THE IMPACT OF TECHNOLOGY ON TEACHING AND LEARNING OF MATHEMATICS IN PRE-PRIMARY SCHOOLS IN ONITSHA SOUTH LOCAL GOVERNMENT AREA, ANAMBRA STATE

Prof. Anyikwa Ngozi .E[1] & Okwumuo, Victoria N.[2]

[1] *Department of Early Childhood and Primary Education, Faculty of Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.*

[2] *Department of Early Childhood Care and Education, Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria.*

Correspondence: ***ne.anyikwa@unizik.edu.ng***

Abstract

This study focused on impact of technology in teaching and learning of Mathematics in pre-primary schools in Onitsha South Local Government Area of Anambra state. Descriptive Survey research design was adopted for the study. It was guided by three research questions. The population comprised of 305 pre- primary school teachers in Onitsha South Local Government Area. The sample comprised of one hundred and five (105) teachers, sixty –six (66) Primary school teachers and thirty – nine (39) Pre – primary school teachers. A 15-item questionnaire was used for collection of data from the teachers. The questionnaire was validated by two lecturers, while spilt half method was used to confirm the reliability of the instrument at coefficient of 0.88. The data were presented in tables and analysed using mean. Results of the study showed that the effective use of technology in teaching and learning of Mathematics in pre-primary schools make children to learn at a faster rate. Similarly, government should train teachers on how to use computer sets and software packages. Recommendations were also made that the government should make efforts to provide technology facilities in pre – primary schools and teachers should be sensitized on the need to use these facilities in mathematics teaching and learning.

Keywords: *Technology, Pre-primary schools, Mathematics, Teaching and Learning*

Background

The word 'technology' is derived from two Greek words: "techne" meaning "art/craft/skill" and "logos" meaning study of something. In view of this etymological understanding, Nwana (2009) pointed out that technology is the systematic study of technique and regular methods of producing things. Technology is the application of scientific knowledge for practical purpose to satisfy perceived needs. The National Policy on Education (FRN, 2013) defined technology under the technical/vocational education as something which involves the study of technologies and related sciences; and the acquisition of practical skills, attitude, understanding and knowledge relating to occupations in various sectors of economic and social life.

The rapid development of technology, in recent years, have brought significant developments in global education systems (Dooley T., Dunphy E., Shiel G., Butler D., Corcoran D., Farrell T., NicMhuira S., O'Connor M., Travers J., & Perry B., 2014). According to the National Council for Educational Mathematics (NCTM, 2015), technology is an integral part of encouraging mathematical skills in kindergarten as well. Toddlers can develop their critical and creative scientific thinking, as well as their interest in Mathematics (Clements &Sarama 2016; Dooley et al. 2014). Technology can support communication, collaboration, critical and creativity scientific thinking and the development of mathematical skills in toddlers. (Calder, 2015; Nikolopoulou, 2014; Papadakis et al., 2018).

Several researchers, have tried to outline some elements or tools of information and communication technology. They include:- a. The computer with its software. b. Communication systems like mobile phones, telephones, telex facsimile, Internet, E-mail, Fax, Videotext, document delivery. c. Technologically oriented audio and audio-visual materials / microwave systems like radio programmes, recorded cassettes, tele-lectures, television programmes, video tapes, and sound motion pictures. d. Reprographic systems (micrographics, electronic copies, word processing). Okoye, (2005); Sanni (2007), and Atagher (2008). Nwachukwu(2003) in his own view outlined other ICT-oriented activities in the field of education to include - Broadcast materials or CD-ROM as sources of information, Micro-computers with projectors and its devices, Electronic toys, E-mail, Video conferencing, Internet-based research and others.

The use of these tools in teaching and learning has several benefits. It creates easy access to information learning opportunities and resources for both learners and teachers, makes learning more flexible, interesting and reduces pupils perception of Mathematics as an abstract subject. It leads to economical delivery of instruction, enables new instructional models, promotes teacher productivity and helps to expand learning time beyond school period (Okoye, 2005 and Sanni, 2007). The use of the internet provides for both teachers and pupils, global access to all kinds of information generation and sharing. Radio and cassette players, educational television, video cassettes and VCD's can be used to teach and reinforce mathematical concepts, skills and processes especially at the primary school level.

According to Trucano (2005), there is widespread belief that technology can and will empower teachers and learners, transforming teaching and learning processes from being highly teacher-dominated to children centred. This transformation results in increased learning gains for children, creating opportunities for learners to develop their creativity, problem-solving abilities, informational reasoning skills, communication skills and other higher-order skills. In essence, technology includes tangible products such as machines and devices, as well as intangible innovations like software, methodologies, and systems that facilitate human activities. The impact to which these technology tools are used in pre-primary schools in Onitsha south Local Government Area of Anambra State constitutes a major problem of this study.

Over the years many countries of the world had questioned the value of pre-primary school and what role this early education plays in subsequent academic performance and socialization in the primary grades. Many parents have been on the dilemma of deciding whether or not to send their children to pre-school (Gregory, 2014). The foregoing concern was the basis for the initiative of the convention on the rights of the child, drafted by the United Nations Commission on Human Rights (UNCHR) and adopted by the General Assembly of the UN in 1989. Most countries have turned to universal pre-primary education in order to give children a better start to life (Myers, 2016).There is however some general agreement among experts around the world from developing as well as developed nations that early childhood care and education programs are not only desirable but essential for many children (Sylva, 2019). According to the National Policy on Education (FRN, 2013) Early childhood/Pre-primary is from birth-5 years. Pre-school is the

education given in an educational institution to children prior to their entering into primary school. It includes the crèche, the nursery and the kindergarten.

The objectives of pre-school according to FRN (2004) are:

1. Effect a smooth transition from home to school
2. Prepare the child for the primary level of education
3. Provide adequate care and supervision for the children while their parents are at work (on the farm, in the market or offices)
4. Inculcate social norms
5. Inculcate in the child the spirit of inquiry and creativity through the exploration of nature, the environment, art, music and playing with toys and so on.
6. Develop a sense of cooperation and team spirit
7. Learn good habits, especially good health habits and.
8. Teach the rudiments of numbers, letters, colours, shapes, forms and so on through play.

Teaching can be defined as the axon moving education impulse to deliver growth, development and knowledge. Teaching is an all-purpose profession engaged in human resource development for individual and economic growth. Olatunji (2012) defined teaching as a social function that aims at necessary growth in others. Teaching as an act of guiding and imparting knowledge in and outside the classroom, can only be done professionally by qualified and trained teachers. Teaching task is so challenging that it surpasses holding chalk, standing before children and giving out different kinds of instructions. Teaching as an application of intellectual technique is the only hope that can bring about overall national progress and development to every citizen of Nigeria.

Wells (2012), defines teaching as cluster of activities that are noted about teachers such as explaining, deducing, questioning, motivating, taking attendance, keeping records of work, student progress and students' background information. Morrison (2012), stated that teaching is an intimate contact between a mature personality and a less mature one which is designed to further the education of the latter. Teaching is defined as an interactive process primarily involving classroom talk, which takes place between teachers and pupils and occurs during certain definable activities.

Teaching is defined as an act of transferring the cultural heritage of a society which includes: the knowledge, skills, customs and attitude acquired over the years by teachers to the pupils or students (Evans, 2012). Teaching has to do with instructing or training a person.

Learning is defined as a relatively permanent change in an individual's potential behaviour as a result of experience. It is observed that only observable changes in behaviour seem to justify the inference that learning has occurred. Learning is the process by which an activity originates or is changed through reacting to an encountered situation provided that the characteristics of the change in activity cannot be explained on the basis of native response tendencies, maturation or temporary states of the organism.

Learning is an unending process of interaction between the learner and his environments. It is unending because it starts from birth and continues till death. This life-long process is defined as a process which involves the acquisition of new knowledge, skills, ideas, values and experiences which enable the individual to modify or alter his action or to realize his goals. Learning is acquiring new or modifying existing knowledge, behaviours, skills, values or preference and may involve synthesizing different types of information (Onwuka cited in Onyejekwe,2012).

Opute in Ughamadu and Okoye (2013) opines that no one definition of the concept, learning is universally accepted but there is a general consensus that learning means modification of behaviour as a function of practice. They goes on to say that it takes place when the performance of the organism is changed through stimulating contracts with the environment and that all the basic elements of curriculum are designed around the learner and all these interact to achieve all around development of the learner. Learning can occur in various settings, such as formal education, informal experiences, or self-directed study, and can be facilitated through different methods, including observation, practice, and teaching.

Mathematics has a vital role to play in achieving the highly desired technological / industrial development of the Nigerian society. Its relevance in an individual's daily dealings is so great that acquiring Mathematical skills, ideas, processes, computational abilities, intuitive and deductive reasoning etc, are indispensable tools for a successful and meaningful human existence. According

to Ale, Mathematics has substantial use in all other human activities including school subjects such as technology, science and others.

However, despite the vital role that Mathematics has to play in the society and its relevance in an individual's daily dealings, children's performance in the subject seems to be quite low. Some children exhibit much hatred or dislike for Mathematics. They devote greater time in studying other subjects than Mathematics, despite the compulsory status ascribed to it in the national policy. Several factors have been outlined as contributing to this low achievement of children in Mathematics and they include use of inappropriate teaching methods, and lack of ICT in teaching.

In the present study the researcher tries to record the views of preschool teachers about the usage, the benefits, and the barriers of technology for teaching of mathematics in the Pre-school. Teachers' views are particularly important, because they decide on the use and impact of technology in the teaching and learning of mathematics and as key members, they support the educational process. The main purpose of this study is to examine the impact of technology on the teaching and learning of Mathematics in pre-primary schools in Onitsha South Local Government Area of Anambra state. Specifically, the study sought to:

1. Examine the benefits of technology in teaching and learning of Mathematics in pre-primary schools.
2. Examine the factors affecting the effective use of technology in the teaching and learning of Mathematics in pre-primary schools.
3. Identify possible ways to enhance the effective use of technology in teaching and learning of Mathematics in pre-primary schools.

Research Questions

The following research questions guided the study:

1. What are the benefits of technology in teaching and learning of Mathematics in pre-primary schools?
2. What are the factors affecting the effective use of technology in teaching and learning of Mathematics in pre-primary schools?"

3. What are the possible ways of enhancing the effective use of technology in teaching and learning of Mathematics in pre-primary schools?

Methods

This study adopted a descriptive survey research design. Survey research designs are procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people, to describe the attitude, opinions, behaviours or characteristics of the population on a matter being studied(Tanny,2018).The population of the study is made up of all the pre-primary school teachers in Onitsha South Local Government Area of Anambra state. The total number of Primary school teachers in the Local Government Area is 305. Source: Onisha South Local Government Education Authority Fegge Summary Sheet July 2023.The sample of the study therefore was (105) teachers which comprised sixty–six (66) Primary school teachers and thirty – nine (39) Pre – primary school teachers. Primary school teachers were randomly selected from each school (33) two teachers and all the thirty-nine Pre-primary school teachers.

A structured questionnaire titled "Impact of Technology on Teaching and Learning of Mathematics in Pre-Primary Schools Questionnaire (ITLMPSQ)" was used to collect data for the study which was validated as an appropriate instrument for a survey research design. The questionnaire was designed by the researcher based on the objective of the study. There were a total of fifteen (15) items on the instrument. The items on the instrument cover some role of technology in teaching and learning of Mathematics in pre-primary schools. The order of distribution is as follows: items 1-5, covers issues on the benefits of technology and it sought to ascertain whether or not, the schools under study had derived any benefit from the use of technology in teaching or learning. Items 6-10 are on factors affecting the effective use of technology in teaching or learning process and sought to find the degree of effectiveness of technology by the teachers from the pre-primary schools in Onitsha South Local Government Area of Anambra state while items 11-15 are on possible ways of enhancing the effective use of technology in teaching and learning of Mathematic. The respondent were required to respond to the statements on a weighted four-point Likert type of scale of strongly Agree (SA) 4 point, Agree (A) 3 point, Disagree (D) 2 point, and Strongly disagree (SD) 1 point.

To ensure that the instrument for the study asked relevant questions, the researcher made the instrument available for face validated by two experts in the Departments Early Childhood and Primary Education and Measurement and Evaluation. The comments and suggestion made by the experts was used to produce the final copy of the questionnaire. The reliability of the questionnaire was established using split half method. Copies of the instruments were administered to the respondents from the selected pre-primary schools in another LGA and the responses were used to ascertain the reliability of the instrument using Pearson Product Moment Correlation. The instrument had a co-efficient value of 0.88 showing that the questionnaire was reliable for the study. The researcher adopted face to face method of administering the questionnaire. This is to minimize misinterpretation of the questionnaire by the respondents.

A total of 105 questionnaires were administered to the respondents by researchers and all were properly filled. Data was analysed using the mean and standard deviation. Since the generated data would be on interval scale. A criterion mean was set and used in taking decision. The criterion mean was arrived at by summing four, three, two and one and dividing the total by four. Thus: 4+3+2+1/4 = 10/4 = 2.50. Hence, any mean item that is 2.50 and above was accepted but any item mean that is less was considered as negative and was rejected.

Results

This section is concerned with presentation, analysis and interpretation of data of the study. This was done according to research questions.

Research Question 1: What are the benefits of technology in teaching and learning of Mathematic in pre-primary school in Onitsha South LGA?

Table 1: The mean rating of teacher's response on the likely benefits of technology in Primary schools

S/N	ITEMS	SA	A	D	SD	FX	N	X	RK
1	Technology makes children to learn better in maths	42	32	22	15	323	105	3.08	agree
2	Technology helps teachers to teach maths very well	47	27	22	15	328	105	3.12	agree
3	Technology helps children to develop interest in learning maths	44	22	17	12	288	105	2.74	agree
4	Technology would help children access interesting learning materials	45	21	18	11	290	105	2.76	agree
5	Technology help children to understand difficult concepts in maths	46	20	15	18	292	105	2.78	agree

From table 1 above, items 1,2,3,4 and 5 were accepted since their mean rating of teachers responses on these items which are 3.08, 3.12, 2.74, 2.76 and 2.78 were above the cut off mean 2.50. This implies that the likely benefits that would be derived from integration technology in teaching and learning of Mathematics in pre-primary schools are as follows: It would make people to learn faster, understand difficult concepts, have access to wide range of learning materials and help teachers to teach effectively.

Research Question 2: What are the factors affecting the effective use of technology in teaching and learning of Mathematics in pre-primary schools in Onitsha South LGA?

Table 2: The mean (X) rating of teachers' responses on the factors affecting the effective use of technology in teaching and learning of Mathematics in pre-primary schools.

S/N	ITEMS	SA	A	D	SD	FX	N	X	RK
6	Enough computer sets are not available for use in teaching and learning	47	20	17	16	298	105	2.84	agree
7	Most teachers do not have adequate knowledge of ICT	49	21	15	20	309	105	2.94	agree
8	Poor funding of Primary Education is a major problem of ICT usage	50	24	15	19	321	105	3.06	agree
9	Shortage of software packages for teaching and learning of Maths	48	23	20	15	316	105	3.01	agree
10	Lack of motivation to use ICT by teachers to teach in the classroom	49	25	18	17	324	105	3.09	agree

From table 2 above items 6,7,8,9 and 10 were accepted since the mean rating of teachers responses on these items 2.84, 2.94, 3.06, 3.01 and 3.09 were above the cut off mean 2.50. It could be inferred that the major factors affecting the effective use of technology in teaching and learning of Mathematics in pre-primary schools are: inadequate computer sets, inadequate knowledge of ICT by teachers, poor funding of Primary education, shortage of software packages for teaching and learning of Mathematics and lack of motivation to use ICT by teachers to teach in the classroom.

Research Question 3: What are the possible ways of enhancing the effective use of technology in teaching and learning of Mathematics in pre-primary schools in Onitsha South LGA ?

Table 3: The mean (X) rating of teachers' responses on the possible ways of enhancing the effective use of technology in teaching and learning of Mathematics in pre-primary schools

S/N	ITEMS	SA	A	D	SD	FX	N	X	RK
11	Government should provide enough computer set to Pre-primary schools	48	26	14	19	317	105	3.02	agree
12	Pre-primary school teachers should attend regular training on ICT	49	25	12	11	306	105	2.91	agree
13	Software packages should be provided for teaching and learning in pre-primary schools	49	24	16	12	312	105	2.97	agree
14	Computer instructors should be employed to assist the teachers	46	27	16	13	310	105	2.95	agree
15	More funds should be allocated to the Primary education sector	44	29	20	13	316	105	3.01	agree

From table 3, item 11,12,13,14 and 15 were accepted since the mean rating of teachers responses on these items 3.02, 2.91, 2.97, 2.95 and 3.01 were above the cut-off mean of 2.50. This implies that government should provide enough computer sets and projectors to schools. Pre-primary school teachers should attend regular ICT training. Software packages should be provided for teaching and learning of Mathematics in pre-primary schools. In addition, government should employ qualified computer instructors to assist pre-primary school teachers.

Discussion of findings

The objective of this research work is to find out whether technology is likely to enhance the effective teaching and learning of Mathematics in pre-primary Schools in Onitsha south Local Government Area of Anambra state. Questionnaires were distributed to the pre-primary schools teachers in the LGA by the researcher who went into fact finding. In summary therefore, the following research results were obtained. With respect to the likely benefits of technology in teaching and learning of Mathematics in pre-primary schools, the researcher discovered that information and communication technology would help children to learn better, technology would equally help teachers to teach very well and at the same time would help children to access to various learning materials. So the above findings were in line with earlier study carried out by

Awana (2009) which revealed that information and communication technology will facilitate the learning of Mathematic. Similarly, Obong (2009) also reported that technology facilitate the teaching and learning of Mathematics in pre-primary schools.

With regard to research question two, the researcher discovered that the major factors affecting the effective use of technology in teaching and learning Mathematics in pre-primary schools include the following: inadequate number of computer sets, poor knowledge of computer by the teachers, poor funding of primary education sector by the government, shortage of software packages for teaching and learning and lack of motivation to use technology to teach by Pre-primary teachers.

In research question three, it was discovered that the factor affecting the use of technology in teaching and learning of Mathematics in pre-primary schools can be overcome by providing adequate computer sets with projectors to schools, employment of well qualified computer instructors and regular supply of electricity to schools to empower the computer sets. The above findings were in line with earlier study carried out by Nwankwo (2009) which suggested that government should employ qualified computer instructors to train teachers in computer usage. Similarly, Whawo (2009) suggested that government should provide adequate computer sets to school in order to enhance the effective teaching and learning of Mathematics in pre-primary schools.

Conclusion

The desire to increase children's achievement in Mathematics is worthwhile. Having seen the benefits of technology and impact to the teaching and learning of Mathematics in the pre-primary schools, it becomes imperative to use technology as an indispensable tool in the teaching and learning process as such should be made available in adequate proportions to primary education sector to enhance the effective teaching of Mathematics.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Software packages for learning of Mathematics at the pre-primary school should be provided for teaching and learning by government.
2. The government should make efforts to provide these technology facilities in pre-primary schools for use in Mathematics instruction as well as other subjects.
3. There should be an effective monitoring system to ensure that the facilities already provided in schools are properly maintained and utilized for making Mathematics learning more creative.
4. Teachers should be sensitized on the need to use these facilities in Mathematics teaching and learning by the government.

REFERENCES

Ale, A. (1994). Mathematics methods, in Anih, S.C; Olaitan, S.O; Azubuilo, C.J.C; Anadi; C.C. (eds) *Approaches to creative teaching*, Onitsha: Summer educational publishers.

Atagher, C.C (2008). Information and communication technology: A veritable tool for national development. *Knowledge review* 16 (2)

Awana O. (2009). Human learning, Agbor: Krisbee publisher

Calder, N. (2015). Apps: Appropriate, applicable and appealing? In T. Lowrie, & R. Jorgensen (Zevenbergen) (Eds.) Digital Games and Mathematics Learning. *Mathematics Education in the Digital Era*, *4*, 233-250.https://doi.org/10.1007/978-94-017-9517-3_12

Clements, D. (2000). From exercises and tasks to problems and projects- unique contributions of computers to innovative mathematics education. *Journal of Mathematical Behaviour*, *19*(1), 9-47. https://doi.org/10.1016/S0732-3123(00)00036-5

Clements, D., and Sarama, J. (2016). Math, science and technology in the early grades. *The Future of Children, 26*(2). https://doi.org/10.1353/foc.2016.0013

Dooley, T., Dunphy, E., Shiel, G., Butler, D., Corcoran, D., Farrell, T., NicMhuira, S., O'Connor, M., Travers, J., and Perry, B. (2014). *Mathematics in early childhood and primary*

education (3-8 years): Teaching and learning. National Council for Curriculum and Assessment. https://ncca.ie/media/2147/ncca_research_report_18.pdf

Evans, E.D. (2010). *Transition to Teaching*. New York: Rinehart and Winston Trust publishers.

Gregory, R. (2014). Parent-school involvement during the early adolescent years. *Teachers College Record, 9(4), 568-588*.

Federal republic of Nigeria, national policy on education 2004.

Morrison, R.F. (2012). *Teaching competence of secondary school physical science teachers in relation to satisfaction of teaching physical education*. Ph.D. education, University of Calicut.

NCTM [National Council of Teachers of Mathematics]. (2015). *Strategic use of technology in teaching and learning mathematics*. https://www.nctm.org/uploadedFiles/ Standards_and_Positions/Position_Statements/Strategic%20Use%20of%20Technology% 20July%202015.pdf

Nwachukwu, E.C (2003). Information communication technology in physical and health education: Challenges in the 21st century. *Multidisciplinary journal of research development. 10* (5):138 – 142

Nwana, S.E. (2010). *Microteaching in computer age: A fundamental in educational technology*. Onitsha: West and Solomon Publishers. View publication stats

Olatunji, J.O. (2012). *Professionalization of teaching in Nigeria:* How realistic; Andrian Forum 9(1), 81-84.

Onyejekwe, A. (2012). *Educational technology in curriculum instructional.* Onitsha: West and Solomon Publishing Co. Ltd.

Okoye, F.N (2005). Need to use information and communication technology(ICT) in teaching and learning mathematics in Nigerian secondary schools for self-actualization and sustainable development. *The Nigerian journal of curriculum and instruction. 13* (1) : 84-86.

Sanni, M.M (2007). Information, communication technology usage competence among studies of the Polytechnic, Ibadan, Nigeria. *International journal of research in education. 4* (1 &2):244-252

Sylva, J. (2019). School/family/community partnerships: Caring for the children we share. *Phi Delta Kappan, 7(6),* 701-712.

Tanny, T. F. (2018).Survey research design. Retrieved from http://slideshare.net/TahminaTanny/ survey research design, on 10 July 2023

Trucano, M. (2005). *Knowledge maps*: *ICTs in education.* Washington, DC: World Bank. http://www.infodev.org/en/publication.154.html

Wells, (2012). Concept of Teaching and Learning of Biology in Secondary Schools. *Journal of Science Education (3) 2*