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Availability and Utilization of Instructional Materials for Teaching Chemistry in Senior Secondary Schools

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Abstract: **The study focused on the availability and utilization of instructional materials for teaching chemistry in senior secondary schools in Ankpa Local Government Area of Kogi State. Four research questions were posed to guide the study. It adopted descriptive survey design. The sample size comprised of 36 chemistry teachers in 30 secondary schools selected by simple random technique from the total population of 75 secondary schools in Ankpa Local Government Area of Kogi State. Two instruments namely checklist of availability of instructional materials (r = 0.71) and teachers' questionnaire titled utilization and inhibiting factors chemistry questionnaire (r =0.76) were used for data collection. The data obtained were analysed using simple percentage, mean and standard deviation. The results revealed that good number of laboratory equipment and audio instructional materials were available but were not adequately utilized and the audio visual materials were neither available nor utilized for chemistry instruction. It was also found that lack of fund, poor implementation policy, lack of motivation among others were the factors inhibiting effective provision and utilization of instructional materials for chemistry instruction. It was recommended that chemistry teachers should endeavour to utilize the available instructional materials and that government should ensure adequate provision of fund for the procurement of the instructional materials.**

Keywords: **Availability, chemistry, Instructional materials, senior secondary, Teaching, Utilization.**

1. INTRODUCTION

Chemistry is defined as the study of nature, composition and properties of matter and the changes it undergoes (Ojokuku, 2010). Science Teachers Association of Nigeria (STAN, 2016) broaden the definition of chemistry as a branch of science that studies the properties of matter in terms of compositions, structures, transformations, interactions and energy implications of chemical changes. Chemistry can also be defined as the constitution, properties and uses of matter and the changes it undergo as a consequence of alterations in the composition of their molecules. The Federal Ministry of Education (2007) of Nigeria through the Senior Secondary Education Curriculum, stipulated the objectives of chemistry education among others are: develop interest in the subject of chemistry; acquire basic theoretical/practical knowledge and skills in chemistry; apply skills to meet societal needs of creating employment and wealth; and adequately prepared for further studies in chemistry.

Despite these laudable objectives of teaching chemistry in senior secondary education in Nigeria, students perform woefully in internal and external examinations. The evidence of the above statement was reflected on the May/June chief examiners' report of West African Examination Council (WAEC; 2013). According to the report (May/June 2008 - 2012), the pass rate at credit level recorded for 2008 – 2012 are 43.46%, 43.69%, 50.70%, 49.54% and 43.13% for the years 2008, 2009, 2010, 2011 and 2012 respectively. Several factors are responsible for students' poor achievement in

chemistry and they are: lack of qualified teachers; poor methods of teaching; poor training of teachers; lack of recommended text books, lack of chemistry laboratory; non-availability and use of instructional materials; etc. (Ezeliora 1999; Ifeakor 2006; Achimugu 2016). Some researchers have reported that lack and non-use of instructional materials is one of the major contributors to students' poor achievement in science subjects (Awobodu 2002; Eze and Nwafor, 2012). This is supported by the assertion of Oladejo, Ojebisi, Olusunde and Isola (2011) that there is positive correlation between academic achievement and use of instructional materials in teaching science subjects.

Agina (2005) defined instructional materials as concrete or physical objects which provide sound, visual or both to the sense organs during teaching. Afforma (1994) defined instructional materials as materials that facilitate teaching and learning activities and consequently the attainment of the lesson objectives. she grouped them into three main types: Visual aids which appeal to the sense of seeing (examples are: charts, maps, objects, pictures, etc); Audio aids which appeal to the sense of hearing (examples are; radios, radio cassette, record player, gramophone, etc); and audio-visual aids which appeal to the sense of sight and hearing (examples are; television, computers, projectors, video films). Ukoha (1996) defined instructional material as educational media that helps learners to understand concrete concepts, principles and ideas during teaching and learning process. He grouped them into two broad categories: Printed Media (examples are textbooks, photographs, pictures, pamphlets, journals etc); non-printed media made of low cost media (examples are posters, models, wall charts, diagrams, etc) and electronic media (examples are audio cassettes, video films, computers, film projectors, television sets, radio recorders, etc). According to Megbo and Saka (2015), effective teaching cannot be fully accomplished without the use of instructional materials because they promote closer and effective communication between the teacher and learners. Contributing to the importance of instructional materials Mwangi (2006) pointed out that instructional materials serve in enhancing retention, stimulating students' interest and making learning more permanent by providing firsthand experience with the realities of the physical and social environment.

From the importance of instructional materials, it is clear that any effort to enhance effective teaching and learning of chemistry will encompass the availability and use of instructional materials. Studies on the area of availability and utilization of instructional materials for teaching chemistry have been reported in contradicting manners. For instance, study by Ifeakor (2006) found out that some material resources are available and adequate but are partly used in teaching and learning chemistry, while Nnorom (2012) and Achimugu (2016) reported that most instructional materials for teaching science were neither available or utilized for teaching-learning process. The implication of these conflicting reports calls for more research efforts in this direction. Therefore the researcher seeks to find out the level of the availability and utilization of instructional materials for teaching chemistry in Ankpa Local Government Area of Kogi State.

STATEMENT OF PROBLEM:

Despite all the efforts made to ensure effective teaching and learning of chemistry at the secondary school level in Nigeria, the problem of students' poor achievement in chemistry in internal and external examination have remained unsolved (Olorundare). This high failure rate has been attributed to many factors including non-availability and non-utilization of instructional materials in teaching and learning science subjects in secondary schools in Nigeria. The problem of the study put in question form: To what extent are the instructional materials available and utilized by chemistry teachers in teaching and learning chemistry? Thus, the researcher is poised to investigate the extent of availability and utilization of instructional materials for teaching chemistry in selected senior secondary schools in Kogi State.

PURPOSE OF THE STUDY:

The main purpose of the study is to ascertain the availability and utilization of instructional materials in teaching chemistry in senior secondary schools. Specifically, the study sought to find out:

(1) The extent to which instructional materials are available for teaching chemistry in the senior secondary schools.

(2) The extent to which teachers utilize the available instructional materials in teaching chemistry in senior secondary schools.

(3) The factors that inhibit effective provision of instructional materials for teaching chemistry in senior secondary schools

(4) The factors that inhibit effective utilization of instructional materials for teaching chemistry in senior secondary schools.

RESEARCH QUESTIONS:

The following research questions guided the study.

1. What are the instructional materials available for teaching chemistry in the senior secondary schools?
2. To what extent do teachers utilize the available instructional materials for teaching chemistry in the senior secondary schools?
3. What are the factors inhibiting effective provision of instructional materials for teaching chemistry in the senior secondary schools?
4. What are the factors inhibiting effective utilization of instructional materials for teaching chemistry in the senior secondary schools?

2. METHODS

The researcher adopted descriptive research of the survey type. The target population was all the chemistry teachers in both the public and private senior secondary schools in Ankpa Local Government Area of Kogi State. A simple random sampling technique by balloting was used to select 30 schools from the total population of the 75 senior secondary schools in the Local government. All the 36 chemistry teachers in the sampled schools were used for the study. Two instruments were used for data collection: checklist of Availability of Instructional Teaching Chemistry (CAIMTC); and a questionnaire titled Utilization and Inhibiting Factors Chemistry Questionnaire (UIFCQ). The checklist contains the list of chemistry instructional materials that are required for effective teaching and learning of the subject at the secondary school level and the researcher has to tick, if the materials were available or not by his personal observation. The questionnaire was divided into four sections. Section A was designed to provide background information of the respondents, Section B dealt with the extent of the utilization of instructional materials by the chemistry teachers on four point scale of: very often, often, rarely and never. Finally section C and D dealt with the factors inhibiting effective provision and utilization of instructional materials on four point scale of: Strongly Agree, Agree, Disagree and Strongly Disagree respectively. The CAIMTC was designed to answer research question one and the benchmark was given as 50%. Any item that was above 50% was regarded as available and any item below 50% was regarded as not available. For UIFCQ, score-values were assigned to the responses using the four point scale as follows: Strongly Agree, Very often = 4; Agree, often = 3; Disagree, rarely = 2 and Strongly Disagree, never = 1for positive statements. The decision rule was that any statement having a mean score of 2.50 and above stood for agreement while the mean score rating of below 2.5 stood for disagreement. To ensure the validities of the two instruments, the drafts of the checklist and questionnaire were given to two experts in chemistry education and one expert in measurement and evaluation. The experts were required to check the appropriateness of the items in terms of coverage, clarity of language, suitability and relevance. The opinions and suggestions of the experts led to the emergence of the final instruments which were used for this study. The reliability of the instruments were determined through pilot study. This was done by administering the two instruments to chemistry teachers in ten senior secondary schools that were not part of the sample. Thereafter, the reliability coefficients of CAIMTC and UIFCQ were calculated using Cronbach Alpha procedure and the values were 0.71 and 0.76 respectively. The reliability coefficient determined for the two instruments respectively were considered good enough to be used for this study. The researcher personally administered the checklist and questionnaire with the assistance of two research assistants. And there were 100% return of the instrument. The data collected were analyzed using simple percentage to answer research question 1 and mean and standard deviation to answer research questions: 2, 3 and 4.

3. RESULTS

The results are presented according to the research questions that guided the study.

Research Question one:

What are the instructional materials available for teaching chemistry in senior secondary schools?

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Table 1: Frequency and Percentage Availability of Instructional Materials in the Sampled Senior Secondary Schools

S/N	*Instructional Materials*	*Available*		*Not Available*		
		Frequency	*Percentage (%)*	*Frequency*	*Percentage (%)*	***Decision***
(i)	A. Laboratory Equipment *General*					
1.	General Chalkboards	26	87	4	13	Available
2.	Electricity Supply	6	20	24	80	Not available
3.	Fire extinguishers	16	53	14	27	Available
4.	First Aid Boxes	18	60	16	40	Available
5.	Gas/Bunsen burners	22	73	8	27	Available
6.	Laboratory (Chemistry)	20	67	10	33	Available
7.	Laboratory Coats	17	57	13	43	Available
8.	Models in Chemistry	22	73	8	27	Available
9.	Pictures and life samples	16	53	14	47	Available
10.	Protective goggles	14	47	16	53	Not available
11.	Sand buckets	15	5%	15	5%	Available
12.	Tables and Stools	20	67	10	33	Available
13.	Text-books/work books	22	73	8	27	Available
14.	Wall Charts	24	80	6	20	Available
15.	Water Supply	12	40	18	60	Not available
(ii)	*Apparatus*					
16.	Balances for weighing	18	60	12	40	Available
17.	Beakers	22	73	8	27	Available
18.	Burettes	24	80	6	20	Available
19.	Evaporating Dishes	20	67	10	33	Available
20.	Flasks	24	80	6	20	Available
21.	Funnels	24	80	6	20	Available
22.	Gas Jars	12	40	18	60	Not available
23.	Glass rods	20	67	10	33	Available
24.	Mortars and pestles	18	60	12	40	Available
25.	Pipettes	20	67	10	33	Available
26.	Report Stands	20	67	10	33	Available
27.	Rubber tubing	22	73	8	27	Available
28.	Test Tubes	24	80	6	20	Available
29.	Tripod Stands	20	67	10	33	Available
30.	Wash bottles	22	73	8	27	Available
31.	Wire gauzes	22	73	8	27	Available
32.	White tiles	20	67	10	33	Available
33.	Weighing bottles	18	60	12	40	Available
(iii).	Chemicals					
34.	Ammonia Chloride	15	50	15	50	Available
35.	Ammonium trioxonitrate(V)	12	40	18	60	Not available
36.	Ammonium hydroxide	18	60	12	40	Available
37.	Barium Chloride	16	53	14	47	Available
38.	Benzoic acid	10	33	20	67	Not available
39.	Calcium Chloride	14	47	16	53	Not available
40.	Calcium hydroxide pellets	18	60	12	40	Available
41.	Copper(II) Chloride	8	30	22	70	Not available
42.	Copper(II) trioxocarbonate(IV)	10	33	20	67	Not available
43.	Copper tetraoxosulphate(VI)	18	60	12	40	Available
44.	Ethanoic acid	10	33	20	67	Not available
45.	Ethanol	11	37	19	63	Not available

46.	Fehling Solution	12	40	18	60	Not available
47.	Iron(II) chloride	17	57	13	43	Available
48.	Iron(II) tetraoxosulpahte(VI)	20	67	10	33	Available
49.	Iron filing	18	60	12	40	Available
50.	Iodine	20	67	10	33	Available
51.	Lead ethanoate (Acetate)	15	5	15	5	Available
52	Litmus Paper	24	80	6	20	Available
53.	Litmus salts	12	40	18	60	Not available
54.	Lead tetraoxonitrate(V)	15	50	15	50	Available
55.	Magnesium ribbons	10	33	20	67	Not available
56.	Methanol	10	33	20	67	Not available
57.	Methyl orange Indicators	20	67	10	33	Available
58.	Methyl red indicators	18	60	12	40	Available
59.	Million reagents	12	40	18	60	Not available
60.	Potassium tetraoxomagnate(VII)	18	60	12	40	Available
61.	Potassium heptaoxodichromate(VII)	16	53	14	47	Available
62.	Potassium hexacynoferrate(II)	15	50	15	50	Available
63.	Potassium hydroxide	20	67	10	33	Available
64.	Phenolphalein indicator	22	73	8	27	Available
65.	Sodium tetraoxosulphate(VI)salts	20	67	10	33	Available
66.	Sodium hydroxide	24	50	6	20	Available
67.	Sodium trioxocarbonate(IV)salt	22	73	8	27	Available
68.	Sodium trioxonitrate(V)salts	6	20	24	80	Not available
69.	Silver trioxonitrate(V)salts	15	50	15	50	Available
70.	Tetraoxosulphate(VI)acid	18	60	12	40	Available
71.	Trioxonitrate(V)acid	16	53	14	47	Available
72.	Zinc trioxonitrate(V)salt	15	50	15	50	Available
B.	*Audio Materials*					
73.	Cell Phones	18	60	12	40	Available
74.	Loudspeakers	16	53	14	47	Available
75.	Microphones	22	73	8	27	Available
76.	Radio sets	20	67	10	33	Available
77.	Record Players	8	27	22	73	Not available
78.	Tape recorders	15	50	15	50	Available
C.	*Audio – Visual Materials*					
79.	Desk top computers	12	40	18	60	Not available
80.	Education softwares	8	27	22	73	Not available
81.	Electronic white boards	10	33	20	67	Not available
82.	Flash Drivers/CD – ROM	10	33	20	67	Not available
83.	Film projectors/Film strips	6	20	24	80	Not available
84.	Lap top computers	10	33	20	67	Not available
85.	Overhead projector/power point presentation	8	27	22	73	Not available
86.	Satellite dishes/internet	4	13	26	87	Not available
87.	Television sets	12	40	18	60	Not available
88.	Video machines/CD plates	6	20	24	80	Not available

Data in table 1 shows that all the laboratory equipment under the sub-heading, *(General)* are available except for items 2, 10 and 15 (i.e 3 out of 15). On the apparatus, all the items are available except for items 22 (i.e 1 out of 18). For chemicals most of them are available except for items: 35, 38, 41, 42, 44, 45, 46, 53, 55, 56, 59 and 58 (i.e 12 out of 39).Table 1 shows also that all the audio instructional materials are available except item 77 (i.e 1 out of 6), while all the audio-visual materials are not available (i.e 79 – 88).

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RESEARCH QUESTIONS TWO:

To what extent do teachers utilize the available instructional materials for teaching chemistry in the senior secondary schools?

Table 2: Mean Ratings and Standard Deviation of Responses on the Extent to Which Teachers Utilize the Available Instructional Materials for Teaching Chemistry in Senior Secondary Schools.

S/N	*Instructional Materials*	*Mean*	*Standard Deviation*	*Decision*
A.	*Laboratory Equipment*			
(i)	General			
1.	Chalkboards	3.46	1.08	Utilized
2.	Electricity Supply	0.95	1.34	Not utilized
3.	Fire extinguishers	2.50	120	Utilized
4.	First Aid boxes	2.36	1.22	Not utilized
5.	Gas/Bunsen burners	2.64	1.13	Utilized
6.	Laboratory chemistry	3.05	1.10	Utilized
7.	Laboratory Coats	2.42	1.20	Not utilized
8.	Models on chemistry	2.36	1.24	Not utilized
9.	Pictures / life samples	2.74	1.21	Utilized
10.	Prospective goggles	2.36	1.24	Not utilized
11.	Sand buckets	2.56	1. 2	Utilized
12.	Tables and Stools	3.22	1.06	Utilized
13.	Textbooks / workbooks	3.15	1.12	Utilized
14.	Wall charts	3.34	1.16	Utilized
15.	Water Supply	0.94	1.31	Not utilized
(ii).	Apparatus			
16.	Balances for weighing	2.86	1.24	Utilized
17.	Beakers	3.19	1.16	Utilized
18.	Burettes	3.28	1.19	Utilized
19.	Evaporating dishes	3.16	1.14	Utilized
20.	Flasks	2.88	1.22	Utilized
21.	Funnels	2.92	1.24	Utilized
22.	Gas Jars	2.04	1.21	Not utilized
23.	Glass rods	2.56	1.26	Utilized
24.	Mortars and pestles	2.64	1.22	Utilized
25.	Pipettes	3.15	1.16	Utilized
26.	Report stands	3.26	1.26	Utilized
27.	Rubber tubing	2.78	1.20	Utilized
28.	Test tubes	3.18	1.22	Utilized
29.	Tripod stand	3.07	1.20	Utilized
30.	Wash bottles	3.18	1.18	Utilized
31.	Wire gauzes	3.16	1.24	Utilized
32	White tiles	3.23	1.21	Utilized
33.	Weighing bottles	2.84	1.20	Utilized
(iii)	Chemicals			
34	Ammonium chloride	2.64	1.26	Utilized
35.	Ammonium trioxonitrate(V)	2.23	1.28	Not utilized
36.	Ammonium hydroxide	3.24	1.16	Utilized
37.	Barium chloride	3.31	1.03	Utilized
38.	Benzoic acid	2.09	1.21	Not utilized
39.	Calcium chloride	2.84	1.22	Utilized
40.	Calcium hydroxide pellets	3.18	1.19	Utilized
41.	Copper(II)chloride	2.02	1.15	Not utilized

42.	Copper(II) trioxocarbonate(IV)	1.57	1.26	Not utilized
43.	Copper tetraoxosulphate(VI)	3.31	1.17	Utilized
44.	Ethanoic acid	1.96	1.32	Not utilized
45.	Ethanol	1.82	1.33	Not utilized
46.	Fehling solution	2.07	1.26	Not Utilized
47.	Iron (II) chloride	2.77	1.24	Utilized
48.	Iron (II) tetraoxosulphate(VI)	3.14	1.28	Utilized
49.	Iron filing	2.64	1.25	Utilized
50.	Iodine	2.32	1.28	Not utilized
51	Lead ethanoate(acetate)	2.56	1.26	Utilized
52.	Litmus papers	3.36	1.19	Utilized
53.	Litmus salts	2.29	1.20	Not utilized
54.	Lead trioxonitrate(V)	2.66	1.20	Utilized
55	Magnesium ribbons	2.47	1.24	Not utilized
56.	Methanol	1.76	1.28	Not utilized
57.	Methyl orange indicators	3.22	1.20	Utilized
58	Methyl red indicators	2.86	1.22	Utilized
59.	Million reagents	1.75	1.28	Not utilized
60.	Potassium tetraoxomagnate(VII)	2.84	1.26	Utilized
61.	Potassium heptaoxodichromate(vii)	2.69	1.24	Utilized
62.	Potassium hexacyanoferrate(II)	2.34	1.25	Not utilized
63.	Potassium hydrotide	2.56	1.24	Utilized
64.	Phenolpthalein indicators	2.98	1.24	Utilized
65.	Sodium tetraoxosulphate(VI)	3.32	1.18	Utilized
66.	Sodium hydroxixe salts	3.44	1.16	Utilized
67.	Sodium trioxocarbonate(IV)	3.36	1.12	Utilized
68.	Sodium trioxonitrate(V) salts	2.38	1.20	Not utilized
69.	Silver trioxonitrate(V)salts	2.85	1.22	Utilized
70.	Tetraoxo sulphate(VI)acid	3.26	1.14	Utilized
71.	Trioxonitrate(V)acid	3.21	1.16	Utilized
72.	Zinc trioxonitrate(V)salts	3.28	1.12	Utilized
B.	*Audio Materials*			
73.	Cell phones	1.66	1.28	Not utilized
74.	Loudspeakers	2.16	1.24	Not utilized
75.	Micro phones	2.32	1.26	Not utilized
76.	Radio sets	1.42	1.28	Not utilized
77.	Record players	1.28	1.27	Not utilized
78.	Tape recorders	1.36	1.32	Not utilized
C.	*Audio – Visual Materials*			
79.	Desk top computers	2.17	1.34	Not utilized
80.	Education softwares	1.15	1.31	Not utilized
81.	Electronic white boards	1.18	1.32	Not utilized
82.	Flash drives/CD – roms	1.54	1.36	Not utilized
83.	Film projectors/Film strips	1.01	1.34	Not utilized
84.	Laptop computers	2.28	1.38	Not uitilized
85.	Overhead projectors/power points/presentation	0.86	1.38	Not utilized
86.	Satellites / Internet services	0.64	1.36	Not utilized
87.	Television sets	1.02	1.39	Not utilized
88.	Video machines / CD plates	0.98	1.38	Not utilized

Table 1 result shows that under the heading laboratory equipment, (general, apparatus and chemicals), out of 72 items, only 21 items are not utilized (2, 4, 7, 8, 10, 15, 22, 35, 38, 41, 42, 44, 45, 46 50, 53, 55, 56, 58, 59 and 62). The rest 51

items are utilized for chemistry instruction. The results also showed that all the audio and audio-visual instructional materials (73 - 88) are not utilized for chemistry instruction.

RESEARCH QUESTIONS THREE:

What are the factors inhibiting the effective provision of instructional materials for teaching chemistry in senior secondary schools?

Table 3: Mean Rating and Standard Deviation of Teachers' Responses on the Factors that Inhibit Effective Provision of Instructional Materials for Teaching Chemistry in Senior Secondary Schools.

S/N	*Factors*	*Mean*	*SD*	*Decision*
89.	Lack of fund to procure instructional materials.	3.56	0.84	Agreed
90.	High cost of instructional materials.	3.48	0.96	Agreed
91.	Lack of political will of government in power.	3.18	0.92	Agreed
92.	Mismanagement of fund meant to purchase instructional materials.	2.98	1.12	Agreed
93.	Poor implementation of educational policies.	3.06	1.01	Agreed

The result in table 3 shows that the five factors (89 – 93) scored above the criterion mean of 2.50. This implies that the five factors inhibit the effective provision of instructional material for chemistry instruction.

RESEARCH QUESTION FOUR:

What are the factors inhibiting the effective utilization of instructional materials for teaching chemistry in the senior secondary schools?

Table 4: Mean Rating and Standard Deviation on Teachers' Responses on Factors Inhibiting Effective Utilization of Instructional Materials for Teaching Chemistry in Senior Secondary Schools (SSS).

S/N	*Factors*	*Mean*	*SD*	*Decision*
94.	Lack of technical skills on part of chemistry teachers.	2.65	1.22	Agreed
95.	Lack of supervision of teachers by the school authority.	2.84	1.16	Agreed
96.	Lack of in-service training for serving chemistry teachers.	2.96	1.18	Agreed
97.	Lack of chemistry laboratory technicians.	3.02	1.02	Agreed
98.	Lack of motivation of chemistry teachers.	3.32	0.88	Agreed
99.	Short periods allocated to chemistry classes on the school time-table.	3.16	0.96	Agreed
100.	Embezzlement of funds Meant for instructional materials by the school principals.	2.88	1.12	Agreed
101.	Large class size.	2.91	1.08	Agreed

From table 4, items 94 to 101 had the mean scores above the acceptable cut-off point of 2.50 and above. This implies that chemistry teachers agreed that all the above seven items inhibit effective utilization of instructional materials in teaching chemistry in senior secondary schools.

4. DISCUSSION

The findings of this study revealed that most laboratory equipment and audio materials for teaching chemistry in senior secondary schools were available in the schools while all the audio-visual instructional materials were not available. The finding of this study collaborates with the findings of Eze and Nwafor (2012) and Ahmed, Abimbola, Omosewo and Akanbi (2012) who revealed that only 2 – dimensional instructional materials such as consumables (chemicals) and non-consumables (equipment) are available in the sampled school and that audio-visual instructional materials were lacking. Also the finding of this work is in conformity with that of Achimugu (2016) who asserted that most schools do not have audio-visual instructional materials. This implies that chemistry teachers in Kogi State Nigeria are yet to join the rest of the world in the use of ICT in teaching and learning chemistry. A careful observation indicates, that most of the available

equipment and chemicals are the ones required by WAEC and NECO for their practical examinations. In other words, equipment and chemicals that deal with concepts that WAEC and NECO do not set practical questions are not available in the sampled schools. The educational implication of this is that WAEC and NECO should spread their practical examination questions to cover all the concepts in the senior secondary education curriculum. In this way, many senior secondary schools would be encouraged to purchase the required equipment and chemicals for chemistry education in their schools.

From table 2, the finding of the study revealed that some of the available laboratory equipment (Apparatus and chemicals) were not utilized for chemistry instruction. Equally, all the audio instructional materials were not utilized by chemistry teachers even though, they were available. Finally, the audio-visual materials were neither available nor utilized by the chemistry teachers in teaching chemistry in the sampled schools. This findings is in line with the finding of Eya and Elechi (2011) and Onwuaicho (2011) who found that most senior secondary science teachers do not utilize the few available materials such as consumables and audio-visual instructional materials in teaching science subjects. The finding is also corroborates with the works of Ezeoba (2007), Fakeye (2010) and Achimugu (2016) who asserted that ICT resources are not available in most secondary schools and that the few ones available are not properly utilized by the teachers.

From table 3, the finding revealed that, the chemistry teachers sampled for this study agreed that the factors inhibiting effective provision of instructional materials for teaching chemistry include: lack of fund; high cost of instructional materials, lack of political will of government in power, mismanagement of educational funds and poor implementation of educational policies. These problems need to be tackled to ensure smooth provision of instructional materials for teaching and learning chemistry.

Finally, table 4 revealed that factors inhibiting the effective utilization of instructional materials for chemistry instruction include: lack of technical skills, lack of supervision of teachers, lack of in-service training programmes, lack of laboratory technicians, lack of motivation of teachers, short periods allocated to chemistry lessons in the school timetable and embezzlement of school fund by the school principals. This finding is in line with the finding of Aburine (2005) who equally identified the above named factors as serious factors militating against effective utilization of instructional materials for teaching and learning process.

5. CONCLUSION

The finding of the study has provided the basis for the researcher to conclude that most of the laboratory equipment and audio instructional materials were available but a good number of them were not utilized for chemistry instruction. Furthermore, all of the audio-visual instructional materials were neither available nor utilized for chemistry instruction. The finding also revealed that some factors such as: lack of funds, lack of political will of government in power, mismanagement of education funds, lack of in-service training, lack of motivation of teachers among others inhibit effective provision and utilization instructional materials for teaching chemistry. Therefore, to achieve the goals of chemistry education, all stakeholders (Government, Principals, teachers and students) should device very good strategies to ensure adequate provision and utilization of instructional materials for chemistry instruction in our schools.

6. RECOMMENDATIONS

1. Chemistry teachers should endeavour to utilize audio and audio-visual instructional materials during chemistry instruction

2. Training of chemistry teachers should be reviewed to include emphasis on knowledge and skills related to emerging technologies such as the use of visual and audio-visual instructional materials in teaching chemistry.

3. Government should ensure adequate provision of fund for the procurement of audio-visual instructional materials as well as other essential laboratory equipment that are not available in our senior secondary schools.

4. Examining bodies such as WAEC and NECO should set practical examination questions in such a way to cover all the concepts that required the use of instructional materials in the senior secondary chemistry education curriculum.

5. Government at various levels and principals of senior secondary schools should ensure strict supervision of the chemistry teachers use of instructional materials in order to make them live up to their instructional responsibilities.

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