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SURVEY OF STUDENT'S PERCEPTION ON IMPACT OF CHEMISTRY PRACTICAL IN CHEMISTRY

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Abstract

Over the years, many have argued that science cannot be meaningful t students without worthwhile practical experiences, or practical in scho laboratories. Typically, practical means experiences in school settings whe students interact with material to observe and understand the natural worl Practical are designed and conducted to engage students individually or i small groups. Since chemistry is a practical science, teaching and learning chemistry should involve chemistry practical. This research study surveys th perception of the students on the impact of chemistry practical in chemistr The study adopted a survey design. The sample population of the study is or hundred and twenty-five (125) students drawn from five selected priva secondary school in Okene local government area of Kogi state. Data for th study was collected through a structured questionnaire. Simple percentag was used to analyze the data and the results were presented in tabular an descriptive form. The findings show that the use of chemistry practical i teaching and learning of chemistry at secondary school level improve performance in the subject. It was also found in the study that the natur quality and frequency of chemistry practical all have immense impact o students' performance in secondary school chemistry. This confirms the nee for proper selection of nature of chemistry practical, good quality of practic and high frequent use of chemistry practical in teaching and learning chemistry. The study recommended that students be given an opportunity t engage in 'deep learning' during chemistry practical and that there should b further study on the curriculum and learning standard for chemistr practical.

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INTRODUCTION

Chemistry is a branch of science that deals with the composition, properties and uses of matter. It probes into the principles governing the changes that matter undergoes (Osei, 2016). It is an important part of what is called science and an active and continually growing science that has vital importance to our world in both the realm of nature and realm of society (Anaso, 2010). According to Kauffman and Szmant (1987), chemistry is characterized as the most utilitarian of all the experimental science. For example, in Nigeria, good grade in chemistry in secondary school education is a prerequisite for joining Medical and Agricultural professional courses, poor performance in this subject means few students will be able to join such professional courses, therefore leading to not having enough professional in those areas which could in turn lead to low health care provision and food insecurity in the country.

Since chemistry is the science that has the most direct and dramatic impact on our lives, and the science that shape the world we will live in tomorrow, the performance of students in the subject is a major concern to any developing country (Khan, et al, 2011). The uniqueness of chemistry and the central role that it stands to play in the development of any nation when considered are however not evident in the performance of students. The students' performance in chemistry in Nigeria has been poor and unimpressive (Anaso, 2010).

Good chemistry practical helps in developing students' understanding of scientific processes and concepts (Dilllon, 2008) hence the heavy investment made in the provision and equipping of chemistry laboratories in secondary schools are worthwhile.

According to Abimbola (1994) science teachers do not usually find it convenient to make chemistry practical the center of their instruction. They usually complain of lack of materials and equipment to carryout chemistry practical and at the same time, it is possible that some of these materials and equipment may be locked up in the school laboratory store without teachers being aware of their existence.

Hofstein (2004) reports that we are in a new era of reform in science education where both the content and pedagogy of science are being scrutinized and new standards intended to shape meaningful science education are emerging. In chemistry, one area that requires urgent reform are the chemistry practical, where it is important to rethink the role and place of chemistry practical in the learning and teaching of chemistry.

Despite the widespread use of chemistry practical as a teaching and learning strategy in school chemistry and the view that increasing its amount would improve chemistry learning. Some science educators have raised questions about its effectiveness or their real educational value as students continue to perform poorly in the subject.

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An appraisal of the role of chemistry practical as an approach or method in the learning and teaching of chemistry is necessary. Hence, the study is intended to find out the impact of chemistry practical on the students of chemistry in some selected private secondary schools in Okene.

RESEARCH QUESTIONS

The study sought to answer the following questions:

i. What influence does chemistry practical have on student performance in chemistry?
ii. Does the nature of chemistry practical have impact on students' performance in chemistry?
iii. How does the quality of chemistry practical affects students' performance in chemistry?
iv. How beneficial is frequent chemistry practical to student's performance in chemistry?

LITERATURE REVIEW

In a review of research on chemistry practical in school science, Dillon (2008) reports that despite curriculum reform in UK aimed at improving the quality of chemistry practical, students spent too much time following 'recipes' and consequently practicing lower-level skills. Strategies to improve the quality of chemistry practical have been identified by many authors. For example, Millar (2004) pointed out that, effective tasks are those where students are not only 'hands on' but also 'minds on' so that they can make the most of this learning experiences. In Millar's opinion, improving the quality of practical activities would be to help teachers become much clearer about the learning objectives of the practical tasks they use. Good quality chemistry practical work promotes the engagement and interest of students as well as developing a range of skills, science knowledge and conceptual understanding.

In reviewing research on chemistry practical, Dillon (2008) found out that the amount and quality of chemistry practical carried out in schools have both suffered as a result of the impacts of national tests in science. For example, according to Dillon the assessment regime in England and Wales has had a major impact on the amount and variety of chemistry practical that the teacher carryout.

Literature on school chemistry practical indicates that there is no clear consensus about the relative merit of chemistry practical and why we devote so much of our time and limited resources to it (Barton, 2004).

Similarly, Abimbola (1994) reports that review of research in this area concluded that science education researchers failed to provide conclusive evidence to support the view that using the laboratory method of teaching science is superior to other methods, at least, as measured by papers and pencil achievement tests.

Hofsein (2004) argues that research has failed to show a simplistic relationship between experiences provided to the students in the

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laboratory and learning chemistry. There are concerns about the effectiveness of laboratory work in helping the students understand the various aspects of scientific investigation (Schwartz et al, 2004). Teachers usually want to develop students higher order thinking skills, like critical thinking, through laboratory work, but to what extent they can achieve this is controversial (Ottander & Grelsson, 2006). Therefore, it is important to analyze the purpose related to laboratory work as the purposes need to be well understood and defined by teachers and students alike for the chemistry practical to be effective.

According to Njoku (2009), the trend in students' performance in chemistry has been poor for some years. Warra, *et al.* (2009) opined that there is urgent need to improve on poor performance in both internal and external chemistry examinations. Even in internal examination, performance in chemistry could be bad as 22.2% pass.

THEORETICAL FRAMEWORK

Learning science at school level is not discovery or construction of ideas that are new and unknown to learners rather it is making what others already know your own (Millar 2004). Experiences given during chemistry practical can provide such opportunities of chemistry students. For example, (Barton, 2004) suggest that, after an illustrative chemistry practical, students are offered explanations, models and analogies from the teacher to help them in their efforts to construct their own understanding of what they have experienced. The primary criterion which a practical activity should satisfy is that of being an effective means of communicating ideas it is intended to convey. This study is asking how this happen in school chemistry practical and how effectively this augment other forms of communication (Verbal, pictorial, symbolic) that teachers might use.

METHODOLOGY

POPULATION OF THE STUDY

The population of the study consists of chemistry students in some selected private secondary schools in Okene Local Government Area of Kogi State. There were five private secondary schools randomly selected for the study.

The study involved S.S.S.2 students who were taking chemistry in the five selected private secondary schools in Okene. The S.S.S.2 class was chosen because at this point the students had been introduced to chemistry practical from S.S.S.1. Also, because the S.S.S.2 students were not being prepared for examination as it happens in S.S.S.3 class of the private secondary schools.

SAMPLE AND SAMPLING TECHNIQUES

A sample of five private secondary schools in Okene Local Government Area where randomly selected for this study.

The selected schools are:

1. Solardad College.
2. Okengwe Comprehensive College.
3. New Era Secondary School.
4. Qualitative College
5. Al-Hilal Islamic Model College

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The sample size for this study stood at 25 chemistry students from each of the selected private secondary schools making a total of 125 respondents for the study.

RESEARCH INSTRUMENT

The data for this study was collected using questionnaire which consist of closed ended questions and was used to solicit information on the teaching and learning experiences during secondary school chemistry lessons involving chemistry practical. It was structured to capture information required in helping to elucidate the relationship between chemistry practical and performance in secondary school chemistry. The questionnaire items were structure using four-point rating scales of agree, disagree, strongly agree, strongly disagree.

PROCEDURE FOR DATA COLLECTION

The permission of the principals of each the selected private secondary schools were sought before administering the questionnaire to the chemistry students. The completed questionnaires were collected immediately to ensure high percentage retrieval of the questionnaires for editing, organization and coding.

PROCEDURE FOR DATA ANALYSIS

The data collected from the respondents were analyzed using simple percentage and the result presented in tables and descriptive form. The responses were tallied and percentage agree, disagree, strongly agree and strongly disagree were computed.

DATA PRESENTATION AND ANALYSIS

Table 1: INFLUENCE OF CHEMISTRY PRACTICALS ON STUDENTS' PERFORMANCE

S/N	ITEM	SA		A		D		SD	
		F	%	F	%	F	%	F	%
1	Chemistry practical increase achievement of good grades in chemistry	80	64	30	24	8	6.4	7	5.6
2	Students' performance is usually low in the absence of chemistry practical	70	56	30	24	20	16	5	4
3	Chemistry practical enhance the understanding of topics taught using lecture method	95	76	20	16	5	4	5	4
4	Absence of chemistry practical makes chemistry abstract.	90	72	20	16	15	12		
5	Chemistry practical makes chemistry interesting and exciting	100	80	25	20				

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The result indicated in Table1 shows the findings of the influence of chemistry practical on the students' performance in chemistry. The findings indicate that for item 1, 64% strongly agree, 24%, 6.4% disagree and 5.6% strongly disagree. For item 2, 56% strongly agree, 24% agree, 16% disagree and 4% strongly disagree. For item 3, 76% strongly agree, 16% agree, 4% disagree and 4% strongly disagree. For item 4, 72% strongly agree, 16% agree and 12% disagree. For items 5, 80% strongly agree and 20% agree. The result of this finding indicates that chemistry practical has a positive effect on students' performance in chemistry.

Table 2: NATURE OF CHEMISTRY PRACTICALS ON STUDENTS' PERFORMANCE

S/N	ITEM	SA		A		D		SD	
		F	%	F	%	F	%	F	%
6	Students assimilate facts better when teacher demonstrate in practical lessons.	85	68	20	16	15	12	5	4
7	Teacher's demonstration during chemistry practical makes chemistry boring.	20	16	20	16	15	12	70	56
8	Students carrying out practical themselves is more interesting than teacher's demonstration	100	80	20	16	5	4		
9	Class experiment improves performance of student in chemistry	100	80	20	16	5	4		

The information contained in Table 2 shows the findings of how the natures of chemistry practical affect students' performance in chemistry. The finding indicates that for item 6, 68% strongly agree, 16% agree, 12% disagree and 4% strongly disagree. For item 7, 16% strongly agree, 16% agree 12% disagree and 56% strongly disagree. For item 8, 80% strongly agree, 16% agree and 4% disagree. For item 9, of chemistry practical lead to better performance in chemistry.80% strongly agree, 16% agree and 4%

S/N	ITEM	SA		A		D		SD	
		F	%	F	%	F	%	F	%
10	Individual practical in chemistry promotes students understanding than group practical	80	64	20	16	15	12	10	8
11	Pairing students in chemistry practical obstruct full participation of students and reduces performance	60	48	35	28	15	12	15	12
12	Students that partake in both group practical and individual practical perform better than those that take part in only one.	100	80	25	20				
13	Performance in chemistry increases when students are in group of more than five.			15	12	20	16	90	72

agree. This result shows that exposing students to various kinds

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Table 3: QUALITY OF CHEMISTRY PRACTICAL ON STUDENTS' PERFORMANCE

The information contained in Table 3 indicates the effect of quality of chemistry practical on students' performance in chemistry. The finding indicates that for item 10, 64% strongly agree, 16% agree, 12% disagree and 8% strongly disagree. For item 11, 48% strongly agree, 28% agree, 12% disagree and 12% strongly disagree. For item 12, 80% strongly agree and 20% agree. For item 13, 12% agree, 16% disagree and 72% strongly disagree. This result implies that student performance is enhanced when they are exposed to different qualities of chemistry practical as indicated by 100% in item 12 on the table.

Table 4: FREQUENCY OF CHEMISTRY PRACTICALS ON STUDENTS' PERFORMAMCE

S/N	ITEM	SA		A		D		SD	
		F	%	F	%	F	%	F	%
14	Students who perform more practical in a term perform better than those who perform once in a term	90	72	25	20	5	4	5	4
15	Students obtain high score in chemistry when their practical classes are consistent than when it is occasional	100	80	17	13.6	8	6.4		
16	Students that are good in chemistry usually engage in chemistry practical while those that are poor in chemistry usually do not	100	80	25	20				

The result indicated in table 4 shows the finding of how frequency of chemistry practical affect students' performance in chemistry. The finding indicates that for item 14, 72% strongly agree, 20% agree, 4 % disagree and 4% strongly disagree. For item 15, 80% strongly agree, 13.6% agree and 6.4% disagree. For item 16, 80% strongly agree, 20% agree. The result from the above table shows that students exposed to high

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frequency of chemistry practical perform better than those not exposed.

DISCUSSION OF RESULT

From the result in table 1 each item in the table indicates that chemistry practical tremendously influence students' performance in chemistry. These findings concur with the report by Lerman (2014) who says, method including practical helps students to remember and understand abstract scientific concepts. This is also in agreement with the findings by Hofstein (2004) who reported that teaching science with the help of chemistry practical makes it more enjoyable and stimulating to students than teaching the same subject matter only through chalk and talk.

The items in Table 2 indicate that exposure to various types of chemistry practical have significant impact on students' performance in chemistry. Different teachers use different types of practical work. Kibirge et al (2014) argue that different types of practical work achieve different purposes. There is practical work to achieve basic skills like: measuring, observation and recording, while investigative skills include analysis and drawing inferences. The selection of the type of practical work requires that teachers should have a good knowledge of the practical work themselves.

The result in Table 3 shows that student's performance in chemistry can be boosted by allowing each student carryout their practical work individually or in small group. It also shows that large group of students during practical work prevent full participation of students, thereby affecting students' performance. This is in agreement with Tobin (1990) and Ikeobi (2004) who stated that meaningful learning is possible from a given laboratory experiments if the students are given ample opportunities to operate equipment and materials that help them to construct their knowledge of phenomena and related scientific concepts. This also support (Abrahams & Millar 2008) argument that students learn so much more by actually doing it than by just being told or even watching it being done. Therefore, students should be provided the opportunity of individual practical exercise after partaking in group work as exposure of students to both individual and group practical exercise lead to better performance in chemistry.

The items contained in Table 4 indicate that high frequency of chemistry practical in a term improve students' performance in chemistry. The finding shows that students' grades in chemistry can be improved if much practical classes are carried out in each term of the academic session. This is in agreement with Pavesic (2008) who stated that students have a lot to benefits from chemistry practical. The benefit may include increasing student's interest and abilities in science subject as well as their achievement in science. The findings show that students who usually attend practical classes tend to do better in chemistry than those that do not attend practical classes. Hence, high frequency of practical chemistry is paramount in achieving the benefit of chemistry practical.

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SUMMARY OF THE FINDINGS

This study investigated the effect of chemistry practical on students' performance in chemistry in private secondary school in Okene Local Government Area.

Responses obtained through the questionnaire were analyzed using simple percentage tables. From the analysis of the data obtained, the following findings were made.

i. That chemistry practical as a teaching and learning strategy significantly improve students' performance in chemistry.

ii. Exposure of students to various types of chemistry practical enhances students' performance in chemistry.

iii. Students exposed to different qualities of chemistry practical (Individual and group) perform better than those exposed to only group practical work.

iv. Students exposed to high frequency of chemistry practical perform better than those not exposed.

CONCLUSION

The findings confirm that the use of chemistry practical is an effective method in improving students' performance in chemistry in secondary schools.

They also confirm that the nature, quality and frequency of chemistry practical in teaching and learning of chemistry boost learner performance in chemistry. Use of chemistry practical enhances students' knowledge and understanding in a better way compared to none use to chemistry practical in the teaching and learning of chemistry.

The study showed that exposure to various types of chemistry practical have a significant positive effect on students' performance. Chemistry practical increase students' interest and abilities in science subjects as well as their achievement in science because it helps students in understanding theories and chemistry principles which are difficult or abstract.

It can also be concluded from the study that students perform better in chemistry when chemistry practical are used in teaching and learning chemistry. Therefore, teachers should ensure that the students are actively involved in chemistry practical, as this will go a long way to enhance students' knowledge during chemistry practical.

RECOMMENDATIONS

Based on the findings, the study recommends the following:

1. More practical work should be used when teaching and learning schools chemistry in Nigeria private secondary schools in order to improve students' performance in the subject.
2. Chemistry teachers should be provided intensive in-service training in practical work management and latest research to improve their practices.
3. To improve the quality of chemistry practical, the numbers of learners in chemistry classroom need to be reduced. This could be done by separating large classes into many small classes.

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4. It is also recommending that there should be further scrutiny of the curriculum and learning standards for chemistry practical in secondary school's chemistry and an in-depth study of teacher competence in the teaching of practical chemistry is suggested.
5. Since the sample respondents were drawn from some selected private secondary schools in Okene Local Government Area of Kogi State, the findings may mainly reflect the situation in the Local Government or at best in the studied schools. Hence the findings may not be representative of all private secondary schools in Okene and Kogi state at large; it is therefore recommended that this study should be carried out in other Local Government of the state in order to get a better and general picture of the whole state as regard to the topic. It should also be extended to the public secondary schools in Okene Local Government as well as other Local Government in Kogi State.

REFERENCES

Abimbola, I.O. (1994). A critical appraisal of the role of laboratory chemistry practical in science teaching in Nigeria. *Journal of curriculum and instruction*. 4, 59-65.

Abrahams, I. & Millar, R. (2008). Does chemistry practical really work? A study of the effectiveness of chemistry practical as a teaching and learning method in school science. *International journal of science education*. 30(14) pp 1945-1969

Anaso, J.N. (2010). Strategies for improving the performance of students in chemistry at the tertiary level. 4(2), 112-118.

Barton, R. (2004). Teaching secondary science with ICT. Bershire, England: Open University Press. pp 15

Dillon, J. (2008). A review of the research on practical in school science. London: Kings College. pp 37-39

Hofstein, A. (2004). The laboratory in chemistry education. Thirty years of experience with developments, implementation and research. Chemistry education: research and practice, 5(3) 247-264.

Ikeobi, I. (2004). Identification and teaching of different concepts in chemistry STAN Bulletin, 11(2), 3-5

Kauffman, G.B. & Szmant, H. (1987). Essays on the uses of chemistry. Texas: Christian University Press pp 51-53

Khan, M.S.; Hussain, S.; Ali, R.; Majoka, M.I. & Ramzan M. (2011) Effect of inquiry method on achievement of students in chemistry at secondary level. *International Journal of academic research,* 3(1), pp 955-959.

Kibirige, I.; Maake, M.R. & Mavhunga, F. (2014). Effect of practical work on Grade 10 learners' performance in science. In Mankweng Circuit in South Africa. *Mediteranean Journal of*

social sciences, MCSER Publisher Rome-Italy. 5(23), 30-32.

Lerman, Z.M. (2014). The challenges for chemistry education in Africa. The Lerman institute for the advancement of science. 4(2), 27-35

Millar, R. (2004). The role of chemistry practical in the teaching and learning of science. High school science laboratories: role and vision. Washington DC. National Academy of Science. 7(3) 21-23

Njoku, Z.C. (2009). Enhancing the Relevance of Chemistry Curriculum delivery using Science-Technology-Society (S-T-S) approach. 5(2), 13-15

Osei Yaw Ababio (2016). New School Chemistry, Ninth Edition. African First Publishers PLC. pp 2.

Ottander, C. & Grelsson, G. (2006). Laboratory work: the teachers' perspective *Journal of Biological Education*, 40(3), 113-118.

Pavesic, B.J. (2008). Science Achievement, gender differences and experimental work in Federation of Teacher. 17(3) 28-35

Schwartz, R.S.; Leaderman, N.G. & Crawford, B.A. (2004). Developing views of nature of science in an authentic context. An explicit approach to bridging the gap between nature of science and scientific inquiry. Science education, 88(4), 610-645.

Tobin, K.G. (1990). Research on science laboratory activities. In pursuit of better questions and answer to improve learning School Sci. Math. 90, 403-418

Warra, A.A; Utono, S.S. & Gunu S.Y. (2009). Factors affecting students in school chemistry: A case study of Haliru Abdu Senior Arabic Secondary School, Jega, Kebbi State, Nigeria. pp 30-32