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The Degree of Using Instructional Technology in Teaching and Learning Mathematics in Delta State, Nigeria

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ABSTRACT*: This work aimed to study the accessibility and use of educational technology for teaching mathematics in senior secondary schools in Delta State. Descriptive survey design was used in the work. 60 mathematics teachers in 30 secondary schools were the sample of the work; simple random technique was used to select them from the overall population of 75 secondary schools in Delta State. Two teachers' questionnaire titled use and preventing factors mathematics questionnaire (r =0.77) were utilized to collect data. Simple percentage, mean and standard deviation were used to analyze the data. The findings showed that there were laboratory equipment and audio educational technology but were not fully used; there were no audio visual technologies and were not used to teach mathematics. Also, lack of money, poor application law, demotivation etc prevented the delivery and use of educational materials for mathematics teaching. The study gave the recommendation that Mathematics teachers should use the educational technology that is available and government should provide enough money to procure educational technology.*

KEY WORDS: Achievement, teaching, technology, learning, utilization

INTRODUCTION

Mathematics literally can be defined as the science of numbers and figures. Mathematics Education is the art of teaching and learning of the mathematics principles and discipline. The importance of mathematics to the nation and growth of education cannot be over emphasized based on its usefulness to the changing world. There is no disparity on the relevance of mathematics to both the scientist and technologist and even to everyday life. Mathematics is a subject that consists of numbers, facts, concepts, skills and generalization which every person whether layman or scientist should know. For instance, the concept of a number is so fundamental in one's daily lives that no normal human being can function without it. Agina, (2005) defined teaching materials as tangible or physical items which make available sound, visual or both to the sense organs during teaching. Afforma, (2004) defined instructional materials as materials that facilitate teaching and learning activities and consequently the attainment of the lesson objectives. It was grouped into three main types: Visual aids which appeal to the sense of seeing (examples are: charts, maps,

objects, pictures, Audio aids which appeal to the sense of hearing (examples are; radios, radio cassette, record player, gramophone, etc); and audio-visual aids which appeal to the sense of sight and hearing altogether (examples are; television, computers, projectors, video films). Ukoha (1996) defined instructional material as educational media that helps learners to understand concrete concepts, principles and ideas during teaching and learning process. He grouped them into two broad categories: Printed Media (examples are textbooks, photographs, pictures, pamphlets, journals etc); non-printed media made of low cost media (examples are posters, models, wall charts, diagrams, etc) and electronic media (examples are audio cassettes, video films, computers, film projectors, television sets, radio recorders, etc).

Gagne (2013) said teaching technology include practical techniques of delivering teaching for effective learning, with or without the use of media. The field of teaching technology promotes and aids the use of these known and authenticated methods in designing and delivering teaching.

According to Megbo and Saka (2015), there will be no effective teaching if teaching materials are not used because they promote closer and effective communication between the teacher and learners. For instance, the study conducted by Ifeakor, (2006) found out that some material resources are available and adequate but are partly used in teaching and learning mathematics, while Nnorom, (2012) and Achimugu, (2016) said that there are science teaching materials for teaching-learning process. There is need for more research in this area due to these conflicting reports.

In this context, the aim of the researcher is to examine the degree of using visual technology for effective teaching and learning of mathematics education in secondary school in Delta State. Usage of Audio-Visual Aids/Instructional Materials and Academic Achievement in School Subjects Obanya, (2004) informed that Owolabi, (2004) reported that Nigerian students‟ performance in ordinary Level physics was generally poor due to the teaching strategy. He emphasized that only around 10% of the students „meaningfully‟ did well. Students do not succeed in examinations due to poor teaching methods and lack of important teaching aids to deliver instruction (Afolabi, 2009). Using teaching aids/technologies in the classroom can enable teachers to teach novel ideas plainly, which helps the students to understand what is being taught in the school environment. Earlier on, in a survey on the factors facilitating teacher's skills, morale, and observed students learning in technology using classrooms, Baylor and Ritchie, (2002) revealed that teachers valued using technologies in class and it impacted student's content acquisitions.

Isola (2010) studied the impacts of teaching materials on the performance of students in WASCE in Kwara State. The author connected teaching materials with educational outcomes of students in ten subjects. Davis (2008) studied the utilization of teaching technology and its impacts on students‟ performance for fifth grade science and mathematics instruction. The data collected was subjected to an independent sample t-test to calculate the mean variation between the experimental and control groups. It was revealed that using technology in instruction did not increase students‟ performance. Contrarily, Okoboli in Isola (2010) studied the use of instructional materials on gender difference in academic performance of primary school pupils in English language and mathematics. The researcher noted that there was a significant difference in academic performance among the male and female students in the two subjects, supporting the use of teaching materials.

In the same vein, a study by Onasanya and Omosewo (2011) examined the impact of utilizing standard teaching resources and improvised teaching materials on secondary school students‟ performance in physics in Ilorin, Nigeria. A study by Mbah (2013) investigated the utilization of teaching materials and academic performance of students in Integrated Science in unity schools in Jalingo, Taraba State. The population consisted of 249 students in the junior section of Federal Science and Technical College, Jalingo. The researcher used experimental design of the pre-test and posttest sessions. The post –tests mean scores were compared using a Z-test statistical analysis and the results showed a statistically significant difference in the mean scores, as the experimental group were observed to have achieved better academically as juxtaposed with the control group.

Osuala, (2010) investigated on the benefits of instructional materials on students learning ability. The result shows that instructional materials help to develop students‟ motivation and interest and help teachers to know the subject. Similarly, a study by Awolaju (2016), investigated the use of teaching materials as it connects with Senior Secondary School students‟ academic performance in Osun State. Students taught with teaching materials did better than those taught without teaching resources.

Teaching Technology

Teaching technology is a particular technology field that creates materials for learning. Ritchie (1994) defined it as "the theory and practice of design, development, use, management and assessment of processes and materials for learning (Figure 1)."

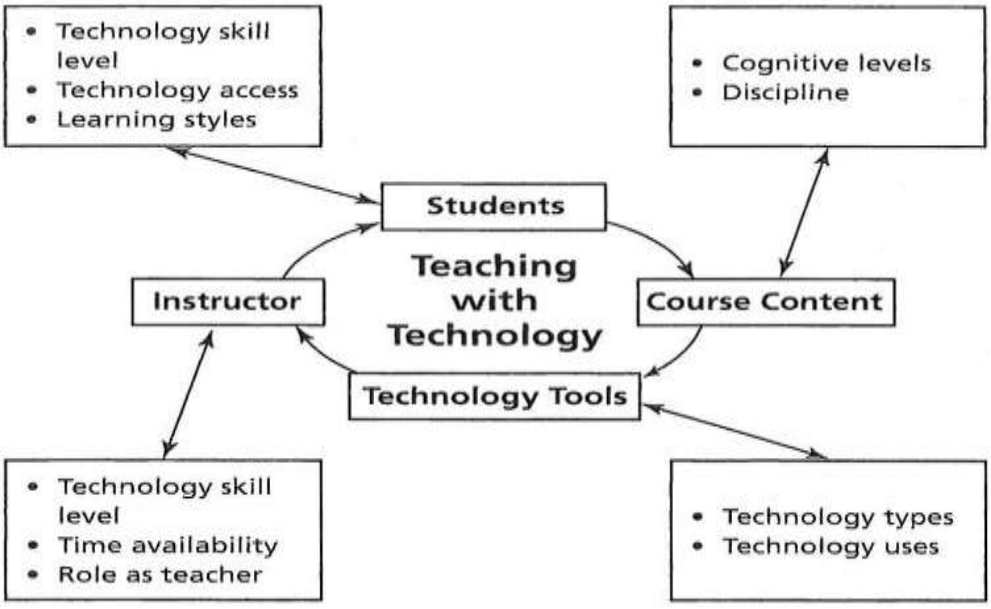

FIGURE 17.1 Teaching with Technology

Spears (2012) in Donovan et al. (2007) described the first 1:1 technology program utilized in a school environment. Spears (2012) states, the first provider of 1:1 computer access for teachers and students was Apple Classrooms of Tomorrow (ACOT). Johnson (2003) said if computer and technology is used well they can “invoke dream in the minds of visionary teachers who saw endless potential for changing traditional

notions of teaching and learning". The model shows that teaching and can be effective between teachers and students using technological instruction which enables immediate feedback. These interactions will enhance better achievement in the learning of Mathematics.

Statement of Problem

Despite all the efforts made to ensure effective teaching and learning of mathematics at the secondary school level in Nigeria, the problem of students‟ poor achievement in mathematics in internal and external examination have remained unsolved (Olorundare, 2014). Thus, the researcher is poised to investigate the extent of availability and utilization of instructional materials for teaching mathematics in selected senior secondary schools in Delta state.

Purpose of the Study

The main purpose of the study is to ascertain the availability and utilization of instructional materials in teaching mathematics in senior secondary schools. Specifically, the study sought to find out:

(1) The extent to which instructional technology are available for teaching mathematics in the senior secondary schools.

(2) The extent to which teachers utilize the available instructional technology in teaching mathematics in senior secondary schools.

(3) The factors that inhibit effective provision of instructional technology for teaching mathematics in senior secondary schools.

(4) The factors that inhibit effective utilization of instructional technology for teaching mathematics in senior secondary schools.

Research Questions

The following research questions guided the study:

1. What are the instructional technologies available for teaching mathematics in the senior secondary schools?
2. To what extent do teachers utilize the available instructional technology for teaching mathematics in the senior secondary schools?
3. What are the factors inhibiting effective provision of instructional technology for teaching mathematics in the senior secondary schools?
4. What are the factors inhibiting effective utilization of instructional technology for teaching mathematics in the senior secondary schools?

Significance of the Study

It is believed that at the completion of the study, the findings will be of benefit to the federal ministry of education as the study will help the ministry to provide adequate instructional technology to secondary schools in Nigeria. It will enlighten them on the extent of use of visual technology in the teaching and learning of mathematics and even bring into awareness how important it is to both the teachers‟ teaching effectiveness and students‟ academic performance. The study will also be of great benefit to the researchers who intends to embark on research on similar topics as it will serve as a guide. Finally, the study will be of great importance to academia's, lecturers, teachers, students and the general public.

METHODS

The researcher adopted descriptive research of the survey type. The target population was all the mathematics teachers in both the public and private senior secondary schools in Delta State. A simple random sampling technique by balloting was used to select 30 schools from the total population of the 75 senior secondary schools in the state. All the 60 mathematics teachers in the sampled schools were used for the study. Two instruments were used for data collection: checklist of Availability of Instructional Teaching Mathematics (CAIMTM); and a questionnaire titled Utilization and Inhibiting Factors Mathematics Questionnaire (UIFMQ). The reliability of the instruments was determined through pilot study. This was done by administering the two instruments to mathematics teachers in ten senior secondary schools that were not part of the sample. Thereafter, the reliability coefficients of CAIMTM and UIFMQ were calculated using Cronbach Alpha procedure and the values were 0.71 and 0.76 respectively. The reliability coefficient determined for the two instruments respectively were considered good enough to be used for this study. The researcher personally administered the checklist and questionnaire with the assistance of two research assistants. And there were 100% return of the instrument. The data collected were analyzed using simple percentage to answer research question 1 and mean and standard deviation to answer research questions: 2, 3 and 4.

RESULTS

Research Question 1

What are the instructional technologies available for teaching mathematics in the senior secondary schools? Data in Table 1 shows that all the visual instructional technology is not available except for items 1 and 10 which are available.

Research Question 2

To what extent do teachers utilize the available instructional technology for teaching mathematics in the senior secondary schools? Table 2 result shows that only 2 items are utilized out of 10 items that is, (2, 3, 4, 5, 6, 7, 8 and 9) are not utilized while the item 1 and 10 are utilized for mathematics instruction.

Research Question 3

What are the factors inhibiting the effective provision of instructional materials for teaching mathematics in senior secondary schools? The result in Table 3 shows that the five factors (1 – 5) scored above the criterion mean of 2.50. This implies that the five factors inhibit the effective provision of instructional technology for chemistry instruction.

Research Question 4

What are the factors inhibiting the effective utilization of instructional technology for teaching mathematics in the senior secondary schools? From Table 4, items 6 to 13 had the mean scores above the acceptable cut-off point of 2.50 and above. This implies that mathematics teachers agreed that all the above seven items inhibit effective utilization of instructional technology in teaching mathematics in senior secondary schools.

Table 1: Frequency and Percentage Availability of Instructional technologies in the Sampled Senior Secondary Schools

S/n	Instructional Technologies	Available		Not Available		
		Frequency	%	Frequency	%	Decision
(I)	A.					
1	Desktop Computers	12	40	18	60	Available
2	Electric White Board	10	33	20	67	Not Available
3	Education Software	8	27	22	73	Not Available
4	Film projector/film strip	6	20	24	80	Not Available
5	Laptop computers	10	33	20	67	Not Available
6	Overhead projector	8	27	22	73	Not Available
7	Television sets	12	40	18	60	Not Available
8	Satellite Dishes/Internet	4	13	26	87	Not Available
9	Power point presentation	8	27	22	73	Not Available
10	Cell phones (Techno Ipad)	18	60	12	40	Available

Table 2: Mean Ratings and Standard Deviation of Responses on the Extent to Which Teachers Utilize the Available Instructional Technologies for Effective Teaching of Mathematics in Senior Secondary Schools.

S/N	*Instructional Technologies*	*Mean*	*Standard Deviation*	*Decision*
1.	Desktop Computers	3.36	1.08	Utilized
2.	Electric White Board	2.42	1.20	Not utilized
3.	Education Software	0.95	1.34	Not Utilized
4.	Film projector/film strip	2.05	1.11	Not utilized
5.	Laptop computers	3.01	1.12	Not Utilized
6.	Overhead projectors	0.94	1.31	Not Utilized
7.	Television sets	2.36	1.22	Not utilized
8.	Satellite Dishes/Internet	2.04	1.10	Not utilized
9.	Power point presentation	2.09	1.21	Not Utilized
10.	Cell phones (Techno Ipad)	3.22	1.06	Utilized

Table 3: Mean Rating and Standard Deviation of Teachers' Responses on the Factors that Inhibit Effective Provision of Instructional Technology for Teaching Mathematics in Senior Secondary Schools.

S/N	*Factors*	*Mean*	*SD*	*Decision*
1	Lack of fund to procure instructional technology.	***3.56***	***0.84***	***Agreed***
2	High cost of instructional technology.	***3.48***	***0.96***	***Agreed***
3	Lack of political will of government in power.	***3.18***	***0.92***	***Agreed***
4	Mismanagement of fund meant to purchase instructional technology.	***2.98***	***1.12***	***Agreed***
5	Poor implementation of educational policies.	***3.06***	***1.01***	***Agreed***

Table 4: Mean Rating and Standard Deviation on Teachers' Responses on Factors Affecting the Effective Utilization of Instructional Technologies for Teaching of mathematics in Senior Secondary Schools (SSS).

S/N	*Factors*	*Mean*	*SD*	*Decision*
6.	Lack of technical skills on part of mathematics teachers.	2.65	1.22	Agreed
7.	Lack of supervision of teachers by the school authority.	2.84	1.16	Agreed
8.	Lack of in-service training for serving mathematics teachers.	2.96	1.18	Agreed
9.	Lack of chemistry laboratory technicians.	3.02	1.02	Agreed
10.	Lack of motivation of mathematics teachers.	3.32	0.88	Agreed
11.	Short periods allocated to mathematics classes on the school time-table.	3.16	0.96	Agreed
12.	Embezzlement of funds Meant for instructional technology by the school principals.	2.88	1.12	Agreed
13.	Large class size.	2.91	1.08	Agreed

From table 4 above, items 6 to 13 had the mean scores above the acceptable the cut-off point of 2.50 and above. This indicates that mathematics teachers agreed that all the above seven items affects the effective utilization of instructional technologies in teaching of mathematics in senior secondary schools.

DISCUSSION

The findings of this study revealed that most visual instructional technology for teaching mathematics in senior secondary schools were available in the schools. The finding of this study collaborates with the findings of Eze and Nwafor (2012) and Ahmed et al. (2012) who revealed that only 2 – dimensional instructional materials such as consumables (chemicals) and non-consumables (equipment) are available in the sampled school and that audio-visual instructional technology were lacking.

Also the finding of this work is in conformity with that of Achimugu (2016) who asserted that most schools do not have audio-visual instructional technology. This implies that mathematics teachers in Delta State, Nigeria are yet to join the rest of the world in the use of ICT in teaching and learning mathematics. A careful observation indicates that most of the available equipment and chemicals are the ones required by WAEC and NECO for their practical examinations. In other words, equipment and chemicals that deal with concepts that WAEC and NECO do not set practical questions are not available in the sampled schools. The educational implication of this is that WAEC and NECO should spread their practical examination questions to cover all the concepts in the senior secondary education curriculum. In this way, many senior secondary schools would be encouraged to purchase the required equipment and chemicals for mathematics education in their schools.

From Table 2, the finding of the study revealed that some of the equipment was not utilized for mathematics instruction. Equally, some visual instructional technologies were utilized in the sampled

schools. This finding is in line with the finding of Eya and Elechi (2011) and Onwuaicho (2011) who found that most senior secondary science teachers do not utilize the few available technology such as consumables and audio-visual instructional technology in teaching science subjects. The finding is also corroborates with the works of Ezeoba (2007), Fakeye (2010) and Achimugu (2016) who asserted that ICT resources are not available in most secondary schools and that the few ones available are not properly utilized by the teachers.

From Table 3, the finding revealed that, mathematics teachers sampled for this study agreed that the factors inhibiting effective provision of instructional technology for teaching mathematics include: lack of fund; high cost of instructional technology, lack of political will of government in power, mismanagement of educational funds and poor implementation of educational policies. These problems need to be tackled to ensure smooth provision of instructional technology for teaching and learning mathematics.

Finally, Table 4 revealed that factors inhibiting the effective utilization of instructional technology for mathematics instruction include: lack of technical skills, lack of supervision of teachers, lack of in-service training programmes, lack of laboratory technicians, lack of motivation of teachers, short periods allocated to mathematics lessons in the school timetable and embezzlement of school fund by the school principals. This finding is in line with the finding of Aburine (2005) who equally identified the above named factors as serious factors militating against effective utilization of instructional technology for teaching and learning process.

CONCLUSION

The finding of the study has provided the basis for the researcher to conclude that most of the laboratory equipment and visual instructional technology were available but a good number of them were not utilized for mathematics instruction.

Furthermore, most of the visual instructional technology was neither available nor utilized for mathematics instruction. The finding also revealed that some factors such as: lack of funds, lack of political will of government in power, mismanagement of education funds, lack of in-service training, lack of motivation of teachers among others inhibit effective provision and utilization instructional technology for teaching mathematics. Therefore, to achieve the goals of mathematics education, all stakeholders (Government, Principals, teachers and students) should device very good strategies to ensure adequate provision and utilization of instructional technology for mathematics instruction in our schools.

Recommendations

1) Mathematics teachers should endeavor to utilize audio and audio-visual instructional technology during mathematics instruction.
2) Training of mathematics teachers should be reviewed to include emphasis on knowledge and skills related to emerging technologies such as the use of visual and audio-visual instructional materials in teaching mathematics.

3) Government should ensure adequate provision of fund for the procurement of audio-visual instructional technology as well as other essential laboratory equipment that are not available in our senior secondary schools.

4) Examining bodies such as WAEC and NECO should set practical examination questions in such a way to cover all the concepts that required the use of instructional technology in the senior secondary mathematics education curriculum.

5) Government at various levels and principals of senior secondary schools should ensure strict supervision of the mathematics teachers use of instructional technology in order to make them live up to their instructional responsibilities.

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