Investigating Mathematics Teachers' Awareness in the Use of Mathematical Softwares in Teaching Secondary School Students' in Benue State, Nigeria

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Abstract:- **This study investigated the mathematics teachers' awareness in the use of mathematical softwares in Secondary Schools in Benue State. The study adopted a survey research design and the study area was Benue State of Nigeria. A sample of 60 mathematics teachers out the entire mathematics teachers in all the government approved secondary schools in the state was used. Purposive and simple random sampling techniques were used in arriving at the number of mathematics teachers used for the study. The instrument for data collection was Mathematical Software Awareness Inventory (MSAI), it had three parts with five items each and was validated by 3 experts. A reliability coefficient of 0.81was arrived at using Cronbach Alpha formula. Descriptive statistics of Mean and Standard Deviation were used for answering the research questions. The study showed that the mathematics teachers in Benue state are not aware of the benefits of mathematical softwares and have not been using them in the teaching of mathematics. The study recommended among others the introduction of mathematical softwares as a core course for all mathematics teachers training institutes.**

Keywords: **Mathematical Softwares, Mathematics Education, Teachers Awareness**

I. BACKGROUND OF THE STUDY

Mathematics plays a key role in the development of any nation because of its merits in all facets of life. Iji, Abakpa, Agbo-Egwu and Fekumo (2018) opined that mathematics is an indispensable tool which has its contributions virtually in all spheres of life and it is known to be an essential discipline recognized globally. Aguele and Usman in Okechukwu and Oyekunle (2018) acknowledged that without mathematics there is no science, without science there is no modern technology, and without modern technology, there is no society, thus, mathematics is an indispensable subject for scientific and technological advancement of any nation. Mathematics, therefore has been found to be a fundamental field of study that deals with the teaching and learning of the methods in the science of size and numbers (Ejakpovi & Ukpebor, 2018). Furthermore, Gambari, Falode and Adegbenro (2014) stated that the application of mathematics in other disciplines, mostly in the sciences is appreciative and without it, knowledge of sciences often remains superficial.

Despite the importance of mathematics and the numerous researches done with beautiful recommendations made, there have been reports of poor performance by secondary school students in mathematics. Agwagah (2004), Ogunkunle (2007) and Chief Examiners' Report(2018) stated that mathematics education has over the years indicated low interest, negative academic performance and negative attitude of Nigerian students. Research results have given reasons for this low interest, under- performance and negative attitudes. These reasons include; poor teaching approach and lack of awareness by school mathematics teachers of recommendations from researches and professional organizations in mathematics education (Jonah-Eteli, 2007; Agwagah, 2004 and Ogunkunle, 2007). According to Strengthening of Mathematics and Science in Secondary school Education (SMASSE) In Sulungai,Toili and Amadalo (2011), the poor results have been attributed to various causes ranging from lack of learning materials and poor teaching methods to psychological factors like poor attitudes towards the subject. Jonah-Eteli (2007) and Ogunkule (2007) that the students poor results is as a result of poor teaching approach and lack of awareness by mathematics teachers of recommendations from researches and other professional bodies in mathematics education. The search for solutions to the causes of this ugly trend has become the worry of many researchers. Anyagh, Agbo-Egwu and Kalu (2017) revealed that the issue of how best to help the learners acquire knowledge, skills and values has been a problem to educationists over the years. Anyagh, Igba and Age (2018) opined that in attempting to provide answers to this problem, educational scholars put forward different strategies, practices, methods or approaches of teaching. Iji, Abakpa and Age (2018) stated that teachers of Mathematics are continually challenged to find the most effective method of teaching students. Thus, Mathematics teachers today are

finding ways to work with various forms of visual media to help gain and keep students' interest.

In 2000, the National Council of Teachers of Mathematics (NCTM) found technology to be very important in teaching and learning of Mathematics. Specifically, it states that "technology is essential in teaching and learning of Mathematics as it influences the teaching of Mathematics and enhances students' learning" (Heidi, 2004). The wide spread use of computers in our daily life include education renders preparedness in new technologies necessary (Sulungai, Toili, and Amadalo, 2011). Computer can enhance student knowledge of mathematics, focusing on what can be done above and beyond with pencil and paper alone (Pea In Kurz, 2005). Using computers as cognitive tools to assist students in learning concepts in mathematics that they could have approached without the technology should be a key goal for research and development not only learning the same mathematics better , stronger, faster but also learning fundamentally different mathematics in the process (Jonassen & Reeves,1996; Pea,1986). According to Cox et al In Sulungai, Toili and Amadalo (2011) it has increasingly become evident that the use of computer together with skillful scaffolding by the teacher enhances the learning of science, mathematics and other areas that are generally abstract or have a high cognitive demand for the students. Public perception also has it that the computer represents both an excellent curricula tool and revolutionary classroom approach that help students to realize important gains in learning and understanding of mathematical concepts (Polonoli, 2001 and Goddard, 2002).

Mathematical software is a computer program that is designed to perform mathematical processes. Its use cuts across all the aspect of mathematics and it is endowed with numerous benefits in the process of teaching mathematics to secondary school students. Vlasta (2007) opines that the appropriate use of mathematical software in mathematics teaching can greatly support the teaching and learning of mathematics. On the one hand mathematical software can be supportive for using mathematical knowledge and in learning how mathematical knowledge can be used. On the other hand mathematical software offers valuable support for the appropriate development of mathematical concepts. Josiah (2010), in education, mathematical softwares is used for the following;

- To teach students the basic skills in mathematics, provide learning math games and work assignment
- To conduct online test and quiz and is a valuable teaching tool for any teacher in his/her classroom
- It is useful for various educational applications such as standardized test preparations.
- It can create an online classroom with a virtual tutor or real life tutors who works for the online mathematics sites and host many other uses.

Taxonomy of Mathematical Softwares

A lot of researchers have tried to taxonomies mathematical softwares according to how they are use in school. Taylor (1980) described potential computer roles as tutor, tool or tutee. In this categorization, the students can be tutored by the computer, the students can use the computer as a tool or the students can tutor the computer through languages or commands. Handal and Herrington (2003) described categories of computer-based learning in mathematics, including drills, tutorials, games, simulations, hypermedia and tools (open-ended learning environments).

According to Kurz, Middleton, and Yanik (2005), there are five general categories of softwares that utilize tool-based conception of mathematics software; all of these categories can be use as part of a (more or less) complete mathematics curriculum. Each software type has the potential to support a student's effort to learn; some are more in line with the National Council of Teachers of Mathematics (NCTM) standards (2002), while others are more traditional (Kurz, Middleton and Yanik, 2005). Specifically, the categories are;

i. Review and Practice Software
ii. General Software
iii. Specific Software
iv. Environment Software
v. Communication Software

In spite of these numerous benefits of mathematical softwares, it seems that many of the mathematics teachers are unaware of this great development. In order to sustain the development of students' interest in mathematics, teachers could teach mathematics in application oriented form using teaching strategies such as mathematical softwares. The major problem is how much of the benefits and the availability of the software are the mathematics teachers aware and how much do they make of these soft ware in their mathematics class room?

Objectives of the Study

The main purpose of this study is to investigate mathematics teachers' awareness in the use of mathematical softwares in teaching secondary school students' in Benue State. Specifically the study is to determine;

(i) the extent of mathematical teachers' awareness to the benefits of mathematical softwares in teaching of secondary school mathematics.
(ii) The awareness of mathematics teachers on mathematical softwares.
(iii) The utilization of mathematical software by the teachers in mathematics class room.

Research Questions

The following research questions were asked in this study

(i) To what extent are the mathematics teachers in Benue State aware of the benefits of using mathematical softwares in teaching secondary school mathematics?
(ii) To what extent are the mathematics teachers aware of mathematical softwares?
(iii) To what extent do mathematics teachers use mathematical software in teaching mathematic in Benue State?

II. METHODOLOGY

Research Design

The study adopts a simple survey design. This is because the study wants to investigate the teachers in their natural environment.

Area of the Study

The area of the study is Benue State of Nigeria. Its geographic coordinates are longitude 7˚ 47' and 10˚ 0' East. Latitude 6˚ 25' and 8˚ 8' North; and shares boundaries with five other states. Nassarawa to the North, Taraba to the East, Cross-River to the South, Enugu to the South-west and Kogi to the West. The state also shares a common boundary with the Republic of Cameroun on the south-east. It has three educational zones namely: Benue Northwest (Zone A), Benue North east (Zone B) and Benue South (Zone C).

Population of the Study

The population of the study comprised of the entire mathematics teachers in all the 1,443(Benue State Ministry of Education, 2018) government approved secondary schools in Benue state distributed through three educational zones. It consists of 60 mathematics teachers from 15 schools selected.

Sample and Sampling Technique

The sample for this study was 60 qualified mathematics teachers drawn from the three educational zones in the state. Multi-stage sampling technique was used for the study because different sampling techniques were used at different stages of the study. The sampling techniques that were used are (a) purposive sampling technique and (b) simple random sampling technique.

Purposive sampling technique was used in selecting 15 mathematics teachers from each zone base on the following criteria (i) well equipped computer laboratory (ii) qualified mathematics teachers(i.e. teachers with bachelor degrees in mathematics education). The 15 secondary schools used were randomly selected from the 45 schools that met the above mentioned criteria.

Instrument for Data Collection

Instrument that was used for data collection was a Mathematical Software Awareness Inventory (MSAI). The inventory consisted of three parts, each part contained 5 items aimed at providing data used in answering the research questions in the study. Part I was a Likert scale of four points with 5 items , part II is also a Likert scale of four points with 5 items, part III is also a four point likert scale and it has 5 items.

Validation of Instrument

The developed instrument was validated by 3 experts, two mathematics educators and a psychometric expert in the college of Agricultural Science and Science Education. The validates examine the suitability of the content and also ascertained the face validity of the instrument. Repeated items were expunged by the experts, their corrections and recommendations led to the development of the final instrument.

Reliability of the Instrument

A trial test was carried out on 12 secondary school mathematics teachers outside the study area to determine the reliability of the instrument. The result has an Alpha coefficient of 0.81. The Crombach Coefficient alpha was used because it measures internal consistency.

Method of Data Collection

In each selected school, four mathematics teachers ,two from the senior secondary school(SSI and SSII) and two from the junior secondary school (upper Basic section) (JSSI and JSSII) were picked to respond to the questionnaire designed for the study . This takes a total of 60 (sixty) mathematics teachers who will be involved in the study. The questionnaires will be administered to the respondents and collected back after responding for analysis.

Method of Data Analysis

Data collated was analyzed using descriptive statistics of mean and standard deviation to answer the research questions. An overall mean of 2.5 and above was considered to have had awareness of the benefits of mathematical softwares, awareness of mathematical softwares as well as used mathematical softwares in their classes, while below 2.5 is considered to have had no awareness of the benefits of mathematical softwares, awareness of mathematical softwares and have not used mathematical softwares in teaching mathematics.

III. RESULT

Research Question 1

To what extent are the mathematics teachers in Benue State aware of the benefits of using mathematical softwares in teaching mathematics?

Table1: Means and Standard Deviation of the extent Mathematics teachers are aware of the benefits of using mathematical softwares in teaching mathematics

S/NO.	Item	Means	Standard Deviations	Remark
1	Mathematical softwares enhances students interest	1.72	0.69	Disagree
2	Mathematical softwares improves students achievement	1.58	0.89	Disagree
3	Mathematical softwares enhances retention among students	1.50	0.85	Disagree
4	Mathematical softwares provide for gender difference	2.28	0.99	Disagree
5	Mathematical softwares reduces maths phobia	2.05	0.75	Disagree

Table shows that all the items have means ranging from 1.50 to 2.28 with corresponding standard deviations of 0.69 to 0.99. The analysis reveals that mathematics teachers are not aware of the benefits of mathematical softwares in teaching mathematics.

Research Question 2

To what extent are the mathematics teachers aware of mathematical softwares?

Table 2: Means and Standard Deviation of the Extent Mathematical Teachers are Aware of Mathematical Softwares

S/NO.	Item	Means	Standard Deviations	Remark
1	Review and practice softwares	1.23	0.59	Disagree
2	General softwares	1.32	0.70	Disagree
3	Specific softwares	1.75	0.75	Disagree
4	Environment softwares	1.32	0.68	Disagree
5	Communication softwares	1.40	0.74	Disagree

Table 2 shows that all the items have means below the benchmark of 2.5 with corresponding standard deviations ranging from 0.59 to 0.75. the analysis shows that mathematics teachers are not aware of mathematical softwares in mathematics education.

Research Question 3

To what extent do mathematics teachers use mathematical software?

Table 3: Means and Standard Deviations of the Extent Mathematics Teachers Use Mathematical Softwares in Teaching Mathematics

S/NO.	Item	Means	Standard Deviations	Remark
1	Use Mathematical Softwares to make students learn mathematics	1.20	0.58	Disagree
2	Use Mathematical Softwares in class as a teaching strategy	1.18	0.60	Disagree
3	Use Mathematical Softwares in class as a teaching material	1.02	0.13	Disagree
4	Use Mathematical Softwares to motivate students	1.07	0.31	Disagree
5	Use Mathematical Softwares to improve students' achievement in mathematics	1.10	0.40	Disagree

Table 3 shows that all the items have means ranging from 1.02 to 1.20 with corresponding standard deviation of 0.13 to 0.6. The table reveals that mathematics teachers in Benue state have not use mathematical softwares in their classes.

IV. SUMMARY OF FINDINGS

The following findings were made based on the analyses of data from the study:

1. Majority of the mathematics teachers in Benue state are not aware of the benefits of using mathematical softwares in mathematics education.
2. Most of the mathematics teachers in Benue state are not aware mathematical software.
3. Almost all the mathematics teachers in Benue state have not use mathematical software in the teaching of mathematics

V. RECOMMENDATIONS

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

1. Seminars/ workshops should be regularly organized for the mathematics teachers on the numerous benefits of mathematical softwares.
2. Institutions that train mathematics teachers should introduce mathematical softwares as a core course for all the students.
3. School proprietors and administrators should equipt their mathematical laboratories with different categories of mathematical softwares.

VI. CONCLUSION

Due to the fact that mathematical softwares are very vital and an effective strategy for the teaching and learning of mathematics, mathematics teachers needs to be encouraged to use mathematical softwares in the teaching of mathematics. In

the study teachers are not aware of the benefits of mathematical softwares, not aware of mathematical softwares and do not use it in the teaching of mathematics, hence the need of making the learning of mathematics more meaningful through mathematical softwares stressed.

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