

# The Roles of Information Communication Technology (ICT) in Teaching and Learning of Mathematics for Educational Development in Nigeria

DELE-ROTIMI Adejoke Olumide

Department of Mathematics. College of Education Ikere Ekiti

Received: May 12, 2018

Accepted: June 17, 2018

## ABSTRACT

*learning of mathematics for educational development in Nigeria. This study adopted descriptive design of survey type. It involves 1000 secondary school teachers selected from the three senatorial districts in Ekiti State using purposive random sampling technique. Questionnaire was used as instrument for data collection. Data collected were analysed using descriptive statistics and ANOVA at 0.05 level of significance. The result showed that the use of ICT significantly influence teaching and learning of Mathematics in secondary schools. There was significant influence of teachers' attitude on the use of ICT for teaching and learning of Mathematics. The use of ICT in teaching and learning of Mathematics was found in the study to improving educational development in Nigeria. It promotes and enhances independent and self-study, bridges the gap between teachers and students, globalised mathematical skills and knowledge thereby changed students' practices positively, helps the physically challenged to move freely to have access to the learning of mathematics and helps those in the remote area to have access to learning. It is therefore recommended that secondary school students should be provided and given access to one computer each during the teaching and learning of mathematics to enable them develop their full capacity and potential in the use of computer for learning, teachers and instructors of mathematics should be given or have access to computer and all other instructional media with proper orientation on how to use them for teaching and learning process. There should be regular training and re-training for Mathematics teachers in public schools on the use of computer so as to improve on their method of teaching the subject.*

**Keywords:** ICT, Teaching, learning, Mathematics and educational development

## Introduction

Teaching and learning processes are constantly expressing changes. This has resulted in innovations to facilitate, improve and increase students' learning experiences, changes in instructional practices and other aspects of educational institution. The National Policy on Education (2004) stressed that teachers should not only be sound in their subject matter but be highly conversant with the effective methodology to impart the said knowledge to their students for continuity in education. As opined by Jegede & Omotayo (2010), activity-based methods like team teaching, field work and computer based method, that would involve active students' participation would promote higher/better learning in mathematics.

A recent discovery in technology which emanated in the second half of the last century is the introduction of teaching machines, audio-visual devices, movies and filmstrips for use in educational setting. The more advancement in technology is the development of computer and its use in all works of life (Mohammed, 2004).

## ICT as an Educational Tool

John (2001) asserted that the development of ICT transforms the applications of computer in education from the simple administration of record-keeping and student scheduling procedures into a widely implemented method of instruction (teaching). Furthermore, Chen (2006) was of the opinion that ICT is becoming more and more widespread and it has been important especially at teaching difficult subjects in sciences (e.g Mathematics, Physics e.t.c.) for over two decades.

ICT refers to a system of educational instruction performed almost entirely by computer. It incorporates the following assistance;

- assessing student's capabilities with a pre-test and assessing students' progress with a post-test.
- presenting educational material in a navigable form
- providing repetitive drills to improve the students' command of knowledge.
- probably, providing game-based drills to increase learning enjoyment.
- routing students through a series of courseware instructional programs for better understanding.
- recording student's scores and progress for later inspection by courseware instructor.

Collete& Collette (2001) defined ICT as a method, which use computer in learning media, strengthening students' motivation and educational process. It gives opportunities to both students and teachers to learn at their own speeds and combine active learning with computer technology. They explained further that using computer increases motivation and the desire to lecture and activate supervision involved in the process of learning.

Steinberg (2000) is of the view that ICT has many method incorporated into it. These methods include; direct and exploratory lessons, drills, games and simulations. The learning takes place through the students' interaction with the computer cum appropriate feedback. Poole (2007), defines ICT as a computer-based system designed to help students learn subject matter of all kinds. While Roblyer and Edwards (2000), defined ICT as software designed to help teach information and skills related to a topic also known as course ware.

According to Bennelt (1999), ICT is a computerized education which encompasses all the uses of computer both as a tutor and as a tool. It includes the search for information on internet; communication through electronic media such as e-mail and teleconferencing. And Bucholten (1999), opined that ICT is a term for internet support-based instruction through the use of web pages, web bulletin boards, and real, audio, graphical and hands-on-applications.

With all the definitions enumerated above, ICT uses computer to play a role of tutor and impact instruction through a means of drill, tutorial or simulation cum any other mode of presentation. Computer hardware and specifically designed software are needed to accomplish the specific goal of learning, this Software development needs a teacher equipped with best teaching skills and a broad vision.

The potential benefit of ICT is highly conspicuous in education. Demirel (1996) opined that in ICT, teachers can use computer in different places and time according to the software and hardware opportunity and characteristics of the students as well as the feature of the issues. i.e teacher can send note, assignment to students simultaneously while student reply same through the computer according to the capacity of the computer, intelligent of students and urgency of the topic. This usual type can be repetition, assessment, practice, implementation and subject learning. In support of this, Durbin (2002), opined that programs in ICT can be implemented on practice, repetition, mutual learning, problem-solving and comparism.

In his own submission, Cotton (2001), sees ICT as enhancing learning and retention rate of students and as well, motivating and developing their sense of efficacy. Kuchler (2006) in his study, use of ICT as tool in teaching Mathematics revealed that ICT has a powerful and positive effect on retention of mathematical concepts and skills of secondary school students, improves students' attitudes toward obtaining information on aspect of learning or teaching aid that are not easily reachable and makes learning more enjoyable for students.

The reinforcement resulting from the completion of a set of frames leaves the students with a sense of accomplishment which causes an increase in motivation to learn more. Also programmed materials or computer machines are never tired and never loose their temper or patience as a teacher can do, this habit if not properly managed can indirectly result into withdrawal of students in learning, rather, the technology involved in ICT propel the interest of student to work more harder. And, as the ICT generate and solve problems, store and retrieve data, diagnose students' misconceptions, select appropriate teaching strategies, and carry on dialogues with students, it incorporate problem solving and or games that usually permit students to "try out" their knowledge (Mubichakani, 2012).

Hsu & Chen (2000) pointed out that, while technology does not promote understanding in itself, it is a tool that can help students view learning as a constructive process and use reference software (encyclopedia, graphic, dictionary) and simulations to draw students' attention. It provides a supportive environment that is rich in resources, aids exploration, creates an atmosphere in which ideas can be expressed freely and provide encouragements when students makes an effort to understand. For instance, the use of a CD-ROM, Video, Projector as a method of teaching in the classroom. The pedagogy of a teacher's text extends into a highly visual, hand-on learning environment that is available anytime. CD-ROM, method of teaching generate higher satisfaction and greater cognitive gains for the multi-media group.

Also research in mathematics education has shown that the computer facilitates the learning of concepts and computations of statistical formulas. Students of mathematics courses were more motivated, self-confident and joyful and the subject becomes more meaningful with ICT (Roblger& Edward, 2000).

In general, Wanala (1993) online opined that ICT which both tests students' abilities and marks their progress may supplement classroom activities or help students to develop ideas and skills independently. Students take examinations on the computer, and the computer scores their cognitive, affective and psychomotor domain; allowing the students to know their status immediately and give the teachers the insight into the areas where the students need attention/assistance.

## Methodology

This study adopted descriptive design of survey type which comprises of selected secondary school teachers in Ekiti State. Purposive random sampling technique was used to select 1000 teachers from the three senatorial district in the state. The instrument for data collection was questionnaire, validated and tested for reliability with coefficient of 0.98 indicating high reliability. Data collected were analysed using descriptive statistics and t-test at 0.05 level of significance.

## Results and Discussion

**Question 1:** Does the use of ICT influence teaching and learning of Mathematics?

**Table 1: Influence of the use of ICT on teaching and learning of Mathematics**

Items	SA	A	D	SD	$\bar{X}$	Decision
The use of ICT enhance effective teaching and learning of mathematics	685 (68.5%)	215 (21.5%)	100 (10.0%)	0 (0)	3.59	Agreed
Secondary school should replace the traditional teaching aids by new ICT tools to improve the teaching of mathematics	890 (89.0%)	110 (11.0%)	0 (0)	0 (0)	3.89	Agreed
There is inadequate time to the use of ICT in teaching mathematics	677 (67.7%)	233 (23.3%)	50 (5.0%)	50 (5.0%)	3.56	Agreed
Mathematics teachers lack technical support regarding the use of ICT	529 (52.9%)	321 (32.1%)	100 (10.0%)	50 (5.0%)	3.33	Agreed
There is inadequate ICT infrastructure for teaching and learning of mathematic	700 (70.0%)	300 (30.0%)	0 (0)	0 (0)	3.70	Agreed
<b>Grand</b>					3.61	Agreed

$\bar{X} \geq 2.50$  indicate 'Agree' otherwise 'Disagreed'

The result presented in Table 1 revealed that majority (90%) of the respondents indicated that the use of ICT enhance effective teaching and learning of mathematics and 100% pointed that ICT should replace the traditional teaching aids to improve effective teaching of mathematics in secondary schools. The respondents however pointed inadequate time to the use of ICT in teaching mathematics (90%), lack of technical support regarding the use of ICT (85%) and inadequate ICT infrastructure for teaching and learning of mathematic (100%) are limiting the influence in the use of ICT in promoting effective teaching of mathematics. The grand mean in the table is greater than 2.50, this implies that majority of the respondents indicated that the use of ICT influence teaching and learning of Mathematics in secondary schools.

**Question 2:** Is there any significant influence of teachers' attitude on the use of ICT for teaching and learning of Mathematics?

**Table 2: Influence of teachers' attitude on the use of ICT for teaching and learning of Mathematics**

Items	SA	A	D	SD	$\bar{X}$	Decision
Teachers' attitude influences successful use of ICT in teaching and learning mathematics	580 (58.0%)	400 (40.0%)	15 (1.5%)	5 (0.5%)	3.55	Agreed
Teachers' are interested in using ICT in teaching mathematics	675 (67.5%)	200 (20.0%)	75 (7.5%)	50 (5.0%)	3.50	Agreed
Teachers' computer self-efficacy has greater effect in teaching and learning mathematics	445 (44.5%)	350 (35.0%)	105 (10.5%)	100 (10.0%)	3.14	Agreed
Lack of training opportunities discourage teachers from using ICT in teaching and learning mathematics	605 (60.5%)	200 (20%)	100 (10.0%)	95 (9.5%)	3.32	Agreed
Teachers see the use of ICT as a waste of time	20 (2.0%)	100 (10.0%)	380 (38.0%)	500 (50.0%)	1.64	Disagreed
<b>Grand</b>					3.03	Agreed

$\bar{X} \geq 2.50$  indicate 'Agree' otherwise 'Disagreed'

The result presented in Table 2 revealed that 98% of the respondents indicated that teachers' attitude influences successful use of ICT in teaching and learning mathematics. The respondents (87.5%) indicated that teachers' are interested in using ICT in teaching mathematics and their computer's self-efficacy have made teaching and learning mathematics interesting. Those that lack training opportunities among the teachers (80.5%) are being discouraged from using ICT to teach mathematics. The teachers (88%) do not see the use of ICT as a waste of time. This implies that teachers had positive attitude towards the use of ICT in teaching and learning mathematics.

**Question 3:** Does the use of ICT in teaching and learning of Mathematics improve educational development?

**Table 3: ICT for improving educational development through the teaching and learning of Mathematics**

Items	SA	A	D	SD	$\bar{X}$	Decision
ICT promotes and enhances independent and self-study	545 (54.5%)	250 (2.50%)	105 (10.5%)	100 (10.0%)	3.24	Agreed
The use of ICT as instructional media bridges the gap between teachers and students	329 (32.9%)	300 (30.0%)	200 (20.0%)	171 (17.1%)	2.79	Agreed
The use of ICT has globalised mathematical skills and knowledge thereby changed students' practices positively	485 (48.5%)	300 (30.0%)	115 (11.5%)	100 (10.0%)	3.17	Agreed
ICT helps the physically challenged to move freely to have access to the learning of mathematics	675 (67.5%)	200 (20.0%)	100 (10.0%)	25 (2.50%)	3.53	Agreed
The use of ICT helps those in the remote area to have access to learning	400 (40.0%)	300 (30.0%)	200 (20.0%)	100 (10.0%)	3.00	Agreed
<b>Grand</b>					3.79	Agreed

$\bar{X} \geq 2.50$  indicate 'Agree' otherwise 'Disagree'

The results of analysis in Table 3 revealed that majority (79.5%) of the respondents agreed that ICT promotes and enhances independent and self-study, ICT as instructional media bridges the gap between teachers and students (62.9%), has globalised mathematical skills and knowledge thereby changed students' practices positively (78.5%), ICT helps the physically challenged to move freely to have access to the learning of mathematics (87.5%) and The use of ICT helps those in the remote area to have access to learning (70%). This implies that the use of ICT in teaching and learning of Mathematics improve educational development in Nigeria.

**Test of Hypotheses**

**H<sub>01</sub>:** The use of ICT does not significantly influence teaching and learning of Mathematics.

**Table 4: Analysis of Variance (ANOVA) of the use of ICT in teaching and learning of Mathematics**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	5845.269 <sup>a</sup>	6	265.694	13.210	.004
Intercept	20512.288	1	20512.288	247.809	.000
ICT	5845.269	1	265.694	13.210	.004
Error	1821.042	3	82.775		
Total	32213.000	989			
Corrected Total	7666.311	999			

a. R Squared = .762 (Adjusted R Squared = .525)

Table 4 shows that the interactive P-value (0.04) is less than 0.05 level of significance. This means that there is a significant interactive influence of method on students learning of Mathematics. The F-calculated (13.210) was found greater than F-table (3.86), this led to the rejection of the hypothesis. Hence, the use of ICT significantly influence teaching and learning of Mathematics.

**H<sub>02</sub>:** There is no significant influence of teachers' attitude on the use of ICT for teaching and learning of Mathematic.

**Table 8: Analysis of Variance (ANOVA) of teachers' attitude on the use of ICT for teaching and learning of Mathematic.**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1381.813 <sup>a</sup>	6	65.801	5.377	.001
Intercept	25911.366	1	25911.366	148.346	.000
Teachers' Attitude	1381.813	1	65.801	5.377	.001
Error	12925.427	3	174.668		
Total	73361.000	989			
Corrected Total	14307.240	999			

a. R Squared = .897 (Adjusted R Squared = .760)

Table 5 shows that the interactive P-value (0.01) is less than 0.05. This means that there is a significant interactive influence of teachers' attitude on the use of ICT. The F-calculated (5.377) was greater than F-table (3.86) at 0.05 level of significance. This led to the rejection of the hypothesis; hence, there is significant influence of teachers' attitude on the use of ICT for teaching and learning of Mathematic.

H<sub>03</sub>: The use of ICT in the teaching and learning of Mathematics does not significantly improve educational development.

**Table 9: Analysis of Variance (ANOVA) for influence of use of ICT to improve educational development**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig. (P)
Corrected Model	250.732 <sup>a</sup>	6	41.789	43.595	.000
Intercept	1166.066	1	1166.066	12099.007	.000
ICT	18.740	1	18.740	94.441	.000
Error	28.238	3	2.096		
Total	2961.000	989			
Corrected Total	278.970	999			

The results in Table 9 revealed that F-calculated (94.441) was greater than F- table (3.86), df = (1, 999) and  $P < 0.05$ . This led to the rejection of the hypothesis; thus, the use of ICT in the teaching and learning of Mathematics significantly improve educational development.

## Discussion

The finding of the study has revealed that the use of ICT significantly influence teaching and learning of Mathematics in secondary schools. This finding is similar to those of Ifray (2001), Baker and Beisel (2001) and Egunjobi (2002) who found that computers and computer-assisted instruction help to automate various task and retain knowledge faster and provides one-to-one interaction with the students and allows them to learn at their own pace.

It was also revealed that there is significant influence of teachers' attitude on the use of ICT for teaching and learning of Mathematics. Computer-assisted instruction make presentation of instruction in small frames which aid better understanding. It contains different games and simulation which develop the interest of the students to learn. This agreed with the finding of Cohen (2000) that using power point to explain some concept in business education through graphics and clip art has a way of stimulating students' interest towards the learning and improving their performance in the subject.

The use of ICT in teaching and learning of Mathematics was found in the study to improving educational development in Nigeria.

It promotes and enhances independent and self-study, bridges the gap between teachers and students, globalised mathematical skills and knowledge thereby changed students' practices positively, helps the physically challenged to move freely to have access to the learning of mathematics and helps those in the remote area to have access to learning.

## Conclusion

It was concluded that the use of Information Communication Technology in teaching and learning of Mathematics for educational development is a virile method that enhances better knowledge of students in the subject. When teachers' method of teaching mathematics improved, the ability to learn will also improve. Consequently, as the use of ICT improve the teaching and learning of Mathematics, there is corresponding improvement in the development of education in Nigeria.

## Recommendations

The following recommendations are made based on the finding of the study.

1. Secondary school students should be provided and given access to one computer each during the teaching and learning of mathematics to enable them develop their full capacity and potential in the use of computer for learning.
2. Teachers and instructors of mathematics should be given or have access to computer and all other instructional media with proper orientation on how to use them for teaching and learning process.
3. There should be regular training and re-training for Mathematics teachers in public schools on the use of computer so as to improve on their method of teaching the subject.

**References**

1. Bennet, F. (1999). Computers as Tutors Solving the Crisis in Education. Sorasota: Fehn Inc.
2. Bucholten, B. (1999). New Tricks for Teaching: Software, Web Based Solution Help Growing Pool of Technicians Get Up To Speed. Telephony, 234, (11), 50.
3. Busari (2006). Effective teaching and learning of Science.
4. Chen, I. (2006). An Electronic Textbook on Instructional Technology HTML (<http://Viking.coe.uh.edu/ichen/ebook/Et-It/Cover.>),
5. Collete, A.T. & Collete, E.L (2001). Science Introduction in The Middle and Secondary Schools (2nd Edition) Ohio, USA: Merrill Publishing Company.
6. Cotton, K. (2001). Computer-Assisted Instruction North West Regional Educational Laboratory Url, <http://www.nwrel.org/scpd/sirs/5/cuio.html>
7. Demirel, O. (1996). General Teaching Methods. Ankara: UseniYayunlar.
8. Durbin, J.M. (2002). The Benefits of Combining Computer Technology and Traditional Teaching Methods in Large Enrollment Geoscience Classes. Journal of Geoscience Education 1(50), 56-63.
9. Hsu, J.J.f. Chen, D. & Hung, D. (2000). Learning Theories and IT: The Computer as a Tutor. Singapore: Prentice Hall.
10. Jackson KhayatiMwelese, Dr.Wanjala M. Martin & Pius Chililia (2016): Barriers to Effective ICT Integration in Mathematics: Implications for Its Actualisation in Secondary Schools in Kenya Journal of Educational Policy and Entrepreneurial Research (JEPER). 3(1) 21-35
11. Jegede, S.A and Omotayo K.A. (2010). Science Education & Science Teaching Method Series 1. Ado-Ekiti Green Line Publishers.
12. Kuchler, J.M. (2006). The Effectiveness of Using Computers to Teach Secondary School (Grades 6-12) Mathematic: A Meta-analysis. Online Ph.D., Dissertation, University of Lowell.
13. Mbugua, K. Z. Kiingo, V & Nelliet, R. (2012). Factors contributing to students' poor performance in Mathematics at certificate of secondary school education in Kenya: A case of Baringo County, Kenya. American international journal of contemporary research, 2, Chuka university college, Kenya.
14. Mohammed, R (2004). The Effect of Computer-base Teaching Method on Senior Secondary School Students' Performance in Mathematics. Minna: Peak Press.
15. Mubichakani, J. M., (2012). Effect of Computer Based Learning in Mathematics on Learners Motivation and Achievement Level in Relation to Gender in Bungoma North District, Kenya. Unpublished MPhil Thesis, Moi University.
16. Roblyer, M.D. & Edwards, J. (2000). Computational Chemistry Using The PC. (3<sup>rd</sup> Edition). New York: John Wiley & Sons.
17. Steinberg, E.R. (2000). Computer-Assisted Instruction: A Synthesis of Theory Practical and Technology. Hillsdale: Lawrence Erlbaum Associate Publishers.
18. Sunday A. Adeyemo (2010) The Impact of Information and Communication Technology (ICT) On Teaching and Learning of Physics. International Journal of Educational Research and Technology. 1(2), 48-59
19. Wanjala, M. (2005). Effectiveness of Computer Based Instructional Methods on Students' Attitudes, Motivation and Achievement in Teaching of Mathematics in Secondary Schools of Bungoma District. Unpublished Thesis Moi University.
20. Wanala, L.W.J (1993). "Computer Managed Learning". The International Encyclopedia of Education. 2<sup>nd</sup> Edition, Volume 2, New York Pergamon