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TEACHERS' ATTITUDE TOWARDS THE USE OF COMPUTER SOFTWARE PACKAGEIN TEACHING CHEMICAL BONDING

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ABSTRACT: *Pedagogy in the 21st century relies on the use of ICT in achieving objectives of 21st century learning. However, experiential evidence shows that teachers do not use computers in teaching chemistry concepts, even as specifically recommended by the curriculum. Reasons for this are often attributed to absence of computers and ICT facilities in schools, teachers' lack of necessary skills and poor knowledge of how to use the computer and software packages. There are cases however, where the facilities are available in schools and teachers have basic knowledge and skills needed to use the computer to facilitate the teaching-learning process. Expectation has been that the situation in such schools would be different from the rest of the schools, where the facilities are lacking and teachers do not have the necessary skills. This study set out to investigate the attitude of Nigerian secondary school chemistry teachers towards the use of computer instructional software package in teaching chemistry concepts.*

KEYWORDS: Teachers' Attitude, Computer, Software Package, Teaching and Chemical Bonding

INTRODUCTION

The use of computer in education started sometime in the mid-1960s. During this period, educators showed interest in the use of computers for classroom teaching, but had their misgivings about this new technology (Glennan and Melmad ,1996). For instance, there was this fear that the computer will impose a rigid and impersonal regime on the classroom and even replace teachers (Suppes, 1967). Because of this fear, Barrett (1968) noted that it would take a long process of education and motivation to make the teachers realise and accept the contributions that computers could make to education. Barrett (1968) advised that teachers must learn to turn over much of their rights, duties, and responsibilities to the computer over which they have little control and towards which some of them were hostile. With the advent of microcomputer in the 21st century, the use of computer in institutions of learning has become widespread from pre-primary education through the university level. Computer-aided instruction or e-learning has come to stay.

LITERATURE

The emergence of basic technology infrastructure and tools for learning in the 21st century resulted in new learning processes and augmented capabilities that learners have using such tools

(Voogt et al, 2011). This forms the basis of e-learning and explains its primary role in 21st century learning, especially towards acquiring 21st century skills. It is interesting to observe that the initial resistance or hostility to computer-assisted instruction or e-learning shown by some teachers appears to be outdated, at least in those nations where computer has been in use in the school system for many years now. This may not be the case with teachers in developing nations where e-learning is new. E-learning is made possible and meaningful because of availability of educational software. Educational software is software that facilitates teaching, using the computer to aid the instructional process. Educational software packages come in increasing variety of form. Houghton (2008) point to increasing use and power of computer technology in schools, and advised that educators must know the capabilities of educational software. This is important because when the teacher is able to understand the role of software in the classroom and has positive attitude towards its usage, teaching-learning process is facilitated and learning on the part of the student becomes interesting and meaningful. As Baker (2011) noted, educational software can be a powerful tool when used by teachers who understand that technology is the vehicle and not the message.

Literature is replete with views of pioneer researchers in e-learning as regards the advantages of use of computer in education. For instance, Suppes (1967) projected among others, that the computer would relieve teachers of some of the burden of preparing and correcting large numbers of individualised drill-and-practice exercises in basic concepts and skills; and of recording grades. Researchers that are more recent have confirmed this and other advantages. For example, Houghton (2008) mentioned many other advantages of the use of computers in learning including its power to evaluate in less interruptive way and record frequent data on students' progress. Clemens (1996) asserted that the technology enhances thinking skills and strategies, has a long-term impact and prepares students to perform in various functions when they return to real world and apart from technology.

In spite of the obvious benefits and advantages of using the computer and software packages in aiding both the teachers and learners in the teaching-learning process, evidence abound to show that most chemistry teachers do not use computers in teaching chemistry concepts, even those specifically recommended by the curriculum (see for instance NERDC , 1998). Reasons for teachers' failure to use computers have always been attributed to absence of computers and ICT facilities in schools, teachers' lack of necessary skills and poor knowledge of how to use the computer and software packages.

There are cases however, where the facilities are available in schools and teachers have basic knowledge and skills needed to use the computer to facilitate the teaching-learning process. The expectation has been that the situation in such schools would be different from the rest of the schools where the facilities are lacking and teachers do not have the necessary skills. This expectation appears to have become a mirage, despite the fact that some states government like Bayelsa and Enugu States in Nigeria had consistently trained their teachers in computer and ICT knowledge/skills acquisition and usage from 2009 – 2012. Experiential evidence shows that

teacher's attitude to the use of computers to facilitate the teaching-learning process appears to be very low. Attitude is defined as 'a mental and neural state of readiness, organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related' (Allport, 1935). It is inclinations and feelings, prejudices or bias, preconceived notions, ideas, fears and convictions about any specific situation or topic (Gankon, 1998). Simply put, attitude is mind set or mental state of readiness acquired and developed through experience that influences individual's response to a given situation or object.

Popoola (2002) observed that fear and negative attitude retard progress in implementing ICT policies. Could this be an explanation why teacher are not implementing secondary school chemistry curriculum recommendation regarding the use of ICT in delivering certain chemical concepts? Ugwu (2011) attributed negative attitude of individuals to fear and anxiety over job insecurity and displacement, which erroneously they associate with use of ICT. Olubiyo and Sheji (2011) described such individuals as 'illiterate in terms of ICT', and observed that the individuals are afraid of moving close to computers with the conviction that they are incapable of operating it. Olubiyo and Sheji (2011) noted that the implication of such attitude is that even if ICT facilities are available, such facilities will not be exploited as those who should use them do not appreciate the need for such facilities. This is a major problem.

There is therefore the need to ascertain the actual attitude of chemistry teachers towards the use of computer and instructional software packages in the teaching of chemical concepts. This is necessary because implementation of secondary school chemistry curriculum recommendation regarding the use of ICT in delivering certain chemical concepts depends on teachers' attitude to use of ICT, especially the computer in the teaching-learning process. Moreover, classroom teachers wield enormous power and their activities and attitude have great influence on the students' behaviour. This is particularly true in primary and secondary schools where the pupils look up to their teachers as role models. Teachers' role, as Somekh (2008) asserted, is part of a socio-cultural environment, which encourages or inhibits the use of ICT. This assertion points to the need for teachers to have the right kind of attitude towards the use of ICT to aid the teaching-learning process. What then is the direction of response of chemistry teachers on an attitude scale for use of software package in teaching chemical bonding? To what extent are the responses dependent on teacher location as a variable?

Problem

The problem of this study put in form of a question is: What is the attitude of Nigerian secondary school chemistry teachers towards the use of computer instructional software package in teaching chemical bonding?

Purpose

The purpose of this study is to investigate the attitude of Nigerian secondary school chemistry teachers towards the use of computer instructional software package in teaching chemistry concepts. Specifically, the purpose is to:

1. ascertain the attitude of Nigerian secondary school chemistry teachers towards the use of computer instructional software package in teaching chemical bonding;
2. determine the mean attitude scores of urban and rural teachers before and after exposure to computer instructional software package for teaching chemical bonding.

Research question

The following questions guided the study:

1. What are the mean attitude scores of teachers before and after exposure to the use of computer instructional software package in teaching chemical bonding?
2. What are the mean attitude scores of urban and rural teachers before and after exposure to the use of computer instructional software package in teaching chemical bonding?

Hypotheses:

On the basis of the above specific purposes, the following two hypotheses stated in the null form were formulated:

HO_1:There will be no significant difference in the mean attitude score of teachers on chemical bonding instructional software teachers' attitude scale (CBISTAS) before and after exposure to the use of computer instructional software package in teaching chemical bonding.

HO_2:There will be no significant difference in the mean attitude score of urban and rural teachers on CBISTAS before and after exposure to the use of computer instructional package in teaching chemical bonding.

METHOD

The design of the study is informal experimental design, precisely, before-and-after without control design. Kothari (2004) explains that in before-and-after without control design, 'a single test group or area is selected and the dependent variable is measured before the introduction of the treatment'. The effect of the treatment on the dependent variable is measured at the end of treatment, and would be equal to the difference in level of the phenomenon before and after the treatment. In other words, 'the effect of the treatment would be equal to the level of the phenomenon after the treatment minus the level of phenomenon before the treatment' The design is represented as follows:

Test area: Level of phenomenon before the treatment (LX) → Treatment → Level of phenomenon after the treatment(LY)

Effect of Treatment (ET) = (LY) – (LX)

Area of Study

The study was carried out in Nsukka Education zone of Enugu state, Nigeria. Nsukka Education zone consists of three local government areas, namely Igbo-Etiti, Nsukka and Uzo-Uwani. The zone has 58 secondary schools controlled by the same education authority – the State Post-primary Schools Management Board. The schools are distributed as follows: Igbo-Etiti: 16; Nsukka: 30; and Uzo-Uwani: 12. All the schools, except one, offer chemistry at the senior school certificate level. Therefore, only 57 of the 58 secondary schools were available for this study. The sample consisted of 7 teachers drawn from 6 senior secondary schools in the zone. 3 of the schools are urban-located schools while the remaining 3 schools are rural-located. Purposive sampling technique was used for selection of the schools, based on the following criteria: availability of ICT facilities such as computer and overhead projectors; ability of teachers to perform basic operations using the afore mentioned ICT facilities and the location of the schools. The choice of the concept, chemical bonding for this study was because the concept is fundamental to the study of chemistry; and research report has it that teachers find it difficult to teach the concept to their students, because of the abstract nature of chemical bonding. Chemical bonding is an abstract chemical concept because both the atoms, which combine to form bonds, the bonds themselves, and the process of bonds formation are not concrete objects that are visible but a phenomenon that can only be conceptualised. Teachers using the traditional lecture method, find it difficult to communicate the concept of chemical bonding to the students. The trend in the 21st century learning is the use of computer and software packages to facilitate the teaching-learning process.

Instrument

An instrument, the Chemical Bonding Instructional Software Teachers' Attitude Scale (CBISTAS) designed by the researcher was used for this study. It consists of 23 items (statements) about the use of software in teaching chemical bonding - reduction of teacher's authority over students; preference for pedagogic approach, as aid to achieving instructional objectives, denial or reduction of interaction time with students, satisfaction and dislike.

Teachers were required to indicate their degree of agreement or disagreement with the statements about the use of software by a tick (√) in the appropriate column. 13 of the 23 statements were positively cued while 10 were negatively cued. The instrument is a 4-point likert-scale with the following options: Strongly Agree (SA) (4); Agree (A) (3); Disagree (D) (2); Strogly Disagee (SA) (1). For positively cued items, the responses were assigned values ranging from 4 to 1. For negatively cued items, the values were reversed. A score of 2.5 or above is accepted, and taken that a respondent agreed with the opinion and therefore had a positive attitude towards the given item; scores below 2.5 indicate disagreement with the item of the instrument and so not positive attitude towards this specific attitude criterion tested. A minimum score of 57.5 (62.9%) of maximum score of 92 (100%) is the benchmark for a respondent to be considered to possess a positive attitude towards the use of software package in teaching chemical bonding. The instrument was validated, and has a reliability value of 0. 87 calculated, using the Cronbach's Alpha reliability method.

Experimental procedure

Before treatment commenced, the researchers administered CBISTAS to the teachers of the selected schools, as pre-test and recorded their scores. The researchers trained the chemistry teachers for one week on how to use chemical bonding instructional software package (CBISP) for teaching . Thereafter, each of the teachers received a copy of the CBISP for teaching students in their various schools. The teachers used the software to teach atomic bonding to their students for 5 weeks in accordance with their schools' peculiar timetable. At the end of the experiment, the researchers administered CBISTAS again to the teachers, as post-test and recorded their scores.

DATA ANALYSIS

Data collected is presented, using descriptive statistics while the hypotheses were tested using t-test statistic at 0.05 level of significance.

RESULT

The result is presented according to the research questions.

Question 1: What are the mean attitude scores of teachers before and after exposure to the use of Computer instructional software package in teaching chemical bonding?

Table 1. Teachers' pre-test scores and post – test scores on CBISTAS

Teacher (TR) No	Pre-Test Score(LX)	Post-Test Score(LY)	Effect of Treatment (ET) (ET) = (LY) – (LX)
TR.1	47	84	+37
TR.2	40	81	+41
TR.3	44	65	+21
TR.4	42	69	+27
TR.5	40	83	+43
TR.6	43	66	+23
TR.7	39	65	+26
Mean	**42.14**	**73.29**	

Table 1 shows that before treatment, Teachers 1, 2, 3, 4, 5, 6 and 7 scored 47, 40, 44, 42, 40, 43 and 37 respectively, giving a mean attitude score of 42.14. This indicates that all the teachers scored below the benchmark of 57.5 (62.5%) accepted for positive attitude. It could therefore, be inferred from the data that before treatment, all the chemistry teachers had negative attitude to the use of software package in teaching chemical bonding. Table 1 shows also that Teachers 1, 2, 3, 4, 5, 6 and 7 had attitude score change of +37, +41, +21, +27, +43, +23 and +26 respectively, having scored 84, 81, 65, 69, 83, 66 and 65 respectively after exposure to treatment. It appears that the teachers possessed better and positive attitude towards the use of CBISP in teaching

chemical bonding than before they were exposed to the treatment. Table 1 shows also that the mean attitude score of chemistry teachers before exposure to CBISP was 42.14 and after exposure, it was 73.29. The higher mean attitude score obtained after exposure to CBISP is indicative that CBISP appears to enhance chemistry teachers' attitude to the use of computer instructional software package in teaching chemical bonding.

In order to ascertain whether the observed difference between the mean attitude scores before and after treatment is real or attributed to error variance, this result was subjected to inferential testing as shown below.

HO_1:There will be no significant difference in the mean attitude score of teachers before and after exposure to the use of computer instructional software package in teaching chemical bonding.
Table 2 show that a t-value of 9.17 with associated probability value of 0.00 was obtained. Since this associated probability of 0.00 was less than 0.05 set by the researchers for decision rule, the null hypothesis was rejected. Therefore, there was a significant difference in the mean attitude scores of teachers before and after exposure CBISP.

Table 2: Paired sample t-test of mean attitude score of teachers before and after exposure to CBISP.

Variable	N	$\bar{X}$	SD	Df	t	Sig
After expt.	7	75.29	8.92	6	9.17	0.00
Before expt.		42.14	2.79			

* $\alpha = 0.05$

Question 2: What are the mean attitude scores of urban and rural teachers before and after exposure to the use of computer instructional software package in teaching chemical bonding?

Table 3: Paired sample t-test of the mean attitude score of urban and rural teacher before and after exposure to CBISP.

	Variable	N	$\bar{X}$	SD	Df	t	Sig
Before	Urban	4	41.50	1.91	5	-0.67	0.53
	Rural	3	43.00	4.00			
After	Urban	4	74.56	8.85	5	0.39	0.72
	Rural	3	71.67	10.69			

* $\alpha = 0.05$

Table 3 shows that the mean attitude score of urban teachers before exposure to CBISP was 41.50 whereas that of their rural counterparts was 43.00. Table 3 also shows that the mean attitude score of urban teachers after exposure to CBISP was 74.56 while that of the rural

teachers was 71.67. A careful look on Table 3 indicates that, before exposure to CBISP, Rural teachers had mean attitude score slightly higher than that of their urban counterparts. However, after exposure to CBISP, Urban teacher had mean attitude score higher than that of their rural counterparts.

In order to ascertain whether the observed difference between the mean attitude scores of urban and rural teachers before and after exposure to the use of computer instructional package in teaching chemical bonding is real or attributed to error variance, this result was subjected to inferential testing as shown below.

HO_2: There will be no significant difference in the mean attitude score of urban and rural teachers before and after exposure to the use of computer instructional package in teaching chemical bonding.

The result in Table 3 shows that t-value of -0.67 with associated probability of 0.53 was obtained for mean difference between urban and rural teachers before exposure to CBISP. The negative sign in front of the t-value indicates that the difference is in favour of rural teachers. It was also found that the t-value of 0.39 with associated probability of 0.72 was obtained for mean difference between urban and rural teachers after exposure to CBISP. This indicates that the difference is in favour of urban teachers. In both situations, the probability values obtained were greater than 0.05. This implies that there is no significant difference in the mean attitude score of urban and rural teachers before and after exposure to computer instructional software package.

DISCUSSION

The result of this study has both curricular and pedagogical implications. The study has shown that when chemistry teachers are enabled to understand the role of software packages in classroom teaching, and are given the opportunity to apply their knowledge and skills, they develop positive attitude towards its usage in facilitating the teaching-learning process. This is irrespective of their location, urban or rural. It shows that further training leading to knowledge and skill acquisition in ICT engenders positive attitude towards the use of computer software for specific purposes, such as teaching and learning. It shows that the earlier training received by the teachers was not enough to guarantee them successful use of technology in teaching-learning process. Perhaps the negative attitude displayed by teacher emanated from fear of failure. Cuban (1986); Tyack and Cuban (1995) showed that application of technology in many schools failed because the teachers were inadequately prepared to use the technology and lacked necessary and adequate support. This revelation should be of interest to educational planner and policy makers as it gives a clue as to why ICT facilities are currently rarely in use as recommended by the chemistry curriculum in teaching certain chemistry concepts in Nigerian secondary schools.

IMPLICATION TO RESEARCH AND PRACTICE

The result has shown that teacher's exposure to CBISP enhanced their attitude towards the use of software package in teaching chemical bonding. This is encouraging and shows that using relevant educational software packages that meet the needs of teachers and students will evoke positive attitude from the teachers; and the technology would be used by teachers. The CBISP was designed by this researcher (Okorie, 2013), based on the content of NERDC chemistry curriculum for Nigerian secondary schools. It was tailored to meet the needs of teachers and students in the teaching-learning process of chemical bonding. Glennan and Melmed (1996) showed that several efforts to integrate technology into the curriculum did not succeed because it did not meet teachers' needs, as a result of which teachers abandoned it.

CONCLUSION

The use of relevant computer software packages like CBISP should therefore be encouraged. Government, which is the proprietor of public secondary schools, should sponsor massive production of software packages for difficult concepts in chemistry and for other subjects studied in public secondary schools. Teachers' positive attitude to use of ICT in classroom should influence students to also have positive attitude towards ICT. If this were the case, the hope of achieving objectives of 21st century learning remains high. Regular training and retraining programmes should be organised to expose chemistry teachers to the use of various relevant software packages. School proprietors in collaboration with local, state and federal governments and other stakeholders in the education system should sponsor such programmes.

RECOMMENDATION FOR FURTHER STUDIES

This study should be replicated, using a larger population and wider geographical area and other states in Nigeria. The present study suffered from a limiting factor, which is insufficient funding.

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