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Impacts of Integrating Practical Classes into the Teaching of Chemistry in Senior Secondary Schools

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Abstract

This study was designed to investigate the impacts of integration of practical into the teaching of chemistry in some selected senior secondary schools in Abuja Municipal Area Council. A survey research design was adopted for the study while simple random sampling technique was used to select a total of 200 respondents from six schools in Abuja Municipal Area Council of the Federal Capital Territory that constituted the sample size for the study. The main instrument used for the study was questionnaire and the data collected were analysed using frequency counts and percentage. The findings of the study revealed that practical helps for better assimilation of chemistry and lack of equipped school laboratory inhibits practical chemistry in our schools. Based on these, it is recommended that teachers should utilize experimental methods in teaching science subjects and government should provide teaching materials, laboratory equipment, and standard curriculum so as to enhance the teaching and learning of chemistry in our secondary schools.

Keywords: Chemistry, Practical Classes, Senior Secondary Schools

INTRODUCTION

In Nigeria, science and technology is indispensable because it has proved to be bedrock of Nigerian economy and industrial development. It is basic in the sense that it required for daily human activities. Ikerionwu, (2006) asserted that the Nigerian education is geared toward science and technology because science and technology are the potent instruments for preparing the young generation for learning and integrating themselves into the society. It makes the learners more flexible, responsive and adaptable to the challenges of the environment. It is worthy to note that the major advances made in Medicine, Pharmacy, Industrial and Engineering and Chemistry are based on researches. Chemistry is one of the three main branches of pure science, the other two being biology and physics. Chemistry deals with the composition, properties and uses of matter. It probes into the principles governing the changes that matter undergoes. Our world is made up of matter. We study chemistry to acquire knowledge about matter, we perform experiment to learn to observe, record and make intelligent inferences. Studying chemistry gives us training in the scientific method.

Teachers, parents and administrators are being faced with many changes in education. Many people are concerned that the high school graduates are not capable of making real-life decisions. One reason is the claim by Anderson, Anderson, Varanka-Martin, Romangnano, Bielenberg, Flory, Miera, Whitworth (1992), Ezike (1985) and Gallagher, Sher, Stephen & Workman (1998), Zoller (1993), in Oloruntegbe and Alake (2010), was that eighty five percent of teachers' questions and methods do not provoke high-order thinking but recall on simple comprehension of materials of learning.

As a result students see chemistry teaching as unpopular (Krajcik, Mamlok and Hug 2001; Osborne and Collins 2001, Sjoberg 2001; WCS 1999, Holbrook, 2009), because there is a gap

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between their wishes and teachers' teaching (Hofstein, Camini, Mamlok and Ben, 2000, 2001; Yager and Weld, 2000; Holbrook and Rannikmae, 2002).

Chemistry discipline should equip learners with knowledge needed to solve every day real world problem Fahmy (2000), stated that this is the most interesting thing about the discipline. Cognitive scientists posit that learning results from the exploration of the environment (Bruner, 1966; Gagne, 1976; Inhelder & Piaget, 1958; in Piaget, 2001) and that the learning so acquired will in turn help the learner solve his own problem as he/she interacts with the environment i.e. the laboratory (Kim, Bonk & Teng, 2007). Thus, the study tends to examine the impacts of integrating practical classes into the teaching of chemistry in selected senior secondary schools.

Science is an integral part of everyone's life, and science knowledge and skills provide practical assistance in helping people make informed decisions of the way of life that are best suited for them, explained Spanish society of biology (2012). The Current West Africa Examination Council (WAEC) syllabus (WAEC, 2012) in use in 2014, recommended that the teaching of all science subjects listed in the syllabus should be practical based. This is to demonstrate the importance of practical work in science. Erten (2000), said that laboratory activities and applied studies have an important and central role on the science education and lots of scientific results also support thesis. Serin (2002), said that laboratory practical is the complementary part and focus point of science education.

Practical carried out in the laboratory, according Nzewi (2008), engages students in hands-on, mind-on activities, using varieties of instructional materials/equipment to drive lesson home. In majority of undergraduate programmes taught in the science, engineering and medical disciplines students will be required to undertake practical and/or laboratory work. In other disciplines that are science or science related, practical work has major role to play. Tatli (2011), emphasized that in constructive learning approach, students construct actively their knowledge by thinking, doing and interacting with the environment (Yidldrim, 2009). Also, Tamir (1991), noted that the prerequisite knowledge of concept and principles can be obtained only if the students have certain underlying capability of the science processes, which are needed to practise and understand science subject especially in Chemistry.

STATEMENT OF THE PROBLEM

There is increase in lack of understanding, comprehension and assimilation of chemistry as a science subject. This can be related to the fact that chemistry students require practical for the in-depth understanding of the subject as majority of the concepts in chemistry seem to be abstract expect for the aid of the practical classes which help the these students to visualize what they have been taught. For instance colour change, odour, energy release etc., during practical classes' further aid understanding of various concepts as chemistry is identified to be science that deals with the properties, composition and structure of substances, the transformations that they undergo, and the energy that is released or absorbed during these processes.

According to Bello and Ajayi (2001), chemistry is the scientific study of matter, its properties, and interactions with other matters and with energy. It is the development of a coherent explanation of complex behaviour of materials, why they appear as they do, what gives them their enduring properties and have interactions among different substances and bring about the formation of new substances and the destruction of old ones. On the note of the observations, it becomes necessary to assess impacts of integrating practical classes into the teaching of chemistry in senior secondary schools.

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Based on the about statement, the present study posed four research questions to guide the study:

I. What are the impacts of integrating practical classes into the teaching of Chemistry?
II. How often is the teaching of practical chemistry in senior secondary schools?
III. What are the problems inhibiting practical chemistry in Abuja Municipal Area Council (AMAC)?
IV. What are the possible recommendations of these problems of laboratory method of teaching science subjects in our secondary schools?

METHODS

The study was conducted in Abuja Municipal Area Council (AMAC) of Federal Capital Territory. The study employed survey design that is descriptive in nature; six schools were selected within Abuja Municipal Area Council (AMAC). The instrument for data collection was questionnaire. The questionnaire was validated by two chemistry teachers and one lecturer in chemistry education, University of Abuja. Simple random sampling technique was used to select the sample for the study. 200 students were selected from the six secondary schools and the data collected were analysed using frequency counts and simple percentages.

RESULTS

The sample (n=200) consisted of 112 (56%) male and 88(44%) female students. They have average age of 16.2 and they are all in SS2 chemistry class.

Table 1 Research Question one: What are the impacts of integration of practical into the teaching of chemistry?

Sr#	Statement	Agree	%	Disagree	%
1	Integration of practical helps for better assimilation of science theories.	161	80.5	39	19.5
2	Pre-requisite knowledge of concept and principles can be obtained in practical lessons.	148	74.5	52	26.0
3	Integration of practical promotes process skills for solving our daily problems	189	94.5	11	5.5
4	The level of science and technology in our country is dependent on the extent of integration of practical into science subjects.	125	62.5	75	37.5
5	Integration of practical has the aim of training the students in the process of scientific investigation.	171	85.5	29	14.5

Table 1 shows that 161(80.5%) respondents agreed that integration of practical helps for better assimilation of scientific theories while 39(19.5%) disagreed. In another fashion, 148(74.0%) respondents agreed that pre-requisite knowledge of concept and principles can be obtained in practical lessons, while 52(26.0%) disagreed. 189 (94.5%) respondents agreed that integration of practical promotes skills for solving our daily problem, while 11(.5%) respondents disagreed with the statement. 125(62.5%) respondents agreed that the level of science and technology in our country is depend on the extent of integration of practical into science subjects, while 75(37.5%) respondents disagreed. Also, 171(85.5%) respondents agreed that integration of practical is aimed at training students in the process of scientific investigations, while 29(14.5%) respondents disagreed. From the above analysis, there is a clear indication that integration of practical has a positive impact.

Table 2 Research Question two: How often is the teaching of practical chemistry in Senior Secondary Schools in Abuja Municipal Area Council?

S/N	Statement	Agree	%	Disagree	%
1	Frequency of practical lessons helps in the Development of Practical Skills	181	90.5	19	9.5
2	The Frequency of Experiments make Chemistry more meaningful to the learner	147	73.5	53	26.5
3	Frequent Practical work promotes development of systematic reasoning and predictive ability in students.	128	64.0	72	36.0
4	The Frequency doing of experiments make the learner see the practical use of Chemistry theories in everyday life.	165	82.5	35	17.5

Table 2 shows that, 181(90.5%) respondents agreed that frequent practical lessons help in the development of practical skills, while 19(9.5%) respondents disagreed with the statement. In another fashion, 147 (73.5%) respondents agreed that frequency of experiments makes chemistry more meaningful to the learner, while 53 (26.5%) respondents disagreed. 128 (64.0%) respondents agreed that practical works promoted development of systematic reasoning and predictive ability in students, while 72 (36.0%) disagreed with the statement.

Also, 165 (82.5%) agreed that frequent experiments make the learner to see the practical use of chemistry theories in everyday life, while 35 (17.5%) respondents disagreed with the statement. From the result above, we can see that frequent practical Chemistry develops practical skills on the learner, makes chemistry more meaningful to the learner, promotes systematic reasoning and predictive ability in students and make the learner see the practical use of Chemistry theories in everyday life.

Table 3 Research Question three: What are the problems inhibiting practical chemistry in Abuja Municipal Area Council?

S/N	Statement	Agree	%	Disagree	%
1	Lack of equipped school laboratory affects students' performance	160	80.0	40	20.0
2	Adequate and proper curriculum planning should be given to the core-subjects.	172	86.0	28	14.0
3	The need for upgrading of our school laboratories with new technologies will enhance teaching and learning.	169	84.5	31	15.5
4	The Attitude of both teachers and students towards experiments contribute to the poor performance of chemistry.	164	82.0	36	18.0
5	The increase in lack of qualified teachers affect the students' performance in the subjects.	125	62.5	75	37.5

Table 3 shows that, 160 (80.0%) respondents agreed that lack of equipped school laboratory affects student performance, while 40 (20.0%) respondents disagreed with the statement. In another fashion, 172 (86.0%) respondents agreed that adequate and proper curriculum planning should be given to the core subjects, while 28 (14.0%) respondents' disagreed. 169 (84.5%) respondents agreed that the need for upgrading our school laboratories with new technologies will enhance teaching and learning, while 31 (15.5%) respondents disagreed with the statement. 164 (82.0%) respondents agreed that the attitude of both the students and the teachers towards experiments contribute to poor performance of chemistry, while 36.0(18.0%) respondents disagreed with the statement.

Also, 125 (62.5%) respondents agreed that the increase in lack of qualified teachers affect the students' performance in the subjects, while 75 (37.5%) respondents disagreed. From the above result, it is clear that really, there are problems inhibiting practical chemistry and proper attention needs to be giving so as to solve those problems.

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Table 4 Research Question four: What are the possible recommendations of these problems of laboratory method of teaching science subjects in our secondary schools?

S/N	Statement	Agree	%	Disagree	%
1	Provision of opportunities to manipulate equipment and materials while working cooperatively with others in an environment should be encouraged in students.	171	85.5	29	14.5
2	Progression from exploratory activities to laboratory-type investigation activities is necessary for effective science learning.	182	91.0	17	8.5
3	For effective learning of Science students need sufficient time to interact, reflect and discuss during practical lessons.	182	76.0	48	24.0
4	The provision of in-service training for teachers should be encouraged by the government.	142	71.0	58	29.0
5	Government should assist the teachers by providing the basic materials for effective teaching and learning.	179	89.5	21	10.5

Table 4 shows that 171 (85.5%) respondents agreed that provision of opportunities to manipulate equipment and materials while working cooperatively with other students in an environment should be encouraged in students, while 29 (14.5%) respondents disagreed with the statement. In another fashion, 182 (91.0%) respondents agreed to the statement that progression from exploratory activities to laboratory-type investigation activities is necessary for effective science learning, while 17 (8.5%) respondents disagreed with the statement. 152 (76.05) respondents agreed that for effective learning of science, students need sufficient time to interact, reflect and discuss during practical lessons, while 48 (24.0%) respondents disagreed with the statement. 142 (71.0%) respondents agreed that provision of in-service training for teachers should be encouraged by the government. On the other hand, 58 (29.0%) respondents disagreed with the statement.

Also, 179 (89.5%) respondents agreed that government should assist teachers by providing the basic materials for effective teaching and learning, while 21 (10.5%) respondents disagreed with the statement. The above result shows that provision of opportunities to manipulate equipment and materials by students, progression from exploratory activities to laboratory-type activities, giving students sufficient time to interact, reflect and discuss during practical, provision of in-service training for teachers by government, and government assisting teachers in providing materials for teaching are some of the recommendations that will aid problems of laboratory method of teaching science subjects in secondary schools.

DISCUSSION OF FINDINGS

The findings of this study revealed that laboratory practical's need not to be neglected for any reason in teaching and learning of chemistry and other science subjects. It enhances and motivates teaching students to learn. This is in line with the reports of Cheung (2006) and Cousine (2007), they suggested that students should be motivated always to put in their best to the study of the subject. Also Eagly and Chaiken (2005), in their work advices students to discard the misconception that chemistry is difficult and volatile, that practical classes are there to help. All that students need to do is to accept challenges so as to be academically strong and firm.

The study also reveals that frequent practical lessons along with proper materials in well-equipped laboratories are keys to better chemistry lessons. The statement that "practice makes improvement" holds true. Having a well-equipped laboratory means that major if not all practical apparatus can be accessed by both the students and the teachers. This also means that all practical lessons needed by the students can be carried out all the time.

Lastly, this study also showed some roles government need to play to make the aim of science is being achieved in our secondary schools today. Provision of trained teachers and provision of effective materials alongside a well-planned curriculum that will reflect societal needs-technology development, entrepreneurship, improved standard of living, etc. should be the concern of government for our schools. Recent and modern technology equipment will have a more lasting effect in the enhancement of chemistry and other science subjects. This reflects the believes of Lang, Wang and Fraser (2005), and Popoola (2008), who believed that the use of recent or modern and adequate materials and equipment arouses the interest of students, and this makes practical lessons enjoyable.

CONCLUSION AND RECOMMENDATIONS

This study was carried out to determine the impacts of integration of practical into the teaching of Chemistry in some selected senior secondary schools in Abuja Municipal Area Council, FCT. The study revealed that practical need not to be neglected in the teaching and learning of Chemistry as it is essential if student want to perform well and if teachers want to be competent enough. We can rightly say that the level of impacts of integration of practical into the teaching of Chemistry was revealed from the study and it is something that both the students and the teachers cannot do without as far as Chemistry is concerned. Also, the study also showed that students have positive attitudes to practical lessons but provision of opportunity to manipulate equipment and materials while working cooperatively with others are not encouraged. On the basis of the findings, the following recommendations are made:

1. It is recommended that teachers should use the hands and minds on method of teaching in teaching chemistry and other science subject.
2. It is also recommended that educational stakeholders should give financial support to the professional development of teachers.
3. Also government should provide teaching materials, laboratory equipment and standard curriculum that will suit the needs and aspiration of the society.

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