INFLUENCE OF INNOVATIVE TECHNOLOGY DEVICES ON SENIOR SECONDARY SCHOOL STUDENTS' ATTITUDES TO CHEMISTRY IN ILORIN, KWARA STATE NIGERIA

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Abstract

This study examined the influence of innovative technology devices on secondary school students' attitude to chemistry in Ilorin, Nigeria. Influence of innovative technology on male and female students' attitude to chemistry was also examined. The population for the study comprised all secondary school students in Ilorin while 200 students (125 males and 75 females) were purposively selected for the study. A 4-point Likert- type scale questionnaire comprising 17 items was administered to students in the five secondary schools. Three research questions were answered using percentage while one hypothesis was tested using chi-square. The findings revealed amongst others that; innovative technology devices had a positive influence since higher percentage of students (70%) had positive attitudes toward chemistry; significant difference was established on the influence of innovative technology on male and female students' attitudes to chemistry in favour of the male students. Based on these findings, the following recommendations were made; efforts should be made to focus on improving use of innovative technology irrespective of gender and adequate provision of technological facilities in schools should also be ensured.

Keywords: Innovative Technology; Attitude; Chemistry; Devices

Introduction

In order to be technologically developed, a nation has to be scientifically literate because of the contributions from science and technology to man and his environment.The success of science, according to Adebayo (2008) is the one that is eventually developed to the evolvement of strategies and technological dynamism. According to Adebayo (2002), in Nigeria, the aim of the education system is to teach the. type of science that will be consistent with the challenges of modern technological age and produce the anticipated manpower with a view to teaching self-reliance and economic independence for the nation. This view is well articulated in the National policy on science and technology which include the need for articulation and use of science and technology transfer and acquisition through mass education by the federal government in order to equip students to live effectively in the modern age of science and technology.

The present age is increasingly modernized as a result of technology. Innovation has to do with new ideas or new ways of doing things. Innovative technology has to do with introducing or using

new ideas in technology This new technology can be used to sustain educational development. The writers therefore submit that, with technology, there will be endless passion for learning. With the use of new technology which is learner-centred, encouraging learners under the guidance of the teachers, the classroom will be participatory and learners will be responsible for their own learning. Technology gives access to more information faster and in an efficient manner. Teachers have to be conversant with the type of technology that will allow students to be engaged more than ever before. There is therefore the need for the type of new technology that will serve as a stepping stone, which can be built upon in the teaching/learning process.

Additional factors that may influence technology use include teaching styles with which the teacher is comfortable and the educational context contextual factors can shed light on how teachers interpret their role, respond, and make sense of their work based on their condition (Lumpe & Chambers, 2001). Teachers and students may be constrained in the use of technology by factors such as access to equipment, training, personal comfort levels, availability of equipment, and time, Barriers within a teachers' context may hinder efforts and meaningful use even when the value of technology integration is widely accepted.

A great number of students are not equipped with basic technological equipments as for teacher to be able to integrate ICT into the school curriculum, using the innovative technology ground work must be done at the pre- service teacher education level. The inadequate use of technology on students can be seen in the few number and low quality of science graduates. Students' enrolment in science has constantly been a fraction of those of other non science subjects and the numbers of students who pass at credit level in secondary schools have been consistently low over the years. Also, the number of those that passed at credit level that eventually go to study science and applied science subjects at the tertiary level of education is equally a small fraction of those who passed it in the public examinations (Ivowi, 1993).

However, attitude of students and teachers to the use of innovative technology has its implication on the targeted learning outcomes. Olowojaye (1999) sees attitude as personal view of something, it is an opinion or general feeling about positive or negative attitude change. An attitude can also be referred to as a relatively enduring system of belief about an object or situation pre disposing one to respond in some evaluating manner, it may be distinguished from an opinion which is usually thought of as typical and short lived. According to Akinsola and Olowojaiye (2008), it is a general belief that students' attitude towards a subject determines their success in that subject. In other words, favourable attitude result to high achievement in a subject. A student, constantly failing chemistry in particular can think low of himself that he can never do well in the subject thereby accepting defeat. On the other hand if he constantly perform well,his successful experience can make him to develop a positive attitude towards learning the subject.

This suggests that students' attitude towards chemistry could be enhanced through effective teaching strategies. It has been confirmed that effective teaching strategies can create positive attitude on the students towards school subjects (Bekee, 1987, Balogun & Olarewaju, 1992, Akinsola, 1994, Akale, 1997, Olowojaiye, 1999). Attitudes are regarded as psychological constructs theorized to be composed of emotional, cognitive, and behavioural components. Attitudes serve as

functions including social expressions, utilitarian, and defensive functions, for the people who hold them (Gibborne, Rukavina & Silverman, 2010).

Particular attention has not been paid to the attitude of students towards the use of technology and its influence. Therefore this study examined the influence of innovative technology devices on secondary school students' attitude to learning of chemistry. The following literature relevant to the study are hereby reviewed

Cognitive activities in the science classes are not only aimed at helping students to acquire scientific knowledge but also to influence their attitude to the subject. For instance, recent science education programmes emphasise self-oriented individual work on the part of students' participation of theoretical principles and participation in the organization of displays in chemistry laboratory exhibition. Thus, there is need for a constant reappraisal of an existing school curriculum (Anaekwe, 2003). The chemistry courses are essentially academic. It convolves comprehending the concept of molecules manipulation of invisible atoms and molecules of abstract systems and formulas.

According to Akale (1997), the developing nations should have a high priority for preparing a scientific literate society because, without scientific literacy, the effectiveness of introducing modern technology would diminish. The objectives of chemistry teaching as outlined by Nuffield foundation (2004) are:

(i) Analytical and perceptive capabilities and to provide the opportunity to explore vocations in the field of chemistry.
(ii) It helps to improve both in the practical techniques and in the equipment of school laboratory
(iii) The development of materials for the teachers to use e.g. like textbooks, production of charts for use by the teachers and students.
(iv) Facility for recalling functional knowledge and experience.
(v) Skills in handling manipulating apparatus for problems solving and making accurate observations
(vi) Ability in interpreting information while showing evidence of judgement and assessment.
(vii) Competencies in reporting and commenting upon matters of scientific interest appropriate to their level attainment.

National Examination Council, an examination body in Nigeria highlighted the objectives of teaching chemistry and its contents as follow:

(i) To enable students develop laboratory skills and to be aware of laboratory hazards and safety measures to be adopted to avert them.
(ii) Providing students with basic knowledge in chemical concepts and principles through efficient selection of contents.
(iii) Enabling students to appreciate the scientific concepts, contents and techniques which involve recording deduction, accurate observation, experimentation and interpretation of scientific data.
(iv) Describe chemistry as it applies to industry, environment and everyday life in terms of benefits and hazards.

(v) Explain chemistry in its inter-relationship with other subjects.

Thus Innovative technology helps students improve their literacy and numeracy skills and to recognize their existing abilities. It also encourages both independent and collaborative learning experiences and helps learners identify areas where they need assistance and support. Learners can complete their education from any location as long as they have access to the learning materials, possible through a wireless connection because learners can access the learning materials anytime, they can select the time they learn best to complete their coursework. This increases the success rate in learning, and facilitates informal learning.(Zurita&Nussbaum 2007)

It is assumed that educators must be sensitive to the idea that students' motivation of learning is influenced by attitudes. According to Fleming and Levie (1978), attitudes help shape subsequent behaviours that determine our actions, such as attention to and acceptance of instructional messages. People pay attention to what they enjoy and ignore or misinterpret what they dislike. Furthermore, information is retained when it is consistent with attitude and disregarded when it is in conflict with attitude. Some types of medium may be more effective in changing attitudes. For example, several researchers have claimed that the more effective medium for changing attitudes is motion. Simonson (1979) in his research found that authentically delivered messages were more effective in creating attitude change than messages presented in a less authentic way. New opportunities abound because technology is becoming a component of the classroom learning environment. Moreover, computers (with their related peripheral devices) are accessible, available, and increasing in numbers.

Thus teachers have many presentation methods from which to choose ,which allows them to actualize instructional objectives. Integrated media presentations allow teachers to literally bring the world to the classroom with the stroke of a key. Most teachers and students believe the use of technology in secondary schools can influence their attitude to teaching and learning. According to Becker and Ravitz (1999), teachers who can be classified as coming from constructivist learning theory are more likely to use computer more often and in more exemplary fashion. For students to have a right attitude to the use of technology, an exemplary behaviour should be exhibited by the teachers to the use of technology. Educators are really embracing the challenges of integrating the technology into their teaching. However, authors and educators still question whether its use positively impacts the learning process. Research is beginning to focus more on the evaluation of the use of ICT and its impacts on teaching and learning.

Teachers through technology would understand and instil in their students the legal and human issues surrounding the uses of technology; encourages teachers to learn and to imbibe technology effectively into their curriculum and in ways and through the means that enhance instructional opportunities and successes for all students. Technology helps students to visualize things that can't be drawn on a chalkboard but which can illustrate concepts better. It also facilitates teaching students with variety of learning styles and makes it easier for instructors to supplement teaching with enrichments and extra activities.

Meanwhile, the educational role of technology has grown tremendously in several ways proving that technology use is undeniably capable of, and important for helping teach content. Technology supports students' performance of complex task; it is integrated into activities that are a core part of the classroom curriculum. Technology has been proved to accommodate learning styles and to be an effective motivator for students with specific learning needs. Students working in collaborative team-learning settings appear to function better when learning events are accompanied by technology use. Technology also is important when used to provide distance learning opportunities to students who otherwise would not have access as the regular undergraduates (Weiser, 1991)).

The strategic introduction of innovative technology into chemistry teaching helps in the improvement of curriculum which in turn helps students to learn more effectively. Innovative technology helps students to learn universally acceptable definition of terms in chemistry, thereby helping them to note the key points in each definition. It also helps students in learning of laws, for example; Boyle's law, Charles law, among others that exist in chemistry and reveals how each law can be represented graphically and mathematically.(Magnus and Okwu 2005)

Innovative technology keeps students and teachers updated on new discoveries of new facts about elements found in the periodic table and how compounds can be named in universally accepted mode when these elements combine chemically. Innovative technology makes information available to teachers and students on how reagents can be prepared, their acceptable standards, how they can be combined chemically during experiment and the accurate precautions to be taken during the experiment. Through Innovative technology the following reforms are made in chemistry learning (Lavoisier 2006)

There is evidence from research that innovative technology helps students to learn and teachers to teach more effectively. However, part of the drive towards greater use of technology in education is aimed at modernizing schools and equipping the students of today with skills that will make them able to use technology in their work place when they leave school (Gibborne, Rukavina &Silverman 2010).

Purpose of the Study

The study sought to examine the influence of innovative technology on the attitude of secondary school students to chemistry. Specifically, the study found out:

(i) The influence of using innovative technology on learning chemistry among secondary school students,
(ii) The attitude of students towards learning chemistry with innovative technology.
(iii) The difference in the attitude of male and female students towards learning chemistry with innovative technology devices.

Research Questions

Answers were sought to the following questions:

(i) What is the influence of using innovative technology on learning chemistry among secondary school students?

(ii) What is the attitude of students towards learning chemistry with innovate technology devices?

(iii) What is the difference in the attitude of male and female students towards the use of innovative technology devices for learning chemistry?.

Research hypothesis

The following hypothesis was tested in the study:

Ho_1: There is no significant difference in the attitude of male and female students towards the use of innovative technology devices for learning chemistry.

Methodology

The population for this research consisted of all secondary school students in Ilorin. 200 students were purposively selected from 5 schools namely: (i) Government Day Secondary school Gaa-Akanbi, Ilorin, (ii) Union Baptist Grammar School, Ilorin, (iii) St. Anthony Secondary School, Ilorin, (iv) Bishop Smith Memorial College, Ilorin, (v) Ebenezer High School, Ilorin.

The instrument for this study was a researchers– designed questionnaire with the title 'influence of innovative technology on secondary school students' attitude in chemistry. The questionnaire comprised two (2) sections; Section A and B. section A focused on demographic information of students. Section B consisted of 17 items using the Likert Scale response modes: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The respondents were to tick the appropriate column on the questionnaire. The analysis and interpretation of data obtained from the instrument were analyzed using percentage for the research questions and chi-square for the research hypothesis.

Results

This section presents the analysis and interpretation of data collected for this study. Data obtained in respect to research questions were analyzed using percentage and Chi-square was used for the hypothesis.

Table 1: Demographic information of students

Variable		Frequency	%
Gender	Male	125	62.5
	Female	75	37.5
	Government Day Secondary School	40	20
	Union Baptist Grammar School.	40	20
	Ebenezer High School.	40	20
School	St. Anthony Secondary School.	40	20
	Bishop Smith Memorial College	40	20

The demographic information of the participants is given in Table 1.The table indicates that 62.5% were male students while female students were 37.5%; this shows that both male and female students were represented..

Research Questions 1: What is the influence of using of innovative technology on learning chemistry among secondary school students?

Table 2: Percentage analysis of students' responses on influence of the use of innovative technology in learning of chemistry.

S/N	Item	SA (%)	A (%)	D (%)	SD (%)
1	The use of innovative technology devices in learning of chemistry provides good avenue for efficient and effective learning	66(33)	132(66)	2(1)	0(0)
2	Innovative technology devices make learning more pleasurable, meaningful and more effective.	80(40)	120(60)	0(0)	0(0)
3	Innovative technology helps to learn more accurate and reliable information and facts in chemistry.	40(20)	150(75)	0(0)	10(5)
4	Use of Innovative technology devices (e.g. computer) in learning of chemistry gives room for an individualized instruction.	87(43)	66(33)	34(17)	13(6.5)
5	Innovative technological devices help to record and store information for future use.	80(40)	120(60)	0	0
6	Use of Innovative technological devices helps to study wide in chemistry	80(40)	80(40)	25(12.5)	15(7.5)
7	Use of Innovative technological devices gives the students' opportunity to make use of their senses to the fullest.	40(20)	106(53)	41(20.5)	13(6.5)

Based on the results in table 2, that students are aware of the use of technological facilities for learning. There is every indication from the responses in item 1-7 that the use of innovative technology enhanced effective learning of chemistry. As seen from the analysis in the table, more respondents believed that technology could generally provide better learning experience.

Research Question 2: What is the attitude of students towards learning chemistry with innovative technology?

Table 3: Percentage analysis of the attitude of students towards learning with innovative technology

S/N	Item	SA(%)	A(%)	D(%)	SD(%)
1	Studying topics yet to be taught in class on internet gives prior knowledge and helps to understand chemistry	69(34.5)	100(50)	20(10)	11(5.5)
2	Chemistry is highly interesting whenever topics taught in chemistry class are read online.	67(33.5)	125(62.5)	0(0)	8(4)
3	Learning with Innovative technological facilities is usually boring to me.	0(0)	40(20)	150(75)	10(5)

4	Innovative Technology helps to develop skills and strategies needed to study chemistry.	90(45)	97(48.5))	12(6)	1(0.5)
5	I enjoy learning with Innovative technological facilities.	2(1)	137(68.5)	40(20)	21(10.5)
6	I have phobia for technological equipment.	0(0)	50(25)	10(5)	140(70)
7	I prefer playing games and chatting with my friends when using technological devices	3(1.5)	10(5)	100(50)	87(43.5)

From the results in items 1-7, the 5 positive statements showed that over 70% of the, students had positive attitude towards the use of innovative technology. It is seen that positive attitude to the use of technology in learning can generally enhance effectiveness. However, negative statements 6&7 showed that only about 5.5% of the respondents agreed or strongly agreed that they preferred playing games and chatting with their friends when using technological devices, while about 94.5% disagreed and also strongly disagreed on the statement. Item 7 showed that 25% of students agreed that they had phobia for technological equipment while about 75% of the students disagreed to having phobia for technological equipment.

Research Question 3: What is the difference in the attitude of male and female students towards the use of innovative technology devices for learning chemistry?.
Corresponding hypothesis was used to answer this question

Research hypothesis
Ho_1: There is no significant difference in the attitude of male and female students in the use of innovative technology for learning chemistry?

Table 4: Significant difference in the attitude of male and female students in the use of innovative technology for learning chemistry

S/N	M SA f	M A F	F D	F SD	F M	df	P	X_c^2	X_t^2	Decision
1	43 20	132 53	2	0	75 125					
2	50 30	75 45	0	0	75 125					
3	25 15	100 50	0	10	75 125					
5	55 25	70 50	0	0	75 125		0.05	256.855	28.869	Rejected
6	50 35	75	25	15	75 125	18				
7	30 10	95 11	41	13	75 125					
Total	453 135	547 299	68	38	450 750					

At 0.05 level of significance, X_t^2 = 28,869

F= Female, M= Male, SA=strongly agree, A = agreed = Disagree, SD =strongly disagree

From the analysis, Chi-square calculated value (256.855) is greater than the table value (28.869) at 0.05 level of significance i.e. $X_c^2 > X_t^2$ which signifies that the hypothesis is rejected. Hence there is a significant difference in the attitude of male and female students in the use of innovative technology devices for learning chemistry.

Summary of Major Findings

Based on the analysis of responses of the students, it was revealed that:

(i) The uses of innovative technology devices in learning of chemistry among secondary school students enhance effective learning.

(ii) The positive attitude of students towards learning of chemistry with innovative technology devices enhances positive results in chemistry.

(iii) There was a significant difference in the attitude of male and female students in favour of the males in the use of innovative technology for learning chemistry.

Discussion

From the findings in this study, it is implied that use of innovative technology devices in the field of education have created unprecedented opportunities and also have profound effect on how students learn chemistry in secondary schools. Also the result of the analysis revealed that,there was a positive attitude towards the use of innovative technology devices among students

Recommendations

Based on the findings of this study, the following recommendations were made:

(i) Students, irrespective of their gender should be encouraged to make use of innovative technology in learning of chemistry

(ii) Students should be trained in order to make them technologically inclined academically and in real life situations.

(iii) Teachers should include the use of innovative technology in order to make learning effective and to motivate learners.

(iv) Students should be advised on the use of innovative technology devices, making application to their academics their priority.

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