

THE USE OF MATHEMATICAL SOFTWARES IN TEACHING AND LEARNING OF MATHEMATICS IN NIGERIA EDUCATIONAL SYSTEM: CHALLENGES AND PROSPECTS

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Abstract

Accelerated revolution and advancement in computer usage during the last decades have brought about various impacts on education and on the way education is delivered. Mathematics as a subject is not left out. The major aims are to hopefully show the relationship between the abstractness of mathematics and the realities of life. Further, to make teaching and learning more productive and efficient by harnessing modern technology. This paper seeks to establish the relevance of using mathematical software as one of the innovative ways of teaching and learning of mathematics in Nigeria. Types, challenges and prospects in their usage were also discussed and recommendations made.

Mathematics Instruction (MI) can be said to have witnessed four information and communication technology (ICT) revolution (Aghamie and Ughechie, 2009).

The first revolution comprised of films, radio television and satellite broadcasting. The second consist telecommunications and micro computers in mathematical instruction. The integration of telecommunications and microelectronic technology in computing was termed a third revolution and came to what is called information technology (IT). The current trend in information and communication technology (ICT), has brought a phenomenon which is termed a fourth revolution in mathematical instruction (Kaino, 2008).

The first revolution was mainly dominated by “paper and pencil” way of instruction and delivery of knowledge and it relied more on the teacher. The second and third revolution can well as described when “new” and “modern” mathematics was introduced in many countries of the world. It was during this time that calculators and computers were integrated in mathematics instructions. It was in third revolution basically, that computers were introduced in school curriculum and this raised many issues on both developed and developing countries.

The fourth revolution in information and communication technology (ICT) brought globalization component force that replaced other revolution and accelerated its influence world-

wide. In education and mathematics in particular, the delivery of knowledge using computers has influenced the design of various school mathematics curricula globally. Available current technology allows students' interaction with the computer screen rather than the teacher alone. Through the computer network, students are able to communicate with the teacher on the materials and can discuss assignment involved. In this process, students are able to attend lecture "online"; they can now learn while at campus or outside benefiting more from distant learning students world-wide.

What are Softwares/Mathematical Softwares?

Software according to Cambridge International Dictionary of English is a set of instruction which control computer programs. A computer software is a computer program that is sold together with instructions on how to use it.

By extension, mathematical software is a computer programme designed to carry out mathematical process.

Examples of Mathematical Softwares and their Uses/General Areas of Application

Modern mathematics involves the use of softwares which are used to solve problems. The table below gives the examples of softwares and their areas of application in mathematics.

Mathematical Softwares	Areas of Application in Mathematics
Mathematica, MATLAB	Linear Algebra
MATLAB, Mathematica, Excel	Numerical analysis
Statistica, SPSS, Excel, Minitab and SAS	Statistical analysis
Mathematica, Excel, MPL, LINGO	Differential equations and partial differential equations and operations research.
Solver 9	Quantitative analysis

The Use of Mathematical Softwares in Teaching...

According to Yu-Wen (2006), there are several types of mathematical softwares in teaching: graphing calculators, Java applets, spreadsheets, computer Algebra System (CAS) and Dynamic Geometry Software (DGS) etc. Positive contributions of spatial visualization such as graphical calculators and DGS have been found in many research studies (Laborde, 2003; Godwin and Sutherland, 2004; Wright, 2005). The graphing capability provided by DGS helps students make the connections between the numerical, symbolic and graphical representations of mathematical relationship, (Ruthven, 1990). Autographs are also used in drawing graphs.

Generally, according to Josiah (2010), in the world of education, mathematical softwares are used for the following:

To teach students the basic skills in mathematics, provide learning math games and work assignment.

Conduct on-line test and quizzes and is a valuable teaching tools for any teacher in his/her classroom. Teachers can grade math homework and exams using math software.

Math software is need for various educational applications such as standardized test preparations To generate lessons and assignments can be custom made or streamlined by the teacher to fit the needs of his/her class or individual students needing help.

Math software can be a teaching tool for students and the parents who home school their children. It can create an online classroom with a virtual tutor or a real life tutors who works for the online math site

for SAT, GRE, GMAT and more.

Statistics math software is used in many fields of study from education to psychology, science, engineering, computer technology and business.

The world of banking uses math software.

The world of business uses math software and the IRA uses math software to compute income tax and other applications. The whole world of stock exchange uses math software to calculate dividends, appreciation and depreciation, analyze stock market trends, creates stock holder portfolios and more. The insurance industry relies on math software to help the actuaries compute the probability of death, sickness, accidents and other insurance risks. It is also used in about every business from small to large corporations to do payroll.

Challenges and Prospects in the Use of Softwares

Challenges:

Reluctance to Change

Newton's first law of motion states that a body continues on its state of rest or uniform motion in a straight line except an external force acts to change its state, Nelkon and Parker (1995). According to ~~Okun, Idris and Pankpor (2006), this law seems to be applicable to technological development in Nigeria.~~ *Academic Excellence* There is that reluctance to change from old system to the new, (Lagene, 2000). Educational sector is not left out and more importantly, the teaching and learning of mathematics using software is also being affected.

Lack of Awareness/Technical Know-How

According to Obalolu (1998), computer literacy in Nigeria is very low and the use of computer for manpower development/effective class room instruction requires experts in the field of computing ranging from information technologist to computer software/hardware engineers. These information technologists should be able to combine the computer with one or more electronic device(s) like telephone, satellite, overhead projection, remote sensors and even the television to make it more meaningful either for classroom instruction, experimental/laboratory equipment monitoring and security control. Some people's knowledge about computer is still limited to word processing. This means that the use of mathematical softwares in the teaching and learning of mathematics in Nigeria is still very limited. The fact remains that some teachers are ignorant of the existence and uses of these softwares.

Lack of Adequate Infrastructures

For computers to be used for effective teaching, it requires constant electricity and good telecommunications services, which we know is virtually absent in Nigeria.

Lack of Finance

According to Ughamadu (2006), inadequate fund can create great problems in the implementation of an innovation. It is a known fact that it will be difficult to implement any innovation effectively and efficiently if there is inadequate fund or money to provide required materials, equipment and facilities. For computers (mathematical softwares) to be effectively used for teaching and learning, it means that enough computers/laptop should be made available if possible one computer to one student.

Prospects

Though, there is improvement in the use of information and communication technology (ICT) generally in Nigeria, the educational sector is still growing in it. Some of the prospects in the use of software in the teaching and learning of mathematics include:

- (1) It helps to speed up mathematical process thereby arriving at a solution quickly. Hennessy et al (2001) asserts that ICT speeds up the graphing process in graphical softwares.
- (2) The use of mathematical software being an improved way of teaching and learning of mathematical makes more people to be interested in the subject unlike in the past when it was very abstract in nature.
- (3) The use of mathematical softwares makes the study of mathematics interesting

- (4) It reveals the various field of life where mathematics can be applied as earlier highlighted in the *The Use of Mathematical Softwares in Teaching...*
general use of math softwares.
- (5) The use of math softwares helps to solve problem in both educational and business sectors. This will lead to technological advancement and development in the country.

Conclusion

This paper examined the use of mathematical softwares in the teaching and learning of mathematics. It has been seen that the use of mathematical software is virtually applied in all aspects of life ranging from the classroom, business, banking world, engineering etc and huge success will be attained if these softwares are effectively used. The prospects, which we stand to gain or benefit were also discussed. The challenges mentioned were lack of infrastructures, electricity supply, lack of finance, lack of awareness/technical know-how and reluctance to change. These problems if well addressed will bring about effective teaching and learning of mathematics using softwares and there will be development in both the educational sector and the world at large.

Recommendations

Based on the above challenges and prospects in the use of mathematical softwares for the teaching and learning of mathematics, the following recommendations are hereby made:

- (1) Though, there is improvement in the use of information communication technology (ICT) in Nigeria, the educational sector is still growing in the use of softwares for the teaching and learning of mathematics in schools, much still need to be done especially in the aspects of making available or providing enough computers and mathematical softwares in schools. Government should help to supply computers to schools to all levels of education to enhance computer literacy.
- (2) Computer operators/analyst should be trained for this purpose who will help to educate the pupils, students and teachers in the use of these softwares.
- (3) In-service training should be provided especially for the teachers who are already in the teaching profession.
- (4) Efforts should be made by government to see that there is steady supply of electricity to make the use of computer easy. Alternatively, standby generators should be provided for schools.
- (5) There should be review of the curriculum to make it compulsory for science, mathematics and technology teachers at all levels of education to employ the use of computer (ICT) in knowledge delivery
- (6) Provision of reliable internet services to simplify school connectivity.
- (7) There should be provision for steady funding scheme for the maintainability of the ICT resource for ready utilization (Aghware, Egbuna, Aghware and Ugboh, 2010).

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