TEACHERS' ATTITUDES TOWARD IMPROVISATION OF INSTRUCTIONAL MATERIALS FOR TEACHING AND LEARNING CHEMISTRY

ACHIMUGU LAWRENCE, PhD, & MUFTAWU, H. M.
Department of science Education,
Kogi State University, Anyigba
E-mail: lawachi88@gmail.com,yusyum87@gmail.com

Abstract
Study was designed to examine the chemistry teachers' attitudes toward improvisation and its implication to innovation in chemistry education in Kogi State, Nigeria. The study was guided by three research questions and one hypothesis. Survey research design was adopted and the population of the study comprised of all the 450 chemistry teachers in public secondary schools in Kogi state. Sample consists of 150 chemistry teachers' selected through simple random sample technique. Instrument used for the study was a 32-item researchers' developed questionnaire titled Chemistry Teachers' Attitudes Toward Improvisation Questionnaire (CTATIQ,). Mean and standard deviation were used to answer research questions, while t-test was used to analyzes the hypothesis at 0.05 alpha level. Results revealed among others that chemistry teachers have negative attitudes toward improvisation of instructional materials and that improvisation of instructional materials enhance teaching and learning of chemistry. Recommendations were made to include that chemistry teachers should endeavour to be innovative by improvising instructional materials for chemistry lessons.

Keywords: Chemistry Education, Improvisation, Instructional Materials, Teacher's Attitude

Introduction

Chemistry is one of the fundamental ingredients of science, technology and mathematics education(Danjuma,2006). The development of any nation today, depends greatly on its scientific and technological development. Therefore, there is need to recognize chemistry education as priority area of education of her citizens. In line with this, one of the objectives of Chemistry education as stated by Federal Ministry of Education (2013) in the senior secondary chemistry education curriculum, is to develop teacher's interest towards using innovative teaching methods such as guided discovery approach. According to Aku, Adeyemo and Bulus (2018), teachers are expected to change their attitudes from the old method of teacher-centered teaching to students-centered approach which involve use of new innovative approaches: Activity, Student-Centered, Experiment, and Improvisation (ASEI);and plan, see and improve (PSAI). The quest to compel teachers to use innovative teaching methods can be successful through effective use of instructional materials. Indeed researchers such as Nwosu, Ibe, and Folorunso (2013), Megbo and Saka (2015) and Achimugu (2017) have linked ineffective teaching and learning of chemistry to insufficiency and non-utilization of instructional materials for chemistry instruction.

Instructional materials have been defined in several ways. Johnson (2000) defined instructional materials as all the tools which can easily be used by teachers to illustrate things that learners cannot forget easily. Eniayeju (2005) defined instructional materials as materials which provide concrete experiences which a learner needs in order to develop intellectually. Instructional materials can therefore be referred to as material resources which the teacher utilizes to ensure effective teaching and learning in the school setting. The importance of instructional materials to effective teaching and learning of chemistry cannot be emphasized. Kola (2013) pointed out that the use of instructional materials in teaching provides a concrete basis for conceptual thinking, motivates pupils to learn and

capture students' imagination. Kola (2013) added that the use of instructional materials during lessons will arouse students' interest by giving them something practical to see and do. Despite the importance of instructional materials, evidence in literature shows that no matter how rich and generous educational authorities might be, they are not always in a position to provide their schools with all needed instructional materials(Johnson, 2000). This necessitate call for improvisation of instructional materials for chemistry instruction.

National Teachers Institute (NTI, 1990) defined improvisation as a technique of originating a total new tool, instrument, material and device or modifying an already existing one for a particular purpose. Igwe (2000) sees improvisation as making or inventing of a piece of science teaching equipment in emergency. Olusa defined improvisation as to make or do something using whatever is available usually because you do not have what you really need . Iliya (2019) defined improvisation in science, technology and mathematics education as the preparation and use of materials and equipment obtainable from the local environment for the enhancement of effectiveness of teaching and learning. Similarly, Nwosu, *et al.,(*2013) defined improvisation as the production of unavailable equipment using available local and cheaper resources for effective teaching. They pointed out that improvised instructional materials can therefore be produced by teachers or students or jointly produced but minding the guiding principles such as: not significantly different in quality and reliability from the conventional types. Iliya (2019) pointed out two types of improvisation to include firstly, improvisation by substitution. This is a situation whereby an already existing local materials is used in place of equipment that is not available. Secondly, improvisation by construction (role simulation). This involves the construction of new materials entirely when the required materials are not available.

Improvisation of instructional material through self-construction stimulate creativity among the students. It also promotes students interest in learning process. Ahmed (2008) argued that improvisation serve as a motivation to learners in as much as they participate in the activities during the production of the materials. Summarizing the importance of improvisation in any level of educational system, Iliya (2019) stated that improvisation can promote intuition, inductive discovery, interactivity, spontaneity, team building, creativity and critical thinking. These features encourage retention of science knowledge and ensure effective learning of chemistry.

The numerous importance of improvisation of instructional materials can be marred by many factors. Igwe, Arisa and Ibe (2013) identified the problems faced by chemistry teachers in improvisation of materials as follows: time constraint, financial constraint, unavailability of tools to fashion materials, large classes in most schools and lack of knowledge of improvisation. In related studies, Achimugu (2016), Omiko (2016) and Achimugu and Onoja (2017) pointed out that in producing and utilizing the available instructional materials, teachers are faced with obstacles such as lack of fund, lack of skills to improvise instructional materials and liaise-fare attitude of teachers towards improvisation of instructional materials among others. The focus of this study is the attitude of teachers toward improvisation.

Zubairu (2014) defined attitude as a preposition to respond in a favourable or unfavourable manner in respect to a given situation or object. Akujieze and Ifeakor (2017) defined attitude as an aggregate measure for attractiveness or repulsiveness of the subject and the belief that the subject is relevant or irrelevant. Also, Aku, Adeyemo and Bulus (2018) defined attitude as an outward and visible postures of human believes that determines what each individual will see, hear, think and do. Therefore, the attitude of a teacher may be a major factor that determines whether or not he/she do something important. Thus, positive

attitude indicates the willingness to improvise instructional materials while negative attitude indicates unwillingness to improvise instructional materials.

Quite a number of researchers have taken place in respect of teachers' attitude towards science. For instance, Onasanya and Omosewo (2011) reported that teachers exhibit poor attitudes to improvisation of instructional materials for science instruction. Anyanwu and Alafiatayo (2015) found out that teachers' attitude were negative as less than average number of teachers produce and use instructional materials in teaching basic science and technology.

In a related study conducted by Omiko (2016),it was revealed that chemistry teachers lack confidence in their ability to improvise and use instructional materials. However, some other studies submitted that teachers have positive attitude towards improvisation of instructional materials (Gotep, Azi & Kankani, 2018).From the review of literature, it is note-worthy to point out the fact that there are diversified findings and that most of the studies were conducted outside the area of the current study, thereby making the current study necessary and important. Indeed, this instigated the researchers' enthusiasm to fill the gap, this study investigated teachers' attitude toward improvisation of instructional materials for teaching and learning chemistry in Kogi State Nigeria.

Purpose of the Study

The main purpose of this study is to find out the attitude of teachers towards improvisation for teaching and learning chemistry.

The study specifically aimed to:

(i) determine the attitudes of teachers toward improvisation of instructional materials for teaching and learning chemistry.
(ii) ascertain the difficulties or problems teachers encounter in the improvisation of instructional materials
(iii) find out the roles of improvisation towards enhancing teaching and learning chemistry.

Research Questions

(i) What is the attitudes of chemistry teachers towards improvisation of instructional materials?
(ii) What are the factors inhibiting chemistry teachers from improvisation of instructional materials?
(iii) What roles do improvisation of instructional materials play in enhancing teaching and learning of chemistry?

Methods

The research design for this study is a survey design. The population comprised of all chemistry teachers in the 285 public secondary schools in Kogi State. Simple random sampling technique by balloting was used to select 100 senior secondary schools from the total population of 285 schools. All the chemistry teachers in the selected schools constituted the sample and were 150 chemistry teachers. Thus, the sample size was 150. The instrument for data collection was a structured questionnaire tagged ''Teachers' Attitude Towards Improvisation Questionnaire" (TATIQ). It consisted of two parts. Part A sought demographic information of the participants whereas part B comprised of 32 items that has three clusters designed to elicit information with regard to the three research questions. The questionnaire was designed to elicit information on attitude of teachers toward improvisation using four-point scale of strongly Agree (SA) = 4, Agree (A) = 3, Disagree = 2 and Strongly Disagree (SA) = 1. The instrument was validated by two experts (one from department of

science education and another one from department of educational foundations) of Kogi State University, Anyigba. The expert comments and suggestions such as the appropriateness of the items in terms of coverage, clarity of language and relevance were used in the final version of the instrument. The instrument was trial – tested on 25 chemistry teachers in senior secondary schools that were not part of the sample. Test-retest procedure and Pearson product moment correlation coefficient was used to determine the reliabilities of each of the cluster and the values were 0.82,0.84 and 0.80 respectively. The researchers administered the instrument with the help of three research assistants which ensured 100% return of the instrument. The data collected were analyzed using mean and standard deviation, to answer research questions and t- Test the null hypothesis at 0.05 alpha level. The decision level for each item was 2.50. The mean score of 2.50 and above indicates positive attitude towards improvisation while a mean below 2.50 indicates negative attitude towards improvisation.

Results

The results were presented according to the three research questions and one hypothesis.

Research Question One

What are chemistry teacher's attitude towards improvisation of instructional materials?

Table 1: Mean and Standard Deviation of Teachers' Attitude Toward Improvisation of Instructional Materials

S/N	Items	$\overline{X}$	SD	Decision
1	I spend my valuable time to improvise instructional materials.	2.36	0.85	Reject
2	I am skilled in the improvisation of instructional materials.	2.40	0.93	Reject
3	Improvisation is beneficial to the academic achievement of students.	3.36	0.76	Accept
4	Knowledge of improvisation enables me to be self-fulfilled as a teacher.	2.78	0.67	Accept
5	I find it very easy to teach chemistry with improvised instructional materials.	2.24	0.89	Reject
6	I always feel happy to improvise instructional materials.	2.39	0.92	Reject
7	I am enthusiastic about improvisation of instructional materials.	2.48	0.88	Reject
8	I always find it interesting to improvise instructional materials.	2.18	0.90	Reject
9	I find the improvisation of instructional materials a comfortable exercise.	1.40	1.27	Reject
10	Improvisation of instructional materials is not time consuming.	1.80	1.12	Reject
11	Improvised instructional materials are not too local for teaching chemistry.	2.35	0.78	Reject
12	I am always relaxed each time I want to improvise instructional materials	2.15	0.82	Reject
	Pooled mean of each item	**2.32**	**0.84**	**Reject**

Table 1 shows that all the items except items 2 and 3 were rated below the criterion mean of 2.50 which indicate that chemistry teachers' attitude toward improvisation is unfavorable. In other words, the teachers have negative attitudes toward improvisation of instructional

materials. The pooled mean of 2.32 which is below the cut-off mean of 2.50 further confirmed the above statement that teachers have negative attitudes toward improvisation of chemistry instructional materials.

Research Question Two
What are the factors inhibiting chemistry teachers from improvisation of instructional materials?

Table 2: Mean Response on Factors Inhibiting Chemistry Teachers from Improvisation of Instructional Materials

S/N	**Items**	$\overline{X}$	**SD**	**Decision**
1	Increased workload for chemistry teachers.	3.30	0.93	Accept
2	Poor salary scale of chemistry teachers.	3.75	1.01	Accept
3	Delay/non-payment of chemistry teachers' monthly emoluments.	2.56	0.98	Accept
4	Lack of funds to purchase the necessary materials for improvisation.	3.86	1.15	Accept
5	Chemistry teachers feel that production of instructional materials from our local environment is crude.	2.86	1.20	Accept
6	Inadequate monitoring of chemistry teachers by stake holders in chemistry education.	3.05	1.08	Accept
7	Laxity on part of chemistry teachers to produce instructional materials locally.	2.75	1.26	Accept
8	Chemistry teachers lack the skills for improvisation.	2.56	1.13	Accept
9	**Pooled Mean of each item**	**3.09**	**1.09**	**Accept**

Table 2 shows that the mean rating of all the item statements as well as pooled Mean were all above the cut-off mean of 2.50. This implies that chemistry teachers agreed that the 8 item statements are problems that hinder teachers from effective improvisation of instructional materials. The three main problems that hindered chemistry teachers from improvisation of instructional materials were lack of funds, poor salary scale of teachers and delay/non-payment of teacher's salary. That is to say, poor funding of education is the major factor that hinder effective improvisation of instructional materials for chemistry instruction.

Research Question Three
What roles do improvisation of instructional materials play in enhancing teaching and learning of chemistry?

Table 3: Mean Response of the Roles of Improvisation in Enhancing Teaching and Learning Chemistry

S/N	**Items**	$\overline{X}$	**SD**	**Decision**
1	It helps in developing students' problem solving skills in chemistry.	2.90	1.12	Accept
2	It helps teachers' manipulative skills in chemistry lessons.	2.76	1.26	Accept
3	It helps to stimulates students' interest in chemistry lessons.	3.22	1.10	Accept
4	Improvisation of instructional materials make	3.55	1.29	Accept

	teachers more resourceful.			
5	It helps the students to develop creative skills.	3.02	1.06	Accept
6	It helps the teachers to develop technical skills.	3.28	1.15	Accept
7	It promotes technological development in local craft men	3.45	1.13	Accept
8	It contributes to students' acquisition of scientific skills.	2.95	1.22	Accept
9	Effective improvisation cover the three domains of educational objectives.	2.76	1.16	Accept
10	It helps students to develop scientific attitudes toward the study of chemistry.	2.82	1.04	Accept
11	**Pooled Mean of each item**	**3.07**	**1.15**	**Accept**

Table 3 revealed that the all mean rating including the pooled Mean were above the acceptable mean of 2.50. This implies that chemistry teachers agreed that improvisation of instructional materials play a role in enhancing teaching and learning in chemistry. In other words, the chemistry teachers are very much aware of the role of improvisation in enhancing teaching and learning in chemistry.

Discussion

Results from these findings revealed that chemistry teachers have unfavorable depositions towards improvisation and by implication negative attitudes towards improvisation. The finding that teachers have negative attitudes towards improvisation contradicts the finding of Gotep, Azi and Kankani (2018) whose study revealed that teachers have positive attitude towards improvisation. However, the finding of this study is in line with Onasanyo and Omosewo (2011) and Anyanwu and Alafiatayo (2015) who found that teachers' attitudes were negative toward improvisation of instructional materials for sciences. In this study majority of the teachers have negative attitude towards improvisation because they lack strong intrinsic sense of personal belief to grasp the concept of improvisation and use it as a means of achieving their lesson objectives.

In research question two, it is a revealed that chemistry teachers are faced with some difficulties in improvising instructional materials for chemistry instruction such as lack of fund, poor salary scale and non-payment of salaries. The finding of lack of funds to procure the necessary materials for improvisation of instructional materials is in conformity with the finding of Omiko (2016) and Achimugu and Onoja (2017). Indeed, Achimugu (2016) lamented that poor funding of education is becoming recurring decimals in science education research. He called on government at various levels to implement science education reports and to do something urgently to address poor funding of education.

In research question three, it was revealed that improvisation of instructional material has a role to play in the teaching and learning of chemistry. The finding of this study agrees with the earlier finding of Iliya (2019) who pointed out that the involvement of teachers and students in improvising instructional materials reduces abstractness and arouse students' interest in chemistry. This finding clearly shows that chemistry teachers recognize the role improvisation of instructional materials in enhancing teaching of chemistry. Hence the teachers' knowledge of the role of improvisation in enhancing teaching and learning is an indication that this is not one of factors inhibiting their positive disposition toward improvisation of instructional materials.

Conclusion

The finding of this study shows that chemistry teachers have negative attitude towards improvisation of instructional materials. The inability of the majority of teachers to improvise instructional materials implies that the benefits of improvisation to chemistry education is not being achieved. The paper concludes that for successful implementation of the objective of chemistry education, serious attention should be given to improvisation of instructional materials.

Recommendations

The paper recommends that:
Chemistry teachers should endeavor to be innovative by improvising instructional materials for their chemistry lessons.

(i) Government at various levels should adequately fund science education so as to encourage chemistry teachers to improvise instructional materials.
(ii) There is the need to empower chemistry teachers through in-service training on the skills and techniques of improvisation
(iii) Government agencies as well as principals of schools should ensure that chemistry teachers are adequately monitored on the use of improvised instructional materials for chemistry instructions.

References

Achimugu, L., & Onojah, P. K. (2017). Factors hindering production and utilization of teacher-made instructional materials in teaching senior secondary Chemistry in FCT Abuja, Nigeria. *International Journal of Scientific Research in Education (IJSRE),*10 (3), 352-361

Achimugu, L. (2016). Principals' instructional leadership qualities that enhance effective teaching and learning of Chemistry in secondary schools from perspective of students and teachers. *International Journal of Science and Research (IJSR),*

Achimugu, L. (2017). Availability and utilization of instructional materials for teaching Chemistry in senior secondary schools. *International Journal of Novel Research in Education and Learning*, 4 (3), 33-43.

Ahmed, A. M. (2008). Improvisation of instructional materials for teaching of biology: An important innovation in nigerian educational system. *Priston Journal,* 6 (1), 1-7

Aku, R. A., Adeyemo, A. A., & Bulus, C. H. (2018). Assessing attitude of Strengthening Mathematics Science Education (SMASE) teachers towards teaching mathematics and a basic science in primary school in Jos Metropolis. *Nigerian Journal of Educational Research and Evaluation,* 17 (1), 10-18

Akujieze, M. O., & Ifeakor, A. C. (2017). Attitude of teachers towards assessment delivery. *Nigerian Journal of Educational Research and Evolution*,6 (2), 95-104.

Anyanwu, R. I., & Alafiatayo, B. M. (2015). Biology teachers' attitude towards production and utilization of instructional material in secondary school in Kaduna State Nigeria. *ATBU Journal Of Science, Technology and Education,* 3(4), 49-59.

Danjuma, B. R. (2006). A survey of the supply of equipment and materials in chemistry Laboratories in Plateau State Senior Secondary Schools. With *Annual Conference Proceeding of Science Teachers' Association of Nigeria* 187-192, Ibadan. HEBN Publisher Plc.

Eniayeju, I. E. (2005). Improvisation for effective learning of Physics. *The Asaba Technical and Science Education*, 1(1), 92-93

Federal Ministry of Education (2013). *Senior secondary education curriculum chemistry for SS1-SS3*, Abuja: Nigerian Educational Research and Development Council (NERDC) Press.

Gotip, N. W., Azi, A. S., & Kankani, J. P. (2018). Economics teachers' attitude and challenges of improvisation and utilization of improvised teaching materials in secondary schools. *Africa Education Evaluation,* 2(1) 1-11.

Igwe, I. O., Arisa, A. B., & Ibe, J. O. (2013). Problems of improvising instructional materials for teaching and learning chemistry. In O.S Abonyi (Eds), *54th Annual Conference of STAN,* 273-278, Ibadan: HBBN Publishers Plc.

Igwe, I. T. (2000). Problems of improvising instructional materials for teaching and learning of Biology. *Journal of Science Teachers Association of Nigerian*, 40 (122), S1-56.

Iliya, J. M. (2019). Innovative improvisation approach as measure of improving senior secondary school the students' academic achievement in chemistry. In A.S Ifamuyiwa (Eds), 425-435, Abuja: The STAN Place Ltd.

Johnson, S. I. (2000). Improvisation and low cost production for science education concept and information. P*aper Presented at Room 803 during School of Science Seminar Series at Federal College of Education FCE Kano on 30th sept.*

Kola, J. K. (2013). Effective teaching and learning of science education through Information and Communication Technology (ICT). *Journal of Research and Method in Education,* 2(5), 43-47

Megbo, B. C., & Saka, A. (2015). Evaluation of modern development in teaching and learning process through instructional materials utilization. *International Journal of Multidisciplinary Research Development* 2(9), 123-127

National Teachers Institute (NTI, 2007). *Improvisation of instructional material manual for retraining of primary school teachers*, Kaduna: NTI press.

Nwosu, A.P.J., Ibe, E., & Folorunsho, O. (2013). Senior secondary school students improvisation of ecological instructional materials: Implication for attainment of millennium development goals. In S. O. Abonyi (Eds), *54th Annual Conference Proceedings of Science Teacher's Association of Nigeria*, 235-241, Ibadan: HEBN Publishers Plc.

Olusa, O. L. (2019). Influence of teachers improvised instructional materials on senior secondary school students' achievement in biology. In A. S. Ifamuyiwa (Eds),*60th Annual conference proceedings of STAN,* 333-340 Abuja: STAN place plc.

Omiko, A. (2016). Investigating the availability and extent of use of instructional material by secondary school chemistry teachers in Nigeria. *International Journal of Education, Learning and Development,* 4(3), 1-11.

Onasanya, S. A., & Omosewo, E. O. (2011). Effect of improvised and standard instructional materials on secondary school students' academic performance in physics in Ilorin, Nigeria. *Singapore Journals of Scientific Research,* 1(1), 68-78.

Zubairu, A. (2014). Investigation of students attitude toward learning physics in federal college of education (FCE) Zaria. In S. O. Abonyi (Eds). *55th Annual Conference Proceeding of Science Teachers Association of Nigeria* 339-344, Ibadan: HEBN publishers Plc.