

EVALUATING THE INFLUENCE OF TEACHERS USE OF MULTIMEDIA IN TEACHING AND LEARNING OF CHEMISTRY IN SENIOR SECONDARY SCHOOLS IN FCT ABUJA

Dalaham P. D.

Department of Chemistry, FCT College of Education, Zuba- Abuja

Corresponding Email: philipdalaham@gmail.com

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Abstract

The study investigated the use of multimedia in the teaching and learning of chemistry. A sample of 150 students and 23 chemistry teachers were drawn from a population of 3420 chemistry students and 59 chemistry teachers respectively in the FCT, Abuja senior secondary two using purposive sampling technique. Two research questions guided the study. Two instruments of Effect of Multimedia on Students' Learning Questionnaire (EMCSLQ) and Chemistry Teachers Use of Multimedia Questionnaire (CTUMQ) were used to collect data. Frequency count and percentage were used to answer the research questions. The study result of the study revealed that 53.33% (80) of the respondents reported that the used of overhead projector in classroom teaching enhanced their understanding of chemistry concepts while 21.7% (5) and 26.1%(6) of the respondents agreed that chemistry teachers used projector in the teaching of chemistry. Based on the findings, it was concluded that there's need for frequent use of multimedia in the teaching and learning of chemistry at the secondary school level. The study suggested that to make learning meaningful, teachers should always integrate multimedia in their classroom to enhance the understanding of chemistry.

Keyword: Teachers, multimedia, learning, evaluation, influence

Introduction

Education has always been a pre-requisite for all forms of effective development. All societies, primitive or modern, require education to enable new members not only to fit into their work role in the world of work, but also to satisfy the labour need of the economy (Dewey, 1959). Thus, every society look up to the teacher as necessary for enabling the raising generation gain the needed insight, skills and manpower to build a better nation (society). It is in view of this that the federal government has recognized education as an instrument "par excellent" for effecting national development. Thus, for such development to be sustained, it most meets the need of the current generations without comprising the ability of the future generation to meet their needs. This simple implies that sustainable national development is the development that gears towards the enhancement of individual in the

economy and which will also enhance the development of the nation, and such development be sustainable overtimes. No wonder the Nigerian National Policy on Education (NPE, 2004) reviewed (2014) has as one of its objectives; to ensure that secondary leavers acquire the necessary skills that will make them employable, self-reliance, and that the teaching should be activity based to prepare them for future challenge.

According to UNESCO medium term strategy 2008 – 2013 paragraph 3 as cited in Maclean (2008) states that “development and economic prosperity depends on the ability of countries to educate all members of their society offer them lifelong learning. An innovative society prepares its people not only to embrace and adopt to change, but also to manage and influence it. Education enriches culture, creates mutual understanding that underpins peaceful societies. UNESCO is guided by upholding education as a human right and as an essential element for full development of human potentials. Maclean (2008) noted that although there are many keys to enhancing national development such as improved infrastructure such as dams, roads, telecommunication facilities, sports and the like, Chemistry education is one or the master key to economic and social national development. High quality and relevant chemistry education have been shown to

open doors to poverty alleviation, sustainable national development, equity, justice and mainstreaming of the marginalized and vulnerable groups in society (Dalaham, 2016).

Today we are living in an inquiry and innovative society. The demand of the 21st century is novelty, creativity and integration of knowledge at global level, research, critical and analytical thoughts. To prepare our youth particular at the secondary school to cope with the present situation suggests that they need to develop analytical and critical thinking, skill and attitude that would make them more flexible and innovative to deal with uncertainty and crises at national and global level. Achieving this will require that the chemistry teacher should redesign his/her teaching method and using modern technological aids such as multimedia which will allow students interact with learning materials (active learning) and work at their pace to enable them develop creativity and stimulate for learning. Furthermore, it is in recognition of the importance of multimedia in the teaching of science that the American Association for the Advancement of Science (1993) and the National Research Council (NRC, 2000) contends that to better prepare students for the science (chemistry inclusive) and technology of the 21st century, science teachers should integrate multimedia and inquiry –based teaching into their instruction.

This will help to improve their thinking and problem solving skill as it allowed them participate actively in the learning process (Trowbridge, Bybee & Powell, 2008)

Thus, Multimedia access to knowledge is one of the possibilities of information and communication technology that has tremendous impact on learning. Multimedia has been defined by deferent authors, as it is always said, there is no one-size fit all definition, thus multimedia according to Ashinaike and Adekumisi (2012), is the combination of various digital media types such as text, images, sound and video, into an integrated multimedia sensory interactive application or presentation to convey a message or information to an audience. It means an individual or a small group using a computer to interact with information that is represented in several media by repeatedly selecting what to see and hear next (Agnar, Kellarmiar & Neyer, 1996 cited in Ashinaike & Adekumisi, 2012). From this definition it could be said that multimedia is an array of computer derives, interactive communication system which creates, store, transmit and retrieves, textual, graphic and auditory network of information. Thus, multimedia could include data carrier such as video, CD-ROM, floppy disks, internet and software in which the possibility for an interactive approach is offered and when properly use by teachers can supplement or complement their

efforts in ensuring effective learning by students.

Furthermore, Michiel and Van-Crowder (2011); and Mahdi and Al-dera (2013) saw multimedia as technologies that is facilitate by electronic means, the acquisition, storage, processing, transmission and disseminating of information in all forms including voice, text, data, graphs and video. From this definition multimedia is seen as a device that allow individual to generate and disseminate information, and therefore, playing an active role in the process of interaction between teacher, learners, policy makers, peers and among others.

This shows that to enhance sustainable national development through chemistry education, the teacher should integrate multimedia technology into the mainstream classroom as this will result to higher-level learning and thinking skills among students. Buttressing this fact Naser, Leong and Fong (2010), posits that the learning outcomes that result from the use of multimedia in the chemistry classroom will includes social growth, problem solving, independent work, exploration and enhance peer learning. Since sustainable national development entails developing the individual, which will in turn enhance the development of a nation, chemistry teachers should develop effective teaching resources by making good use of modern teaching technologies as this will

enable chemistry teachers individualize instructions, which allows students to learn and develop at their own pace in a non-threatening environment, develop students critical thinking and allowing them to organize, analyze, interpret, develop and evaluate their own work, thereby encourage students artistic expression and at the same time enables students access research outside the school among others. All these will increase students' creativity and testing of new knowledge. Thus, using technology in the chemistry classroom to enhance sustainable national development, the teacher clearly must act as the "change agent" to motivate students for higher productivity and acquiring creative problem-solving skills, scientific and social literacy and commitment to engage in responsible individuals and co-operative actions. Furthermore, Okobia (2011) noted that when students are given the chance to learn through more senses using multimedia, they can learn faster and easier. Buttressing this fact, Larson (2001) noted that the use of electronically mediated instruction to duplicate the traditional face to face classroom will result in a shift from teacher to students' centered classes. Thus, Chin and Hortin (2014) posits that the teacher clearly must act as the "change agent" in the relationship between technology and the students.

Over the years' studies have been conducted at local, national and international on the effect of using multimedia to facilitate learning and teaching. The studies aim to improve teachers' attitude towards the use of multimedia (Cavas, karaoglam & Kislal, 2009); Haji, (2015), levels of technology use in classroom (Naser, Leon & Fong), gender differences in the use of multimedia (Adeduran & Kehinde, 2014). However, the early studies in the field have ignored the role of multimedia in enhancing sustainable national development. Recent studies have shown that multimedia have significant implications for enhancing sustainable national development (Ammani & Ogunyinka, 2011), Krishnasamy (2007), Arogundade (2011), Barak, Ashkar and Dori (2010). These studies separately found that multimedia is key in teaching the skills necessary/required for enhancing sustainable development and to enable school learners be immediately employable, and computerized modeling and animations are useful researches for describing, explaining and predicting scientific process, thus, help to evoke misconceptions or hinder students meaningful learning. Thus, if quality in the teaching and learning of chemistry is anything to go by, chemistry teachers should employ the use of electronic media to enhance students understanding of chemistry concepts.

Statement of Problem

In Nigeria, education appears to be unsuccessful in preparing graduates particularly the secondary schools to meet the market needs of the society as stipulated in the National Policy on Education (NPE) which states as one of its objectives is to make secondary schools graduates immediately employable. Enhancing National development entails providing individuals with good knowledge that will enable them cope with the present situation needs to develop analytical and critical thinking skills and attitude that will make them to be flexible and creative.

The use of multimedia for improving teaching and learning has been accepted globally. It can be used to access global knowledge and communication, and thus, enable students gain deeper understanding of complex topics and concept in chemistry and students are more likely to recall information and use it to solve problems. This shows that enhancing sustainable national development through chemistry education require that teachers should use modern technology (multimedia) such as the ICT (Computers, telephone, internet, digital camera, data projector radio, television among others) to equip the new generation (secondary school students) with enhanced skills and to operate in the 21st century. Since the use of multimedia by chemistry students will enable

students extend and depend on their knowledge of investigation and inquiry according to their needs and interest when access to information is available on multiple levels.

Government today has recognized the importance of multimedia in the teaching/learning process and multimedia such as Information and Communication Technology (ICT) is acknowledge as being critical to the enhancement of sustainable development of every sector of the economy of all nations, since it is regarded as a tool for enhancing good governance practice. Furthermore, the ministry of education has emphasizes the usage of multimedia to facilitate the teaching and learning process. It was based on that, today school teachers in FCT are provided with laptops/computers which were acquired through soft loans as personals and at the same time build computer laboratories to schools and courseware to be utilized in the teaching and learning process. The question that one may asks is “Are chemistry teachers utilizing this multimedia (computer) possess as teaching aids to facilitate the teaching and learning process in all schools? However, very little if any empirical studies exist on the use of multimedia to enhance students learning in chemistry for enhancing national development in Nigeria.

This study was informed by the fact that chemistry education is meant to prepare graduates at all levels to meet the market needs, contribute to development of the society they live, self-reliance such as enabling them creating new environment that will promote pride in primitive work and self-discipline, encouraging graduates to take part actively and freely in discussions and decisions affecting their general welfare. The high rates of many businesses are winding up prematurely consequent upon the unemployable graduates idle away due to lack of skills, creativity and innovations. Therefore, slowing down the process of national development. Could the teacher use of multimedia be part of solution in addressing this difficulty? This study set to investigate chemistry teachers' use of multimedia in the teaching and learning process for enhancing sustainable national development in Nigeria.

Purpose of Study

This study sought to evaluate the use of multimedia by chemistry teachers as a means of enhancing students learning in chemistry. In specific term, the objectives of the study was to find out:

1. The extent to which chemistry teachers use multimedia in the teaching chemistry.

2. The influence of multimedia on students learning of chemistry.

Research Questions

The following questions were stated to guide the study.

1. To what extent do chemistry teachers use multimedia in the teaching of chemistry?
2. What is the influence of multimedia on students' learning of chemistry?

Methodology

The study adopted a descriptive survey research design. The design was adopted because the research is aimed at collecting data from the population to describe the extent to which chemistry teachers' use of multimedia in their classroom, and at the same time find out whether teachers' use of multimedia has any influence on students' learning of chemistry concepts. Emaiku (2011) posits that one of the scope of a descriptive survey research is that it enable the researcher to systematically find out the point view of the respondents or attitude that are held and influences that are being held and it involved collecting data from a representative sample. This was all done in the present study.

The population of the study consisted of all 3420 chemistry students and all the 59 chemistry teachers in the 30 senior secondary

schools in FCT Abuja. Eleven senior secondary schools consisted of 150 Senior Secondary two (SSII) chemistry students and 23 chemistry teachers from the selected schools in FCT Abuja were purposively sampled for the study. Two instruments of Chemistry Teachers Use of Multimedia Questionnaire (CTUMQ) and Effect of Multimedia on Chemistry Students Learning Questionnaire (EMCSLQ) were used to gather data from the respondents. The two instruments CTUMQ and EMCSLQ were administered to chemistry students to obtain information about teachers' use of multimedia in the chemistry class. The CTUMQ consists of 15 items with five options of always used, used, often used and not used, while the EMCSLQ consisted of seven items with five options of Strongly Agree (SA), Agree (A) Undecided (U), Disagree (D) and Strongly Disagree (SD) were administered to chemistry students to seek their opinion on the effect of teachers used of multimedia on their learning of chemistry. The students were asked to tick (✓) the current options nearest to their opinion in each constraint. Thus, for a SA

tick attracted 5 marks, D tick is 4marks, U tick is 3marks, D tick is 2marks and for SD tick it attracted 1mark.

The CTUMQ and EMCSLQ were subjected to experts' validation in chemistry education selected from University of Jos. They were asked to determine construct and content validity of the two instruments. Their constructive criticism was used in developing the final copy of the instruments. The two instruments were pilot tested in two schools in FCT Abuja who were part of the population but do not formed part of the studied sample. The result obtained was used to determine the reliability of the CTUMQ and EMCSLQ, using Cronbach Alpha formula, which yielded reliability coefficient of 0.68, and 0.87 respectively.

Data collected were used to answer the two questions stated. Frequency count and Percentage were used to answer the questions, to determine the influence of multimedia on students' learning of chemistry concepts.

Results

Data collected were tabulated and analyzed to answer the research questions as shown in Table 1 and 2

Research Question One: To what extent do chemistry teachers use multimedia in the teaching and learning of chemistry?

Table 1: Frequency Count and Percentage of Extent of Teachers' Use of Multimedia in Teaching of Chemistry

S/N	Multimedia	Always Freq	Use %	Use Freq	Use %	often Freq	Use %	Not Freq	Use %
1	Overhead Projector	0	0	2	8.7	5	21.7	16	69.6
2	Computer	0	0	5	21.7	6	26.1	12	52.2
3	Internet/web	0	0	2	8.7	8.7	3	18	78.0
4	Television	02	8.7	5	21.7	6	26.1	9	39.1
5	Video Cassette Recorder	2	8.7	7	30.4	3	13.0	11	47.8
6	Film Strip	3	13.0	3	13.0	6	26.1	11	47.8
7	P.C Projector	5	21.7	3	13.0	6	26.1	9	39.1
8	Telephone/Intercom	01	4.3	4	1.4	6	26.1	14	60.9
9	Fax Machine	0	0	0	0	0	0	23	100.0
10	CD Rom	02	8.7	5	21.7	4	17.4	10	43.5
11	Floppy Disks	3	13.0	2	8.7	7	30.4	11	37.8
12	Radio	05	21.7	6	26.1	8	34.8	04	17.4
13	Slide Projector	04	17.4	5	21.7	3	13.0	11	47.8
14	Opaque	03	13.0	4	17.4	7	26.1	10	43.5
15	Video Camera	04	17.4	6	26.1	7	30.4	06	26.1

Table 1 shows that 21.7% (5) and 26.1% (6) of the teachers indicated that they often use overheard projector and computer in teaching and learning of chemistry, while 21.7% (5) also indicate that they use television and 26.1(6) % often use television in teaching of chemistry. From the table, it also shows that

26.1% (6) indicate that they use film strip in teaching chemistry while 21.7% (5) said they always P.C projector in teaching of chemistry. Only 26.1% (6) indicate that they often use telephone/intercom. However, from the responses of the respondents as shown in Table 1, none of the teachers indicated that

fax machine is either used or often used. On the other hand, 21.7% (%) of the respondents indicated they used CD-ROM while 30.4 (7) of the teachers said they often use floppy

disk. 21.7% (5) indicate they used radio during teaching of chemistry. The table also shows that 26.1 (5) of teachers used opaque, 26.1 (5) also use video camera.

Research Question Two: What is the influence of multimedia on students learning of chemistry?

Table 2: Frequency Count and Percentage of Influence of Multimedia on Students Learning in Chemistry

S/N	ITEMS	SA	A	U	D	SD
1	Chemistry is better understand when taught with computer package	50 (33.33%)	32 (21.33%)	30 (20.00%)	14 (9.33%)	24 (16.00%)
2	Chemistry teachers use of projector for teaching chemistry enhance understanding of concept	80 (53.33%)	22 (14.67%)	18 (12.00%)	14 (9.33%)	16 (10.67%)
3	chemistry interpretation through radio is confusing	30 (20.00%)	20 (13.33%)	14 (9.33%)	26 (17.33%)	60 (40.00%)
4	Watching video of chemistry bonds and structure enhances my understanding	55 (36.67%)	20 (13.33%)	13 (8.67%)	24 (16.00%)	38 (25.33%)
5	Listening to talks involving chemistry in television enhance my comprehension of my the concert	64 (42.00%)	43 (28.67%)	13 (8.13%)	11 (7.33%)	09 (6.00)
6	Telephone and internet improve the understanding of chemistry	56 (37.33%)	39 (26.00%)	18 (12.00%)	22 (14.67%)	15 (10.00)
7	CD-ROM increase my understanding of chemistry concept	64 (42.00%)	30 (20.00%)	16 (110.67%)	10 (0.66%)	30 (20.00%)

Table 2 shows the responses and percentage of the respondents on the influence of multimedia on their understanding of chemistry concepts. From the table, it shows that 50 (33.33%) of the

respondents strongly agreed that the use of multimedia such as computer will influence their learning of chemistry, while 80 (53.33%) of respondent also were of the opinion that when

teachers can use projector in the classroom it will enhance their understanding of chemistry concept. However, 30(20.00%) of respondent believed that listening to chemistry interpretation through radio is more confusing. Furthermore, the respondents, 55(36.67%) were of the view that the use of video to show chemical bonds and structure will enhance their understanding in chemistry. Similarly, the 64(42.00%) of the respondents strongly agreed that the television shows involving chemistry will enhance their comprehension of concepts in chemistry. The use of telephone and internet was also supported by the respondents with 53(37.33%) strongly agreed that these two multimedia will enhance their understanding of chemistry. Finally, 64(42.00%) respondents responded that CD-ROM if properly utilized will also serve as a catalyst in increasing their understanding of chemistry concept

Discussion of Result:

From research question one, the result shows that only very few teachers always use multimedia such as computer and overhead projector when teaching chemistry because it enhances their teaching, while only few of them used multimedia such as film strip and CD-ROM. This finding is alignment with the findings of Michiel and Van-Crowder (2011); and that of Mahdi and Al-dera (2013) who both opined that multimedia as technologies that is facilitate by electronic means, the acquisition, storage, processing, transmission and disseminating of information in all forms including voice, text, data, graphs and video This is an indication that most of our chemistry teachers in secondary school do not make use of the multimedia in teaching and

learning chemistry. Despite the fact that we are living in a global world, teachers are not innovative enough to choose from the numerous multimedia at their disposal to enhance students understanding of chemistry. The presence of multimedia resources in schools often encourages collaboration among teachers, as they share experiences, resources, and best practices for effective implementation. This fosters a more supportive and innovative teaching environment, also, inadequate support from school administrations discourages the use of multimedia. Without proper resources, maintenance, or encouragement from leadership, teachers may not feel empowered to adopt new teaching approaches. Curriculum constraints also contribute to the problem, as teachers often feel pressured to cover extensive syllabi within limited timeframes and may see multimedia as an additional burden rather than a helpful aid.

From research question two, the students indicated that giving the opportunity to work in group through the use of computer they will understand chemistry concept better, the table also shows that students are interested in seeing structure of chemical being displaced, if teachers can use multimedia such as projector to illustrate bonds and structures it will enhance their understanding in chemistry. These are in line with the findings of Ammani and ogunyinka (2011). Krishnasamy (2007); Arogundade (2011); Barak, Ashkar and Dori (2010), these studies separately found that multimedia is key in teaching for enhancing students' learning and that computerized modelling and animations are useful ways of describing, explaining and

predicting scientific process, thus, help to evoke misconception that can hinder students' meaningful learning. This could be that students perceive multimedia tools as beneficial for understanding chemistry concepts, since multimedia tools, such as animations, simulations, and computerized models, bridge this gap by providing dynamic and interactive visual representations, making abstract concepts more tangible and relatable.

Conclusion

From the finding of the study it can be concluded student strongly agreed that the lack of multimedia in teaching will affect their understanding of chemistry. Thus, the need for teachers' use of multimedia as this will enhance their understanding of chemical concepts and structures as well. Teachers do not frequently used multimedia in the teaching of chemistry despite the fact that multimedia has both auditory-verbal and visual-pictorial which if properly utilized in the teaching and learning of chemistry will make learning interesting and could result in a more meaningful learning and at the same time supplement and compliment the efforts of the teachers in the teaching and learning process.

Recommendations

The government should ensure training and retaining of chemistry teachers to equip them on the use of multimedia in teaching /learning of chemistry.

There is need for a multimedia laboratory in each secondary school, stock with necessary

multimedia facilities and ensure proper usage by chemistry teachers in teaching of chemistry.

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