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# PERCEIVED IMPACT OF COMPUTER IN TEACHING AND LEARNING MATHEMATICS IN SECONDARY SCHOOLS IN ENUGU NORTH LOCAL GOVERNMENT AREA OF ENUGU STATE

**Prof. Felicia. O. Ononye[1]**
Director School of Post Graduate Studies
African Thinkers Community of Inquiry College of Education Enugu.

**Uche Ekwutosi Doris[2]**
Department of Science Education, Faculty of Education
Nnandi Azikiwe University Awka Anambra State.
ed.uche@unizik.edu.ng

## ABSTRACT

*The main purpose of this study was to investigate the impact of computer in teaching and learning of mathematics in secondary schools in Enugu North LGA. Two research questions were raised in correspondents to the purpose of the study. Descriptive survey design was adopted for the study. The study area was Enugu North LGA. The population of the study comprises all the secondary school teachers in the study area which is 50 with a sample size of 50. The instrument used for data collection was a questionnaire which was validated by lecturers in computer science. A reliability index of 0.75 was obtained using spearman rank order. The data collected was analyzed using mean score. The result showed that teaching and learning of mathematics with the use of computer helps the students to understand the subject better.*

***Keyword:*** Computer, Teaching and Learning and Mathematics

## Introduction

Education is a purposeful activity directed at achieving certain aims, such as transmitting knowledge or fostering skills and character traits. These aims may include the development of understanding, rationality, kindness, and honesty. Various researchers emphasize the role of critical thinking in order to distinguish education from indoctrination. Some theorists require that education results in an improvement of the student while others prefer a value-neutral definition of the term. In a slightly different sense, education may also refer, not to the process, but to the product of this process: the mental states and dispositions possessed by educated people. Education originated as the transmission of cultural heritage from one generation to the next. Today, educational goals increasingly encompass new ideas such as the liberation of learners, skills needed for modern society, empathy, and complex vocational skills.

Types of education are commonly divided into formal, non-formal, and informal education. Formal education takes place in education and training institutions, is usually structured by curricular aims and objectives, and learning is typically guided by a teacher.

In most regions, formal education is compulsory up to a certain age and commonly divided into educational stages such as kindergarten, primary school and secondary school. Non-formal education occurs as addition or alternative to formal education. It may be structured according to educational arrangements, but in a more flexible manner, and usually takes place in community-based, workplace-based or civil society-based settings. Lastly, informal education occurs in daily life, in the family, any experience that has a formative effect on the way one thinks, feels, or acts may be considered educational, whether unintentional or intentional. In practice there is a continuum from the highly formalized to the highly in formalized, and informal learning can occur in all three settings. For instance, homeschooling can be classified as non-formal or informal, depending upon the structure.

Regardless of setting, educational methods include teaching, training, storytelling, discussion, and directed research. The methodology of teaching is called *pedagogy*. Education is supported by a variety of different philosophies, theories and empirical research agendas.

There are movements for education reforms, such as for improving quality and efficiency of education towards relevance in students' lives and efficient problem solving in modern or future society at large, or for evidence-based education methodologies. A right to education has been recognized by some governments and the United Nations. Global initiatives aim at achieving the Sustainable Development Goal 4, which promotes quality education for all.

The educational history of computers began in sixties with the realization of its potential to teaching and learning. That was a period of enchantment. According to Suppes et al. (2018) the change that was to come through computers could only be compared to the fact that how books had changed the way of people looking at the world. Computers would change the face of education in a very short period of time by eventually removing the teacher from the classroom scene. Looking in retrospect, can it really be said that his predictions were realized? Or is it just a "techno-romantism" (Underwood and Underwood, 1990) to believe that the computer is a panecea for all of the problems in education. Allthough not having been able to solve all of the problems of
education by itself, this powerful machine, no doubt, will continue to occupy a very central place in education.

A major figure in the history of computers, besides Suppes, in education is Seymour Papert who is famous for his work "Mindstorms" (2010) which presents quite revolutionary ideas about the place of the computers in education. He, like Suppes argued that the computer would change the face of education, but unlike Suppes he advocated the use of the computer not as a teaching machine but as a device to develop learners' intellectual skills through writing their own programs to direct the computer and not let the computer direct themselves. It seems that the effect of computer technology on education is greater in mathematics than

in any other discipline. This may be because of the close links between the two disciplines. In fact the computer science was a part of mathematics and afterwards gained independence as a sole discipline.

**Statement of the Problem**

The rate to which students fails mathematics in senior secondary schools is very disturbing, although mathematics by nature is a complex subject, the methods and strategies used by most teachers in teaching the subject has made many students to hate the subject thereby causing them to fail the subject. It has been discovered that most teachers still prefers using the traditional/conventional method to teach mathematics without engaging the students in some practical work to do on the subject for better understanding. And this has made mathematics teaching to be teacher-centered instead of student-centered. Hence, there is then the need to find and use a method that will get the students actively involved, while at the same time exploiting their natural tendencies of play.

**Research Questions**

The following research questions were formulated to guide the study;

I. What are the impacts of use of computers in teaching of mathematics?
II. What are the impacts of use of computers in learning of mathematics

**Review of Literature**

**Computers in Mathematics Education**

Mathematics instruction is among the most explored research area in education. There have been considerably varied computer applications in instruction (Hatfield, 2014). The teachers of mathematics are confused with the extensive amount of suggestions on how to teach mathematics with a computer. Teachers' attitudes towards computers vary mostly as a function of teachers' age or years in service. Complete 'ignorance' attitude towards computers still continues, although its magnitude is weaker compared to past years This attitude is mostly shared by teachers who had had their training before the start of the computer age who have the most negative attitudes towards its pedagogical use and who insist on using the traditional modes of teaching. Second major attitude is not being able to abandon their traditional habits completely foreseeing its potential for the future of education. Most prevalent and widening attitude is the realiziation and acceptance of the importance of computers for education.

There are three broad categories of the applications of computers in the field of mathematics education:

- Computer assisted instruction (CAI)
- Student (educational) programming
- General purpose educational tools such as spreadsheets, databases and computer algebra systems (CAS).

This survey of literature revealed that, this categorization is also a historical one, although it cannot be said that there were sharp shifts from one movement to another. Another important note is that the CAI movement is not as popular in the Europe as it is in United States.

**Computer assisted instruction (CAI) and its effects on mathematics curriculum**

Behavior modification programs before CAI
There are two major events that had a great influence on education in general and mathematics education in particular in 1958 (Dick, 2016). The first one is the Sputnik event, the satellite launched by the Russians. The other one is the paper presented by Skinner, an influential and famous neo-behaviorist, on programmed instruction.

Behaviorism is considered to be the theory underlying CAI. Hence, it is understandable that the CAI programs are mainly behavioral control programs (Hartley, 2011). An example is Skinner's Programmed Instruction (PI) which was designed to change the behavior of the learners. Fundamental approach of Skinner was to identify the desired behaviors, then to prepare situations in which successive approximations of the behavior would be reinforced. All the students study the so called "linear text", the instructional material used by Skinner. When students complete the text, they were assumed to have acquired the behaviors required from them. The basic characteristic of programmed instruction is the small steps approach, meaning the division of the task into small manageable units, and the immediate feedback given to students from each response they give.

The teaching machine is the box designed to expose the programmed instruction text one frame at a time. It is commonly considered to be ancestor of the device called the "computer" to be used for educational purposes. Skinner's programmed instruction formed a basis for the computer assisted instruction movement (Dick, 2016). Among several other trends Skinner's PI became more widespread than the others. Other major movements in that tradition which followed PI chronologically were Glaser's individually prescribed instruction (IPI) and Keller's personalized system of instruction (PSI). Both approaches contributed to the individualization of instruction movement in similar ways. In Keller's (2018) PSI there were self-paced courses in which students were required to master successive unit tests. Bloom's (2016) is considered to be the last widespread
individualized approach to instruction, before computer assisted instruction movement. The method involves the mastery of certain subject area (e.g. trigonometry) before passing to another. According to Hilgard (2016) these approaches to instruction had important consequences for educational psychology.

- The individualized instruction based on the idea that best learning outcomes can only be obtained with one to one tutoring approach. The claim related to those behaviorist models of instruction was that they could
  provide learning environments closer to one-to-one tutoring (Bloom, 2016).
- The diagnostic teaching which is based on the immediate feedback obtained from the responses of students to the questions being asked during the instructional process.
- The step-by-step approach they presented in the instruction of a certain learning task. Those programs advance in a way such that one sub-task followed the other, in other words one frame at a time as in teaching

machines. Therefore, in each step, what is expected from the user should be specified in terms of observable behaviors.

According to Mager (2012) a behavioral objective has four basic components. The first component is the actor or the learner who is supposed to act in the prescribed manner. Second component is the behavior itself. The condition(s) under which that action would occur and the criteria to judge if the behavior is applicable are the third and fourth components respectively.

**The types of CAI programs**

CAI means, in broader terms, the use of a computer to provide the course content in the form of drill, practice, tutorial, and simulations. Demonstration, testing, information, and communication are the main facilities provided by CAI. Hatfield (2015) counts eight basic types of CAI. The first type of CAI includes "drill and practice" programs. Here, the students rehearses different elements of teaching and develop related skills. They are presented to students in the educational softwares produced for school and home computers. That type of program relies heavily on positive reinforcement. That means, a reward follows a correct response, negative reinforcement is also used but not frequently. A good example for drill and practice programs are the ones designed to help children learn multiplication tables. The drills might be presented to students with a car race game for instance. The rule is simple: the refuelling of the car depends on the correct answer the student gives to a multiplication question Besides drill and practice facilities the use of "computers as tutors" are as widespread as the former. The tutorial programs are the one designed to teach basic concepts or methods as well as certain subject in mathematics for instance. Those type of programs try to behave like a good stimulating teacher. It involves explanations, questions, as well as feedback and correctives. For example, when the user asks for help in a certain step he/she may need help for handling the problem. The third type," simulation" is really a very useful advantage that CAI provides for the users. It is the facility to set up the reality in the classroom, which makes CAI very attractive for the users.

This feature of CAI presents great advantages for the science curriculum. With this way, experiments that are difficult, time consuming and costly could be realized in the classroom (Watson, 2014). It is also useful in the mathematics curriculum. Many of the three dimensional objects that are very difficult to be visualized by the students. These objects can, and then be presented to the learner through the screen of a computer. "Gaming", the fourth type of CAI is the most stimulating use of computers. These programs are a kind of simulation offering competitive situations in which one or more persons can play and win. That does not mean that all games are educationally useful. The stress here is upon the ones that produce worthwhile learning situations related to the objectives contents and processes in the mathematics curriculum (Hatfield, 1984). They are other types of games which are not necessarily based upon a winning and losing theme. Such programs give opportunity to the user to work as team and explore the

environment with other team members. For instance the game DEFCIT asks to form two themes, both having the goal of balancing the budget (Watson, 1984). The programs really offer great opportunities for the mathematics students to work within a co-operative environment to learn difficult mathematical concepts.

The idea that games can be used to enhance the learning of mathematical concepts stems from two different views (Dugdale 2015)

- Making mathematics fun": mathematics is uninteresting and difficult. It can be made easier and enjoyable by playing computer games.
- By providing the structured environments with which students manipulates things in mathematics: mathematics is useful and interesting

**The Impact of Computer in Mathematics Teaching and Learning**

Many other authors have written on the role of Mathematical Games. Obioma and Ukeje (2012) and National Mathematical Centre (2012) highlight the role of mathematical games as follows:

- Making practice period more pleasant and successful. Games situation can reduce tension and boredom considerably, thereby adding color to the study of mathematics
- Enriching the Mathematics vocabulary. The vocabulary of Mathematics is peculiar and unique. Games can provide avenues for learning, internalizing and enriching the vocabulary.
- Introducing new ideas. New ideas and concepts can be introduced through Games. This can be facilitated, if the games are arranged in such a way as to precede the learning of the concepts.
- Allowing for individual differences. The power of Games is that they can be planned to suit or meet the needs of individual differences. Providing for remedial work, reinforcement work or accelerated tasks can be brought about through some special game.
- Review of variety of mathematical skills or to reinforce specific ones. Through good Mathematical Game students are aided to review variety of skills and to reinforce them.
- Generation of interest and excitement about learning Mathematics. This is one of the main objectives of mathematical games. Once students generate interest in and are excited about learning Mathematics, half of the problem would have been solved. Once students lose interest in Mathematics then it becomes strange to them.
- Improvement of study habits. As each player is actively involved, study habits are improved. Co-player can also help poorer pupils.
- Developing positive attitudes toward Mathematics. The informality and excitement of games can lead to the development of positive attitudes. Pupils will tend to like activities that excite them.
- All in all Mathematical Games are activities which normally develop sense of competitiveness, bring satisfaction and pleasure to the

students. They may also help to improve creative use of mathematical and meaningful learning related to social needs. Thus, in general Mathematical Games are assessed for their mathematical skills, motivational potency and competitive strategy.

**Research Method**

The research design adopted for the study was a descriptive research design. The study was conducted in public secondary schools in Enugu North LGA. The population of the study consisted of 50 mathematics teachers from the 9 public secondary schools in the study area with a sample size of 50 teachers.

Simple random sampling was used to draw (10) teachers from each of the selected five schools giving a total sample size of 50 mathematics teachers that was used for the study. The instrument used for data collection was a structured questionnaire which was designed by the researcher. Data were analyzed using mean score. For the sake of taking decision, any mean that is equal to or above 2.5 is considered agreed while any mean below 2.5 is disagreed.

**Presentation of Results**

**Research Question 1:** What are the impacts of use of computers in teaching of mathematics?

**Table 1:** Mean responses on the impacts of use of computers in teaching and learning of mathematics.

| SN | ITEMS | X | Remarks |
|---|---|---|---|
| 1 | The use of computers in teaching mathematics helps the students to understand the subject better | 3.6 | A |
| 2 | computers helps in erasing the fear students have in learning mathematics | 3.5 | A |
| 3 | computers makes the teaching and learning of mathematics more interesting | 3.8 | A |
| 4 | Use of computer helps the students to understand the abstract nature of mathematics more better | 3.7 | A |
| 5 | computers serves as an instructional aid for the effective teaching and learning of mathematics | 3.6 | A |

From the computed mean in table 1 above, it shows that items 1-5 have the mean score of 3.6, 3.5, 3.8, 3.7 and 3.6 respectively which indicates that the respondents agreed on the listed impacts of use of computers in teaching and learning of mathematics

**Research Question 2:** What are the impacts of use of computers in learning of mathematics?

**Table 2;** Mean responses on the impacts of use of computers in learning of mathematics

| SN | ITEMS | X | Remarks |
|---|---|---|---|
| 1 | The use of computers in learning mathematics helps the students to understand the subject better | 3.6 | A |
| 2 | computers helps in erasing the fear students have in learning mathematics | 3.5 | A |
| 3 | computers makes the learning of mathematics more interesting | 3.8 | A |
| 4 | Use of computer helps the students to understand the abstract nature of mathematics more better | 3.7 | A |
| 5 | computers serves as an instructional aid for the effective teaching and learning of mathematics | 3.6 | A |

**Discussion of Findings**

Based on the findings of the study, the researcher concluded that

i. Use of computers influences the teaching and learning of mathematics in senior secondary schools
ii. Use of computers helps to improve the study habit of the students.
iii. It enhances the students' performance in mathematics examination.
iv. Inadequate funding, inadequacy of qualified teachers, poor infrastructure, attitudes of students towards mathematics and teachers attitudes towards the introduction of mathematical games are some of the factors militating against the use of mathematical games in teaching and learning of mathematics.

**Recommendations**

Based on the findings and conclusions of the study, the researcher recommended that;

i. Government should provide the funds needed for the procurement of these mathematical games because it will help in the teaching and learning of mathematics.
ii. The government should ensure that only qualified mathematics teachers are employed that will be able to handle these mathematical games during teaching and learning process.
iii. Teachers on their own part should develop a healthy attitude towards the introduction of mathematical games in mathematics teaching and learning.

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