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ASSESSING THE USE OF AUDIO-VISUAL AIDED INSTRUCTION IN TEACHING AND LEARNING OF CHEMISTRY IN SECONDARY SCHOOLS IN ANKPA. L.G.A. OF KOGI STATE, NIGERIA

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Abstract

This work investigates the use of audio-visual aided instruction in the teaching and learning of Chemistry in Senior Secondary Schools in Ankpa Local Government Area of Kogi State. A descriptive survey was employed. The population of the study comprises of Nine Hundred and Twenty (920) Chemistry Students and Teachers. Sample size of 220 comprising 20 teachers and 200 students from 10 selected secondary schools was employed. The instrument for data collection was questionnaire. The data were analyzed using frequency table and percentage. The findings revealed that few audio-visual materials like posters, pictures, chalkboard and models are used for chemistry teaching and learning. Other ones like computer with internet services, projectors and so on are neither available nor utilized. It was however, recommended that the Government, school managers and stakeholders, parents and caregivers should ensure that they provide necessary facilities for effective teaching and teachers should ensure proper utilization of facilities while they try to improvise audio-visual materials where necessary, as these will enhance effective chemistry teaching and learning.

Keywords: *Assessment, audio-visual, instruction, learning, chemistry, teaching.*

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Introduction:

Science is a dynamic human activity concerned with understanding the activities of the world. This understanding helps man to know more about the universe (Usman, 2010). Science is an intellectual activity carried on by humans that is designed to discover information about the natural world and to discover the ways in which this information can be organized into meaningful patterns (Achor,2006). On this note, the relevance of science to national goals, aspirations and economy dictates to a large extent, the huge commitment and support which nations make and give to science and technology advancement (Agogo & Onda, 2014). This may be the reason why Achor (2006) and Ada (2008) opined that as a result of the speed at which the world is changing technologically, the need and usefulness of teaching and learning of science therefore cannot be over looked. The classification of any nation into developed, developing and underdeveloped could be measured accurately by the number of chemists, physicists, engineers, pharmacists, doctors, agriculture and science educators the nation could produce (Agogo, 2009).

It is also the backbone of developing countries because sustainable development of economy and society is achievable if knowledge in science education is embraced (Enemuo, Anyaduba & Ezeaka, 2019). Therefore, science education has been identified as one of the major bedrocks for the sustainable development of our country, which is seen as knowledge or ideas acquisition relevant to science (Nnamdi, 2014). It is against this background that science education has been accorded a prime position worldwide. Within the context of science education, Chemistry has been identified as a very important science subject and its importance in scientific and technological development of any nation has been widely reported (Adesoji & Olatunbosun, 2008). Jegede (2007) sees chemistry as a very important science subject that occupies a central position among the sciences due to its remarkable contribution in medicine, biochemistry, microbiology, pharmacy, textile industry, engineering, petroleum, and agriculture to mention but a few.

Chemistry is a broad science embracing the concepts of creation of molecules. It covers interaction with humans through electronics, new building material and new sources of energy (Eledalachi, 2012). Chemistry can

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contribute to the development of students' scientific literacy (Mumber & Hunter, 2009) and provides a concrete foundation for further studies or careers. Chemistry education is the vehicle through which chemical knowledge and skill reach the people who are in need of capacities and potentials for development. In addition, chemical education addresses the social objective of substance development as education is now of the primary means for empowerment, participation, cultural preservation, social mobility and equity (Emumejaye, 2006). According to Uwague and Ojebah (2008), chemistry is one of the naturally and well-established means through which the nation's abundant natural resources can be harnessed into useful ventures for the overall economic and socio-political wellbeing of its citizenry. Okieimen (2007) equally asserted that chemistry is all about everything in the world. He added that chemistry is the nucleus of science which ultimately is the foundation upon which any nation is developed.

It was as a result of the recognition given to Chemistry in the development of the individual and the nation that it was made a core-subject among the natural sciences and other science- related courses in Nigerian education system (Adesoji & Olatunbosun, 2008). In addition, it has been a pre-requisite subject for offering most science-oriented courses in the tertiary institution and this calls for the need in teaching it effectively. Moreover, Chemistry is deemed as the central science and the mother of all sciences. It is widely acknowledged that chemistry is one of the most difficult subjects in secondary science as it contains aspects of chemical reactions that need to be understood in order to solve chemistry related problems. Therefore, because of this reason, it should be emphasized in terms of its teaching and learning as it plays a very important role in unifying other science subjects (Agogo & Onda, 2014).

Chemistry teaching is supposed to be result oriented and students centered, and this can only be achieved when students are willing and the teachers are favorably disposed, using the appropriate methods and resources in teaching the students (Adesoji & Olatunbosun, 2008). Students by nature are curious; they need to be actively involved in the learning process in which they are continuously equipping, testing, speculating and building their own personal construct and knowledge. It

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is only by personalizing such knowledge that it becomes valid, meaningful and useful to them. In chemistry, students need to actively construct their own personal awareness and meaning (Usman, 2010). To substantiate the argument, Usman (2006) remarked that the brain is not a passive consumer of information and to learn with understanding, a learner must actively construct meaning of what to be learned.

The objectives of the chemistry curriculum as stipulated by the Federal Ministry of Education (2014) is to provide basic literacy in chemistry for functional living in the society; acquire basic concepts and principles of chemistry as a preparation for further studies; acquire essential scientific skills and attitudes as a preparation for technological applications of chemistry and to stimulate and enhance creativity. Unfortunately, in Nigeria, research has shown that, despite the importance and centrality of Chemistry, students' academic performance in the subject is usually below expectation (Olatoye, 2008; WAEC, 2015). Chemistry as a science subject is activity oriented and the suggested method for teaching it which is guided discovery method is resource based (NTI, 2007). This suggest that mastery of chemistry concepts cannot be fully achieved without the use of instructional materials. Experience over the years has shown that teachers have been depending on excessive use of words to express, convey ideas or facts in the teaching-learning process. This process is termed the 'chalk-talk' method. Today advances in technology have made it possible to produce materials and devices that could be used to minimize the teachers' talking and at the same time, make the message clearer, more interesting and easier for the learner to assimilate (Onasanya, Adegbija, Olumorin & Daramola, 2008).

According to Ngoka (2000), resources are potent tools, which could be used to effectively communicate science, while enriching the learning experiences of the learners. The instructional resource brings desired improvement in teaching and learning processes by making it effective to the maximum, for cognitive, affective and psychomotor aspects of the learners. It also makes the classroom teaching easy, clear, interesting and scientific (Adetayo, 2008). It is presumed that availability and proper utilization of instruction resource materials improved the performance and the output of

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the educational institutions. This is the reason why science teaching can only be effective when adequate and relevant instructional resources such as audio-visual aids are used (Afolabi, Adeyanju, Adedapo & Falade, 2006). Audio visual aids, otherwise referred to as educational media, could be defined as the wide variety of equipment's and materials used for teaching and learning by teachers and students (Okechukwu, 2010).

Also, Okechukwu asserted that, utilization of more than one sensory channel is able to clarify, establish and correlate concepts. They make dynamic learning experience more concrete and realistic. The use of audio-visual aids improves students' critical and analytical thinking. Audio visual aids are very crucial to the proper implementation of any curriculum used in the education process (Eze, Ani & Eya, 2007). Learners are supposed to see, hear, feel, touch and practice whatever they are learning, and for every academic delivery to be effective, cognizance should be taken of the present-day education and technology and their efficient gadgets and techniques resulting in improved way of learning. When teaching is appropriately done with appropriate audio-visual aids, it has a direct impact on students' achievements since their interests in learning are stimulated (Abbatte & Mcmahon, 2002). According to Adjai (2005), there is pleasure in teaching job when audio visual aids are used and intended results are realized. They make what would have been an abstract idea concrete and brightens what would have been dull lesson. This carries success with it and creates a lasting impression in the students. Since the use of audio-visual materials in teaching and learning of chemistry in our schools would go a long way in improving the academic performance of students, this study was designed to assess the use of audio-visual aided instruction in the teaching and learning of chemistry in secondary schools in Ankpa Local Government Area of Kogi State, Nigeria.

Purpose of the Study

The general purpose of this study is to assess the use of audio-visual aided instruction in the teaching and learning of chemistry in secondary schools in Ankpa Local Government Area of Kogi state, Nigeria.

Specifically, the study sought to:

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i. Determine the availability of audio-visual aids to the chemistry teachers in Secondary Schools in Ankpa Local Government Area.

ii. Determine the chemistry teacher 's extent of utilization of audio-visual aids in Secondary Schools in Ankpa Local Government Area.

iii. Find out the benefits of using audio visual aids in teaching chemistry in Secondary Schools in Ankpa Local Government Area.

Iv. Determine teachers' improvisation skill and willingness to utilize audio-visual aids in Secondary Schools in Ankpa Local Government Area.

Scope of the study

This study was designed to assess the use audio visual aided instruction in the teaching and learning of chemistry in secondary schools in Ankpa Local Government Area of Kogi state, Nigeria. It was delimited to determining whether teachers use audio-visual aids in teaching and learning, whether audio-visual aids are available in secondary schools in Kogi state. In addition, it will also determine the benefits of using audio visual aids for teaching and learning of chemistry.

Research Design

The research design of this study is a "survey type". It is a survey because the researcher did not influence or manipulate any variable during the course of investigation. The choice of survey design is considered appropriate because the investigation involves collection of data in their natural setting.

Area of the Study

The area of the study is Ankpa Local Government Area of Kogi State. The Local Government Area is situated in the Eastern part of Kogi State. It has five (5) districts; Ankpa, Enjema, Ojoku, Emekutu and Adanawo districts.

Ankpa Local Government Area has common boundaries with Olamaboro Local Government Area in the South-East of Kogi State, Dekina Local Government Area in the Northern part of Kogi State and Benue State. Ankpa Local Government Area has forty-two (42) registered and approved secondary schools in all its districts. A total of ten (10) secondary schools were randomly selected for this study. That is, two (2) Secondary schools from each district in Ankpa Local Government Area of Kogi State.

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Population of the Study

The target population of this study is Nine Hundred and Twenty (920) Teachers and Students presently teaching and learning Chemistry in ten (10) randomly selected secondary schools in Ankpa Local Government Area of Kogi State.

Sample and Sampling Technique

All chemistry teachers and students in forty-two (42) secondary schools in all five (5) districts of Ankpa Local Government Area of Kogi State constituted the target population for this study. A sample of ten (10) secondary schools were randomly drawn using simple random technique from the target population. In addition, two hundred (200) SSI and SS II students and twenty (20) chemistry teachers were randomly sampled from ten (10) selected secondary schools using the same simple random technique. This means that twenty (20) students and two (2) chemistry teachers were drawn from each school, making total of two hundred (200) students and twenty (20) chemistry teachers.

Research Instrument

The major instrument used for data collection is questionnaire. Two (2) sets of questionnaires were used for this study. That is; one for the teachers and the other for the students. Each instrument has two sections; A and B. Section A comprised the respondents' demographic data while section B contained items designed to generate data to address the research questions. Items 1 to 44 in section B were presented (1). There were four (4) subscales namely; availability of audio-visual aids (13 items), utilization of audio-visual aids (13 items), benefits of using audio-visual aids (13 items) and teacher's efforts on improvisation (5 items).

Validity of the Instrument

The two instruments were validated by two (2) lecturers from Chemistry Department and One Lecturer from Education Department in Kogi State College of Education, Ankpa, for face and content validities. These experts on the basis of their corrections, comments and suggestions gave the instrument better quality.

Method of Data Collection

The data was collected using questionnaire. The researcher personally administered the instrument to both teachers and students under

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study through the help of principals and chemistry teachers in each selected school to prevent loss and facilitate quick recovery of the instruments administered.

Method of Data Analysis

The data for this study was analyzed using simple statistical tool which comprises the use of frequency table and percentage (%) to address the research questions. Section B was divided into four (4) subsections. First subsection comprises the list of audio-visual aids on scales; available and not available. Second subsection comprises the list of audio-visual aids on the extent of their usage with scales; used and not used. Third subsection comprises the items on the benefits of using audio-visual aids with scales; Agree and Disagree. Fourth subsection comprises items on teacher's effort on improvisation on audio-visual aids on scales; agree and disagree.

Research Questions

The following research questions guided this study.

i. What audio visual materials are available to the chemistry teachers for teaching and learning of chemistry?
ii. To what extent do chemistry teachers utilize audio visual aids?
iii. What are the benefits of using audio visual aids in improving qualitative chemistry education?
iv What are teachers' efforts on improvisation?

Research Question 1: What audio-visual materials are available for teaching and learning of chemistry?

Table 4.1: Responses of teachers and students on availability of audio-visual materials

S/N	Items	Teachers		Students	
		A (%)	NA (%)	A (%)	NA (%)
1.	Poster	20 (100)	0 (0)	194 (97)	6 (3)
2.	Pictures/photograph	20 (100)	0 (0)	200 (100)	0 (0)
3.	Chalk board	16 (80)	4 (20)	194 (97)	6 (3)
4.	Cassette recorders	0 (0)	20 (100)	0 (0)	200 (100)
5.	Magnetic board	0 (0)	20 (100)	0 (0)	200 (100)
6.	Models	20 (100)	0 (0)	200 (100)	0 (0)
7.	Radio	0 (0)	20 (100)	0 (0)	200 (100)
8.	Sound projectors	0 (0)	20 (100)	0 (0)	200 (100)

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9.	Computer	6 (30)	14 (70)	60 (30)	140 (70)
10.	Internet services	4 (20)	16 (80)	40 (20)	160 (80)
11.	Television	0 (0)	20 (100)	0 (0)	200 (100)
12.	Power points	0 (0)	20 (100)	0 (0)	200 (100)
13.	Chemistry software	0 (0)	20 (100)	0 (0)	200 (100)

Key: A = Available
NA = Not Available

Table 4.1 shows that items 1, 2, 3 and 6 have the percentages (%) of 100 and 97; 100 and 100; 80 and 97; 100 and 100 for teachers and students respectively. It indicates that majority of teachers and students agreed that items 1, 2, 3 and 6 are available. While items 4, 5, 7, 8, 9, 10, 11, 12 and 13 have percentages (%) of 0 and 0; 0 and 0; 0 and 0; 0 and 0; 30 and 30; 20 and 20; 0 and 0; 0 and 0; 0 and 0 also for teachers and students respectively. It can be deduced from the table that the percentages (%) are very low which indicates that both teachers and students agreed that items 4, 5, 7, 8, 9, 10, 11, 12 and 13 are not available for Chemistry teaching and learning.

Research Question 2: To what extent do chemistry teachers and students utilize audio-visual aids?

Table 4.2: Responses of teachers and students on utilization of audio-visual aids

S/N	Items	Teachers		Students	
		U (%)	NU (%)	U (%)	NU (%)
1.	Poster	20 (100)	0 (0)	194 (97)	6 (3)
2.	Pictures/photograph	20 (100)	0 (0)	200 (100)	0 (0)
3.	Chalk board	16 (80)	4 (20)	194 (97)	6 (3)
4.	Cassette recorders	0 (0)	20 (100)	0 (0)	200 (100)
5.	Magnetic board	0 (0)	20 (100)	0 (0)	200 (100)
6.	Models	20 (100)	0 (0)	200 (100)	0 (0)
7.	Radio	0 (0)	20 (100)	0 (0)	200 (100)
8.	Sound projectors	0 (0)	20 (100)	0 (0)	200 (100)

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9.	Computer	6 (30)	14 (70)	60 (30)	140 (70)
10.	Internet services	4 (20)	16 (80)	40 (20)	160 (80)
11.	Television	0 (0)	20 (100)	0 (0)	200 (100)
12.	Power points	0 (0)	20 (100)	0 (0)	200 (100)
13.	Chemistry software	0 (0)	20 (100)	0 (0)	200 (100)

Key: U = Used

NU = Not Used

Table 4.2 shows that items 1, 2, 3 and 6 have the percentages (%) of 100 and 97; 100 and 100; 80 and 97; 100 and 100 for teachers and students respectively. It indicates that both teachers and students agreed that mostly used audio-visual aids for teaching and learning of Chemistry are items 1, 2, 3 and 6 while items 4, 5, 7, 8, 9, 10, 11, 12 and 13 having percentages (%) of 0 and 0; 0 and 0; 0 and 0; 0 and 0; 30 and 30; 20 and 20; 0 and 0; 0 and 0; 0 and 0 are not used. Since the percentages (%) are low, the items are not available hence not utilized.

Research Question 3: What are the benefits of using audio-visual aids in improving qualitative Chemistry Education?

Table 4.3: Responses of teachers and students on the Benefits of using audio-visual aids in improving qualitative chemistry education

S/N	**Items**	**Teachers**		**Students**	
		A (%)	**DA (%)**	**A (%)**	**DA (%)**
1.	Captures and retains the interest of learners	20 (100)	0 (0)	194 (97)	6(3)
2.	Keeps the learners busy and active, thus increasing their participation in class.	18 (90)	2 (10)	196 (98)	4 (2)
3.	Concretizes the abstract concepts and make them more meaningful.	20 (100)	0 (0)	200 (100)	0 (0)
4.	Saves time and energy of the teachers and students	20 (100)	20 (100)	200 (100)	0 (0)

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5. Helps the students to see, feel and touch what he/she is being taught.	20 (100)	20 (100)	200 (100)	0 (0)
6. Makes lesson realistic	20 (100)	20 (100)	200 (100)	0 (0)
7. Students are motivated	20 (100)	20 (100)	200 (100)	0 (0)
8. Fosters explanation	18 (90)	2 (10)	196 (98)	4 (2)
9. Erases learning of difficult concepts	19 (95)	1 (5)	200 (100)	0 (0)
10. Makes learning permanent/makes the students to remember the concepts for longer period of time.	20 (100)	0 (0)	190 (95)	10 (5)
11. Attract learner's attention.	20 (100)	0 (0)	200 (100)	0 (0)
12. Makes class more interactive	20 (100)	0 (0)	200 (100)	0 (0)
13. Encourages collaborative learning	20 (100)	0 (0)	200 (100)	0 (0)

Key: A = Agree

DA = Disagree

Table 4.3 shows that items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 have the percentages (%) of 100 and 97; 90 and 98; 100 and 100; 100 and 100; 100 and 100; 100 and 100; 100 and 100; 90 and 98; 95 and 100; 100 and 95; 100 and 100; 100 and 100; 100 and 100 for teachers and students respectively. The above percentages (%) indicate that both the teachers and students agreed that audio-visual materials have all the benefits in the table when used for teaching and learning of Chemistry.

Research Question 4: What are teacher's efforts on improvisation?

Table 4.4: Responses of teachers and students on efforts on improvisation

S/N	Items	Teachers		Students	
		A (%)	**DA (%)**	**A (%)**	**DA (%)**
1.	There are adequate materials to improvise audio-visual aids.	0 (0)	20 (100)	0 (0)	200 (100)
2.	Teachers are their personal computers as audio-visual aids.	2 (10)	18(90)	20 (10)	180(190)

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3. Teachers improvise models and posters as audio-visual aids.	20 (100)	0 (0)	200 (100)	0 (0)
4. Teachers improvise pictures as audio-visual aids.	20 (100)	20 (100)	200 (100)	0 (0)
5. Teachers use their personal radio and cassette recorders as audio-visual aids.	0 (0)	20 (100)	0 (0)	200 (100)

Table 4.4 shows that items 3 and 4 have the percentages (%) of 100 and 100; 100 and 100 for teachers and students respectively. This indicates that items 3 and 4 are mostly improvised materials by teachers and students when standard materials are not available. While items 1, 2 and 5 have percentages (%) of 0 and 0; 10 and 10; 0 and 0 for teachers and students respectively. This indicates that both teachers and students agreed that items 1, 2 and 5 are not improvised since the teachers do not have them for effective teaching and learning of Chemistry.

Discussion of Results

As discovered in this study, posters, pictures and photograph, chalkboard and models are the most available and utilized audio-visual materials for teaching and learning of chemistry. Availability and utilization of the above materials are supported by Mayer (2005) who opined those pictures, images and other visible materials promotes better understanding to students than words alone. Also, this finding is supported by Klemm (2007) who also opined that learning happens by associating new information with one already known and associations are most effective when they include audio-visual materials.

More so, the benefits of using audio-visual materials stated above is supported with opinion of Erick and King (2012) that use of audio-visual materials improves learner's attitude and interest in the subject which increases their motivation to learn taught materials. This indicates that there is need for availability and utilization of audio-visual materials to improve classroom effectiveness.

Finally, most improvised materials are posters, pictures, chalkboard and models while radio, computers with internet services, cassette

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recorders among others are not improvised. In the face of the existing abstract nature of chemistry in secondary schools, there is need for improvisation to improve classroom teaching and learning. This is supported with findings of Ugbe and Dike (2012) that revealed that improvised materials are effective in enhancing student's academic performance in chemistry.

Conclusion

It has been established by this study that only few audio-visual materials like posters, pictures and photographs, models and chalkboard are available and utilized in teaching and

learning of chemistry in secondary schools in Ankpa Local Government. Due to the benefits of audio-visual materials for effective chemistry teaching and learning, efforts should be made to provide and improvise audio visual materials like sound projectors, chemistry software, computer with internet services to mention but a few, by the government and other stakeholders in education industry as this could improve and motivate teachers and students for effective chemistry teaching and learning.

Recommendations

Based on the findings in this research, the following recommendations were made;

1. Government should work with private and public secondary schools in Ankpa Local Government to provide audio-visual materials like computer with internet services, chemistry software, sound projectors, magnetic board and few but yet to mention in order to improve chemistry teaching and learning.
2. Government and school managers should ensure proper utilization of audio-visual materials if provided, by the teachers and students for effective chemistry teaching and learning through proper monitoring and supervision.
3. School managers and other stakeholders in the education sectors should provide necessary facilities for the teachers to improvise audio-visual materials like providing them with computers and projectors.
4. Parents and care givers who has some of the audio-visual materials like computers should provide their wards with their personal computers to serve as aid in the teaching learning process of chemistry.

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