



Integrating Information and, Communication Technology (ICT) in Teaching and Learning of Statistics: A Remedy to Students' Declined Interest in Mathematics

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Abstract

This paper was specifically designed to find out how Information, and Communication Technology (ICT) should be integrated into the teaching and learning of mathematics at the upper basic education. Mathematics education in Nigeria appears to be in crisis as reflected in the general fall in the standard of education. The poor facilities used in teaching and learning mathematics in Nigeria have made students to have difficulties in learning statistics and mathematics in general. It equally made teachers to have difficulties in achieving effective teaching in school system. These failures have contributed in the quest for new teaching methods in the wake of technological breakthrough and the affordability of computer technology. This paper has looked at the importance and role of ICT in teaching and learning of mathematics. The importance of ICT cannot be over emphasized in the teaching and learning of mathematics. It arouses students' interest and increases their performance in mathematics. The use and application of ICT were also looked at. ICT in Education and the use of ICT in teaching and learning of statistics were also considered. Suggestions were made among which are that: Government should provide ICT facilities in all secondary schools, mathematics teachers should be trained on how to use ICT and curriculum planners should include the use of ICT in the curriculum.

Keywords: Integration, Information Communication and Technology, Mathematics (Statistics).

Introduction

The building blocks of any nation's development in science and technology are anchored on the standard of Mathematics attained. Mathematics is one of the core subjects offered by all students' till the tertiary levels of education (FRN, 2013). All scientific education which does not commence with Mathematics is said to be defective at its foundation (Iyekekpolor, 2015). According to the author, if mathematics is removed, the backbone of our material civilization would collapse. Hence, mathematics teaching and learning are crucial to the future of Nigerian, economy and deserves a special-focus in education (Adetula, 2012). Mathematics is essential in the training of Science and Technology which these children need in order to face the challenges of life. Despite the importance placed on mathematics, massive and consistent failures of students in West African School Certificate Examinations (WASSCE) and National Examinations Council (NECO) have remained a major threat to its learning and the trend of students' achievement in WASSCE and NECO exam have been on the decline (Akpan & Bryant, 2013; Agwagah & Utibe, 2015). Specifically, evidence from research works has shown that the performance of students in statistics and mathematics in general, has been fluctuating (Basturk, 2014; Katz, Poorten & Scalfa, 2018; WAEC, 2016 & 2017 and NECO, 2016). To solve the problem of mass failure in mathematics, especially statistics, the use of

ICT should be incorporated in the teaching and learning of mathematics. However, the effective integration of ICT into the teaching and learning of statistics and mathematics, in general, will involve not just technology but also curriculum and pedagogy, institutional readiness, teacher competences, and long-term financing, among others (Tinio, 2012). This paper was organized under the headings:

1. Importance of Mathematic
2. Importance and role of ICT in Teaching and Learning of Mathematics
3. Uses and Application of ICT in the classroom
4. ICT in Education
5. Classification and description of ICT in education
6. Use of ICT in teaching and learning of statistics in schools
7. Suggestion
8. Conclusion

Importance of Mathematics Education

Mathematics is the study of science that deals with numbers, shapes, figures and space. Sunday, Akanmu and Fajemidagba (2014) defined mathematics as the queen of science and technology and a tool for scientific and technological development. Mathematics plays a fundamental role in the scientific and technological growth of any nation and as such, it can be taught at all levels of education. It is a tool for acquiring intuition,

logical thinking, faculty training and especially aesthetic and ethical values (Umar, 2017). Knowledge of mathematics lead students to understand lessons in other subjects; make them always alert; more sophisticated thinking and mentally composed (Afolabi, 2017). However, despite the enormous important role mathematics play in society, many students struggle with mathematics and become discouraged as they continually meet obstacles in understanding mathematics, which in most cases result in massive failure rate both in internal and external examination, most especially in secondary schools. There has been poor performance in mathematics in National Examination Council (NECO, 2012 & 2016). In recent years, the Chief examiner for West African Examination Council (WAEC) general comments indicated that there were poor academic performances of students in years such as 2016, 2017, 2018, 2019 and 2021. The credit passes are still below 50% in all who took the examination. This poor performance can be attributed to poor teaching methods. Following the advice of Mohammed, (2013) who stated that for Nigeria to become among the greater nation in the world, there is a need for change in the methods of teaching and learning; a shift to the technology-assisted classroom. Thus, integrating computer or ICT in secondary schools, will help to capture student's interest and also increase students' achievement in statistics and mathematics in general.

The Importance and Role of ICT in the Teaching and Learning of Mathematics

The role of Information Communication Technology (ICT) in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy. ICT includes radio, television, computers and internet etc. which serve as potentially powerful, enabling tools for educational change and reform. It is an electronic device that is capable of accepting data and displaying the results (Umerah, 2015). The computer brought about rapid development in the world of communication. Computers enable time and cost savings, faster results, distance learning, assessment of students' achievement scores and monitoring of classroom progress among other benefits (Alexander, 2013). ICT allows students to monitor and manage their learning, think critically and creatively, solve simulated real-world problems, work collaboratively, engage in ethical decision-making and adopt a global perspective towards issues and ideas. ICT can be applied in many area of

mathematics, such as algebra, mensuration, geometry, measurement and statistics (NCTM, 2000).

Uses of ICT in Education

Information refer to facts or details that tell one something about a situation, person and event. It is news or knowledge given. The process of giving the news or knowledge is communication. Technology is an ensemble of devices and procedures based on science, and directed towards a practical result. Educational technology encompasses almost everything in education, from curriculum development to student's learning styles to computerized class scheduling. The use of ICT in the education process has been divided into two broad categories: ICTs for Education and ICTs in Education. ICTs for education connote the development of Information and Communication Technology specifically for teaching and learning purposes, while the ICTs in Education involve the adoption of general components of Information and Communication Technologies in the teaching and learning process (Oladugba, 2014). However, many researchers (Khan, Din, & Ismail, 2015) emphasized the various ways by which ICTs are used in education.

1. E-learning or online learning: This is learning using an electronic device or a browser (such as chrome or internet explorer).
2. Blended learning: This refers to learning models that combine traditional classroom with e-learning solutions.
3. Open and distant learning: This is defined as a way of providing learning opportunities that are characterized by the separation of teacher and learner in time or place, or both time and place.

According to UNESCO (2013) Information and Communication Technology is seen as a way to promote educational change, improve the skills of learners and prepare them for the global economy and information society. ICT is used to improve the understanding of the learner, and increase the quality of education thereby increasing the impact of education on the economy. Katz, Poorten, and Scalfa, (2018) further enumerated the following impacts of ICT on student's achievement.

1. The positive impact of ICT use in education has not been proven. In general, the impact of ICT use on student achievement remains difficult to measure and open to much reasonable debate.
2. Positive impact is more likely when linked to pedagogy. It is believed that specific uses of

ICTs are used appropriately to complement teacher's existing pedagogical philosophies.

3. Computer aided instruction has been seen to slightly improve student performance on multiple choice standardized testing in some areas of computer aided (Assisted) instruction (CAI) which refers to student self-study or tutorials on personal computers (PCs), which has been shown to slightly improve student test scores on some reading and mathematics skills.
4. There is a need for clear goals. ICTs are seen to be less effective when the goals or purposes for their use are not clear.

From the above, the authors concluded that the impact of ICT use on student's achievement is difficult to measure and that Computer-Assisted Instruction slightly improves student's achievement. Ahmed, Isiaka, Opeyemi and Omotayo (2018) discovered that ICT in education, if properly used, affects student's achievement positively.

Classification and Description of ICT in Education

Technological tools should be followed systematically to achieved the desired goals. For these effect, Newhouse (2013) made a classification and description of ICT in education:

1. Electronic blackboard: Teacher presents information as text or graph to the whole class.
2. Drill and practice: Students revise knowledge and skills.
3. Tutorial: Students are presented with new information
4. Simulation: Students use computer to imitate a real solution
5. Modeling: Students uses computer to create an environment, realistic or imaginary
6. Application tools: Teachers and students complete task using software package as word processor, graphics package and databases.
7. Programming: Students develop sets of instructions for computer in order to solve problem.

Use of ICT in teaching and learning of statistics in schools

Statistics is the collection information or data shown in numbers. It is the branch of mathematics concerned with collecting numerical data and making inferences from the data on the basis of probability (Duller, 2018). According to Katz, Poorten and Scalfa (2018), the opportunity to use computers in teaching statistics

provides hands on activities, supports cooperative learning, provides active/constructive learning and produces greater peer interaction. Moreover, using computer with software programmes in statistics establishes a clear link between statistics and its uses in the real world (Basturk, 2014). Computer usage in teaching and learning statistics in senior secondary schools can be in the form of preparation of lesson plan of statistics sub-topic using internet browsers for research, Microsoft (MS) Word for typing, MS Power point for preparation of the lesson; Compact disk (CD ROM), Flash, etc. for storage and delivering the lesson using desktops, and projector or use of calculators, and use of spreadsheets like Microsoft Excel along with projector. Katz et al, classified computer software uses in statistics into categories such as: assisted instruction software designed to teach statistics, commercial available statistical spreadsheet packages (SPSS, Minitab, MS Excel, lotus suits etc.) software distributed on CD or the internet, usually applets, and data bases. However, most of them are used in higher institutions. Basically, internet or research softwares computers assisted instruction, power point, Microsoft Excel and calculator are softwares used in teaching and learning statistics in secondary schools.

Suggestion

Based on the importance and uses of ICT, it is obvious that concepts that look abstract in statistics and mathematics will be made real when ICT is integrated in the teaching and learning of mathematics. Thus, the following suggestions are made:

1. Mathematics teachers should be trained on the use of ICT during their training process by experts.
2. Curriculum planners should include the use of ICT in the curriculum.
3. Government should provide ICT facilities in schools
4. More time should be allocated to the teaching of mathematics.
5. Ministry of education policy makers should organize seminars, workshops and conferences on the use of ICT for serving teachers, teacher educators, textbooks writers and curriculum developers.

Conclusion

Mathematics as a subject has been faced with a lot of problems in terms of its teaching and learning. Besides, there are many instructional materials for the teaching



and learning of mathematics which constitute ICT tools (calculators, computers etc). Therefore, there is a need to prepare mathematics teachers to meet up the challenges of teaching and learning of mathematics, especially at the secondary school level. Hence, there is a need to integrate ICT in the teaching and learning of statistics and mathematics in general, which will boost students' academic achievement.

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