (2015) mobile phones have been portrayed as one of the applications for teaching and learning in which a new opportunity for the use of ICT in education came to the lime light. Although, the cell or mobile phones were once considered a distraction in the classroom, it however remains true that, educators have slowly found the possibility of turning mobile phones into learning tools. Mohammed (2021) observed that phones have evolved over the years into powerful teaching aids to such an extent that, when used appropriately they can improve children's learning outcomes.

Teaching of rudiments of numbers (which is one of the goals of early childhood education) as well as teaching of mathematics in public primary schools often relies on traditional methods such as chalk and talk, look and say and textbooks which can lead to lack of engagement and poor understanding. However, the primary purpose of any modern methods of teaching is to facilitate understanding through observation. For instance, in science education, students gain a clearer understanding of chemical reactions when they observe experiments rather than just reading about them. However, for the modern method to reach its full potential, educators must prepare thoroughly, involve students actively, and integrate it with complementary teaching approaches, such as mobile phone scaffolding strategy in the case of children.

The application of modern method of teaching involves the teacher showing students how to perform a task or procedure by explaining the steps involved in the task and this tends to promote active participation and effective learning among children. However, the instructor or teacher should always be concise and straightforward in explaining the process clearly and concisely and

ensure that all materials are nearby when the instructional process begins. Thus, for effective teaching of children, the educator should employ a variety of strategies, utilizing media to present information to learners. The teacher must have the ability to use audio-visual aids with expertise and this provide basis for the application of mobile phone scaffolding strategy as a form of modern method of teaching children at the childhood level of education.

Vygotsky (1978) is one of the champions of childhood education and who is globally known for his work on Scaffolding. Vygotsky advocated that scaffolding is temporarily provided and it is gradually removed bit by bit as the learners become more competent independently." Thus, Vygotsky's theory of scaffolding establishes that, what children can do with assistance today, they will be able to do by themselves tomorrow. The present study is underpinned to Vygotsky's idea of scaffolding. Another theory supporting studies on use of devices such as mobile phones for classroom instruction is the Mayer's Cognitive Theory of Multimedia Learning. Thus, the Mayer's Cognitive Theory of Multimedia Learning in Mathematics could be one method of enhancing children motivation which can lead them to having a better problem-solving ability and would improve their performance in number work.

Studies abound on the efficacy of mobile phones usage in classrooms. Some of these studies include that of Ghimire (2023) which examined the use of mobile smart phone and students' mathematics learning in Nepal and found that 89.9% of the learners had access to smart phones and that mobile phone usage enhanced mathematics performance. However, the study maintained that excessive usage of mobile phone could have negative effect on mathematics learning. Hence, the study suggest that in spite of the benefits of using mobile phone for learning, it usage should depend on purpose and effective instructional time. In another study, Gath, Monk, Scott and Gillon (2024) examined educators and students' perspectives on mobile phones usage in schools in New Zealand. The study found that many educators and students support the use of mobile phones in school. Also, a study by Pozos-perez, Herrera-Urizar, Pabio, Rivera-Vargas and Christiana Alonso –Cano (2023) established that, mobile phones can be effective tools for learning, but their use in classrooms is often restricted due to concerns about distractions and social inequalities. Equally, an empirical study by Nguyen and Trinh (2015) examined the effects of mobile phone as a learning tool in the mathematics classrooms in some Vietnamese schools. The study established that mobile web-based content provides students with opportunity to learn at their own pace and preferences as well as to guide self-study at home.

Statement of the Problem

The acquisition of numeric skills is fundamental aspect of early childhood education, laying the foundation for future Mathematical understanding and problem-solving abilities. However, in many of the states referred to as 'backward' or 'disadvantaged' in terms of formal education in Nigeria (Sokoto state inclusive) the poor quality learning at the grassroots level is evident as many children attending ECE schools (specifically those in public ECE schools) are battling with lots of learning challenges. One of such challenges is the difficulty in dealing with numeric concepts, which often result to poor academic performance and lack of interest in Mathematics.

The researchers observed that the teaching of rudiments of numbers (which is one of the goals of early childhood education) often relies on traditional such as the chalk and talk method

which can lead to lack of engagement and poor understanding among learners. Thus, in spite of the importance of numeric skills, traditional methods of teaching often fail to fully engage young learners and this often tends to break the linkage between children's learning potentials and their actual learning performance. It is obvious, therefore, that the failure of the traditional teaching method to live up to the expectations of the 21st century classroom is an issue of concern not only to childhood educators by to parents as well. It is therefore important to remedy this situation to restore parental confidence in early childhood education by exploring other instructional strategies that could be applied to engage children in effective learning activities in ECE schools. The increasing prevalence of ICT devices (such as the mobile phone) presents an opportunity for childhood educators to explore innovative and effective strategies for enhancing numeric skills acquisition in ECE schools. Mobile phones may have the capacity to offer a range of interactive apps for mathematics and number games that can support children's acquisition of numeric skills. However, the effectiveness of mobile phone usage as scaffolding strategy for children learning need to be established. In the light of this, the present study was carried to determining the impact of using the mobile phone system to scaffold the acquisition of numeric skills among children ECE schools in Sokoto State.

Objectives of the Study

The objectives of this study are to:

1. Find out the difference in number identification ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

2. Find out the difference in number counting ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

3. Find out the difference in number identification ability of male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

4. Find out the difference in number counting ability of male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Research Questions

The study has the following research questions:

1. What is the difference in number identification ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method?

2. What is the difference in number counting ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method?

3. What is the difference in number identification ability between male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method?

4. What is the difference in number counting ability of male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method?

Hypotheses

The study has the following Hypotheses:

1. There is no significant difference in number identification ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

2. There is no significant difference in the number counting ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

3. There is no significant difference in the number recognition ability between male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

4. There is no significant difference in the number counting ability of male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Methodology

This study is a quasi experimental by design. The justification of using this design is that, it provide basis for making comparison between learners in two groups, with the stimulus administered in only one group (Statistics Solutions, 2019). The researchers purposefully selected 10 public primary schools having ECE classes in Sokoto metropolis. A total of 16 (male and female children aged 5-6 years) were randomly selected from each schools, giving a total of 160 children used as the sample size. The sample was divided into two groups A and B. with each group having 80 children. The researchers choose children in Kindergarten class in public primary schools because that is the transition point from pre-school (early childhood) education to formal education in the primary school, as enshrined in the Nigerian National Policy on Education.

Instruction lasted for four (4) weeks and the researchers personally taught both groups in order to control the teacher factor. The lessons were taught to both groups in two normal class periods per week. The intervention involved Mobile phone usage with math and number games applications specifically directed at measuring pupils' ability to identify and count numbers effectively. The data collection involved teaching of number work to the 80 children in group (A) using the mobile phone (scaffolding) strategy while the other set of 80 children in group (B) were taught the same content using the traditional chalk and talk method.

Results

The four null hypotheses formulated in this study, were tested at a 0.05 level of significance to determine the difference in the ability of the children in the two groups.

H_{01}: There is no significant difference in the number identification ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Table 1: T- test summary of the mean difference in number identification ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Groups	N	X	Df	t-cal	P. value	Decision
Experimental (Scaffolding Strategy)	80	2.972	158	0.00252	0.000	*S
Control (Look and Say Method)	80	2.875				

SPSS Output @ 0.05

Table 1 showed that the P-value is less than 0.05 at a degree of freedom of 158, the hypothesis is therefore rejected. In this regard, there is significant difference in the number identification ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

H_{02}: There is no significant difference in the number counting ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Table 2: T- test summary of the mean difference in the number counting ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Groups	N	X	Df	t-cal	P. value	Decision
Experimental (Scaffolding Strategy)	80	2.825	158	0.0211	0.000	*S
Control (Look and Say Method)	80	2.125				

SPSS Output @ 0.05

Table 2 showed that the P-value is less than 0.05 at a degree of freedom of 158, the hypothesis is therefore rejected; indicating that there is significant difference in the number counting ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method. The difference also reflected in the mean scores of the pupil where those taught using scaffolding strategy have a mean of 2.825 compared to the pupils taught using the traditional chalk and talk method having a mean score of 2.125.

H_{03}: There is no significant difference in the number recognition ability between male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Table 3: T- test summary of the mean difference in number identification ability between male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Groups	N	X	Df	t-cal	P. value	Decision
Male Children	80	2.909	158	0.0189	0.000	*S
Female Children	80	2.298				

SPSS Output @ 0.05

The result shown in table 3 indicates that the P-value is also less than 0.05 at a degree of freedom of 158. In this regard, the hypothesis is therefore rejected, thereby signifying the existence of significant difference in the number identification ability between male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method. The difference also reflected in the mean scores of the two categories of pupils; where the male pupils had a mean of 2.909 where as their female counterparts had a mean score of 2.298.

H_{04}: There is no significant difference in the number counting ability of male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Table 4: T- test summary of the mean difference in number counting ability of male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method.

Groups	N	X	Df	t-cal	P. value	Decision
Male Children	80	2.79	158	0.0189	0.000	*S
Female Children	80	2.18				

SPSS Output @ 0.05

The result in table 3 indicates that the P-value is also less than 0.05 at a degree of freedom of 158. In this regard, the hypothesis is therefore rejected, thereby signifying the existence of significant difference in the number counting ability of male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method. The difference also reflected in the mean scores; where the male pupils obtained a mean of 2.79 while their female counterparts obtained a mean score of 2.18.

Discussion of Findings

The first finding of this study revealed that there is significant difference in the number identification ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method. This difference also reflects in the mean score, where the pupils exposed to scaffolding strategy seem to be better up with a mean of 2.972 against the pupils taught using look and say method having a mean score of 2.875. This study is in line with a study by Mayer et, al (2014) which found that mobile math games can improve children understanding of numbers and math concepts. The study also lends support to the work of Ghimire (2023) which established that 89.9% of the learners in New Zealand had access to smart phones and that mobile phone usage enhanced mathematics performance. The study suggest that in spite of the benefits of using mobile phone for learning, it usage should depend on purpose and effective instructional time. This finding also agreed with the findings of Richards and Schmidt (2002) which establishes the fact that scaffolding is a teaching learning strategy in which the teacher and learners engage in a collaborative problem-solving activity with the support and guidance of the teacher to enable learners become increasingly independent.

The second finding of this study revealed that there is significant difference in the number counting ability of ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method. This finding lends support to the work of Gath, Monk, Scott and Gillon (2024) which established that many educators and students support the use of mobile phones at school due to its impact on students' academic performance. This finding also lends support to the work of Pozos-perez, Herrera-Urizar, Pabio, Rivera-Vargas and

Christiana Alonso –Cano (2023) which established that mobile phones can be effective tool for learning in the classroom, but their use in classrooms is often restricted due to concerns about distractions and social inequalities.

The third finding of this study revealed that there is significant difference in the number identification ability between male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method. This finding is contrary to the work of Schlebusch (2018) which found no statistically significance difference between males and females in terms of computer anxiety, internet attitude and computer self-efficacy.

The fourth finding of this study revealed that there is significant difference in the number counting ability between male and female ECE children taught using the mobile phone scaffolding strategy and those taught using the traditional chalk and talk method. This finding lends support to the work of Ujah and Abubakar (2021) which established the existence of statistically significance difference between males and females taught counting ability using computer touch screen and mouse input devices.

Conclusion

The study was concluded with the view that, scaffolding strategies proved to be more effective in developing and enhancing pupils' acquisition of numeric skills. As children are assisted to understand sequence and place values of numbers, eventually their acquisition of numeric skills can be enhanced. The use of scaffolding method at the ECE level of schooling makes preschool children to support one another through their interactions (i.e., peer interactions). Mobile devices have new attractive features and provide considerable advantages in the teaching of numeracy and others skills in kindergarten education. Therefore, with the mobile (smart) phones, classroom interaction can be enhanced and ECE teachers can keep children connected to the learning content at all times.

Recommendations

For effective instructional delivery, especially in promoting children acquisition of numeric skills in ECE schools in Sokoto state, the researchers made the following recommendations:

1. Teachers in public ECE schools in Sokoto state should endeavor to use scaffolding strategies in order to foster learning in terms of developing numeric skills among children. This will help to address the significant difference that exists in the number identification ability of ECE children when they are taught using the mobile phone scaffolding strategy as compared to when they are taught using the traditional method,

2. Teachers in public ECE schools should employ the use of mobile phones and other ICT related devises as scaffolding strategies for instructional delivery. This will help to address the difference found in the number counting ability of ECE children when they are taught

using the mobile phone scaffolding strategy as compared to when they are taught using the traditional method.

3. Teachers serving in ECE schools in Sokoto state need to become more involved in professional growth and to exhibit expertise in their instructional delivery by engaging in the use of various scaffolding strategies. This will help in eliminating the difference found to have exists in the number identification ability between male and female ECE children when they are taught using the mobile phone scaffolding strategy as compared to when they are taught using the traditional method.

4. The Sokoto state government should equip all public ECE schools in the state with modern technological tools. Essentially, ECE teachers should be given free smart mobile phones as motivational incentives to facilitate the use of such devices as scaffolding strategy for the development of number counting ability among male and female ECE children.

References

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- 1

Mohammed, A.K. (2021). Teacher competence, facilities utilization and pupils acquisition of literacy skills in public primary schools in Sokoto state, Nigeria. Ph.D Thesis, University of Uyo, Uyo Akwa Ibom state, Nigeria

Nguyen, N. D. & Trinh, T. P. (2015). An Empirical Research on the Use of Mobile Phones to Support Students' Mathematics Learning. *International Journal of Learning, Teaching and Educational Research.* 12(1). Retrieved from http://ijlter.org/index.php/ijlter/article/view/83

Pozos-Perez, K., Herrera-Urizar, G,.Rivera-Vargas, P. & Alonso–Cano, C. (2023) Use of Mobile Phones in Classrooms and Digitalization of Educational Centers in Barcelona. *Education Science,* 13(1), 21

Statistics Solution (2019), Quasi-experimental Research Designs. Online material, retrieved from www.statisticssolution.com.

Sukyadi, D. and Eneng U. H. (2013). Scaffolding Pupils' Reading Comprehension with Think-Aloud Strategy. Retrieved 4th February 2014, from http://didisukyadi.staf.upi.edu/files/2010/03/Scaffolding-and-Reading-Comprehension.doc.

Ujah, B.A. & Abubakar, K.M, (2021). Impact of Computer Touch Screen and Mouse Input Devices on Counting Skills of Nursery School Pupils in Benue State, Nigeria. *Journal of Science, Technology and Education.* Vol. 9, No. 1. 363 – 373. Retrieved from **www.atbuftejoste.com.**

Van Der Stuyf and Rachel R. (2002)."Scaffolding as a Teaching Strategy". Retrieved 12th February 2014 , from: www.sandi.net/cms/.../scaffolding_as_a_teaching_strategy.pdf.