

## Effects of Ill-Equipped Laboratory in the Conduct of Biology Practical in Secondary Schools in Kagarko Local Government Area of Kaduna State

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### Abstract

This research work examined the effect of ill-equipped laboratory on the conduct of Biology practical in secondary schools in Kagarko local government area of Kaduna State. A survey research design was used; simple random sampling technique was used for selection of the schools, one hundred and fifty (150) students and eighteen (18) teachers were the sample population used for the study. The questionnaire titled "Effect of ill-equipped Laboratory in the conduct of Biology Practical in Secondary School" (EIELCBPSS) was the instrument employed. Data collected were analyzed using simple percentage and Chi-square statistical tools. The results show that poor laboratory and insufficient practical materials and equipment have a great effect on the conduct of biology practical and teachers need to improvise instructional materials for effective delivery of their lessons or practical work. For Chi-square analysis, the entire three formulated hypotheses were of no significance as  $X^2_{cal}$  was less than  $x^2_{crit}$ . This implies there is no significant difference between ill-equipped laboratory and well-equipped laboratory including students' failure and there is also no significant difference between out-dated equipment and teacher's improvisation of instructional materials in the conduct of biology practical. It was recommended amongst others that non-governmental organization should take interest and bold steps in enhancing the quality of school science laboratories in our various institution of learning; teachers should be encouraged to attend regular workshops and seminars on improvisation and laboratory techniques so as to improve their laboratory skills.

## **Background to the Study**

Biology is defined as the scientific study of living things, it is a branch of science which deals with structure, functioning and developmental process of maintaining life (Akinagboto, 1990). Learning by doing as a concept has been described as a learning situation where hand-on and minds-on activities or a concrete sensory experience are used to aid understanding of learning experience that is student-centred and contrary to traditional lecture pattern of instruction which is teacher-centred (Maduabum, 1992 and Ajeyalew, 2011). Therefore, the government or any nation should foster enabling environment for learning by doing what would guarantee quality science education. This is by making adequate provision of laboratory facilities, equipment and instructional materials that are necessary for scientific learning by doing. According to Wasagu (2009) learning by doing (inquiry-based) is advocated in school, he drew an ancient proverb which says that:

*“Tell me and I forget  
Show me and I remember  
Let me do it and I will understand”*

However, one can say without fear of contradiction that contemporary science laboratories at senior school level in Nigeria are grossly ill-equipped thereby making it impossible to ensure the practice which could motivate learning by doing and the generation of globally competitive indigenous scientists (Wasagu, 2009). Arneh, (1990) stated that most of our secondary school laboratory are poorly equipped. Mustapha (2009) said teaching facilities such as relevant science textbooks, instructional aids, laboratory equipment etc. are either grossly inadequate or non-functional (obsolete) or not even available at all in some schools' laboratories. Gyuse, (2009) also observed that facilities; teaching materials, laboratories/workshop equipment and other accessories in our schools setting are part of problems that lead to professional job inefficiency amongst the Nigerian school.

The term practical is an examination or lesson in which theories and procedures learned are applied to the actual making of doing something.

## **Statement of the Problem**

The problem with ill-equipped laboratory in conducting biology practical in senior secondary schools in Kagarko and environ has been a great concern to the people and students of the area. Here are some points that lead to the problems of ill-equipped laboratory as follows:

- 1. Lack of fund:** The laboratories in most of our secondary schools require adequate funding and capital. This problem is often compounded by lack of interest by government, private and public organizations to provide adequate funds for the laboratory sector in the school. Imogie (2010) revealed that political instability which affects Nigeria economy has culminated to failures in our educational systems.
- 2. Lack of equipment, facilities and materials:** The laboratory requires adequate provision of necessary materials and facilities in terms of quantity and quality. The situation is compounded by lack of effort and interest to provide and maintain such facilities in the laboratory. In the same vein, Imogie (2010) warned that the admission of students has increased the population of students in these schools that the

laboratories are too small to contain them. This shows that there are inadequacies in the quantity of resources provided to biology laboratories and the teaching to be effective.

3. **Lack of quality technologist:** The laboratory needs people that are qualified in the field to study not just someone without the knowledge or skill, when there is a technologist in the sector, the laboratory will not damage the way some of the laboratories are today. Good technologist, good laboratory. Education in Nigeria is always characterized by lack of adequate personnel both in quantity and quality. Experts in most biology education are few when compared to its value to man and the society at large in a study by Okoli and Osuafor (2010), the six educational zones sampled for the number of laboratory assistants/attendants confirmed that fifty (50%) of the schools sampled do not have laboratory technical/attendants.

### **Purpose of the Study**

The specific objectives for this study are focused in finding if

- i. Poor biology laboratory and insufficient practical materials or equipment could affect biology practical in secondary schools.
- ii. The materials or equipment are functional and teacher knowledgeable.
- iii. There is provision of instructional materials by the teachers.
- iv. There is good relationship between the teacher and students during biology practical.

### **Research Questions**

In relation to the ill-equipped laboratory in conducting biology practical in secondary schools, the following research questions were thrown forward:

1. Does poor laboratory and insufficient practical materials or equipment have any effect in organizing effective biology practical?
2. Is the equipment or materials in the biology laboratory functional and teacher knowledgeable?
3. Do teachers improvise instructional materials in case of insufficient practical materials or equipment?
4. Do teachers create humour and good relationship with their students during biology practical?

### **Research Hypothesis**

The following hypothesis would be treated at  $p \leq 0.05$  of significance:

1. **H<sub>0</sub>**: there is no significant difference between ill-equipped laboratory and well-equipped laboratory in the conduct of biology practical.
2. **H<sub>0</sub><sub>2</sub>**: there is no significant difference between ill-equipped laboratory and students' failure in biology practical.
3. **H<sub>0</sub><sub>3</sub>**: There is no significant difference between out-dated equipment and improvisation of instructional materials by the teacher.

## **Methodology**

The design for this research was the survey design. This design was chosen because the research is descriptive research and aims at collecting and presenting people's opinions through the use of questionnaire. The population for this research work comprises all senior secondary schools in Kagarko local government area of Kaduna State. Three (3) schools were randomly selected for the study. This is to make sure that the schools sampled had laboratories. The three (3) schools purposively sampled include; Government Secondary School Kagarko (Senior), Government Secondary School, Jere (Senior) and Government Secondary School, Kuse. Fifty (50) students from each school were randomly selected by picking from hat method making a sample population of one hundred and fifty (150) students. Also, six teachers who teach biology were randomly selected from each school for the study.

The research instrument used in the study to generate data was the four Linkert scale questionnaire. The questionnaire designed was of two types; one for the students and the other for the teachers, both titled "Effect of ill-Equipped Laboratory in the Conduct of Biology Practical in Secondary Schools" (EIELCBPSS). The questionnaire comprises of twelve (12) items statements for both students and teachers to respond to either; strongly agree (SA), agree (A), strongly disagree (SD) and disagree (D). The questionnaire was constructed by the researcher and face validated by experts in the field. The instrument was field tested on a random sample of fifty (50) students selected from two schools; Government Secondary School Kagarko Senior and Government Secondary School (Senior) Jere and the result of the test was used to determine the reliability coefficient, which was found to be 0.76. The researcher visited the selected schools; copies of the questionnaire were distributed and respondents were asked to tick the appropriate columns as it is specified in the questionnaire and later retrieved for analysis.

## **Data Analysis**

The data obtained from the student's questionnaire was used to answer the research questions by using simple percentage scores, while data collected from teacher questionnaire were also analyzed using chi-square statistical tools.

## **Research Questions**

1. Does poor laboratory and insufficient practical materials or equipment have any effect in organizing effective biology practical?

**Table 1:** Percentage analysis of research question one based on poor laboratory and insufficient practical materials.

S/N	Items	SA	A	SD	D	SA & A %	SD & D %
1	Insufficient practical materials hinders effective conduct of biology practical.	211	134	48	57		
2	The equipment and materials functional and in good conditions for practical	46.89%	29.78%	10.67%	12.66%	76.67%	23.33%
3	Ill-equipped laboratory is a dangerous place for learning as students may prompt to any forms of laboratory accident						

**Source:** Field Work 2023

The table above comprises of three (3) questions in which the students who responded to strongly agree and Agree had a total of 76.67% while those who strongly disagree and disagree has a total of 23.33% indicating that, poor laboratory and insufficient practical materials or equipment have an effect on the conduct of biology practical.

2. Is the equipment or materials in the biology laboratory functional and teacher knowledgeable?

**Table 2:** percentage Analysis of Research question 2 based on functionality of materials.

S/	Items	SA	A	SD	D	SA & A %	SD & D %
1	Teachers are knowledgeable In the use of laboratory equipment	117	118	124	91		
2	The laboratory has all relevant equipment for carrying out practical	26.00	26.22	27.56	20.22	52.22%	47.78%
3	Teachers carried out biology practicals one's in two weeks						

**Source:** Field Work 2023

From the table above, the table comprises of three (3) questions, students who responded to strongly agree and agree had a total of 52.22% while those who responded strongly disagree and disagree has a total of 47.78% indicating that, the equipment or materials in the biology laboratory are functional and the teachers knowledgeable in the subject matter.

3. Do teachers improvise instructional materials in case of insufficient practical materials or equipment?

**Table 3:** Percentage analysis of research question 3 based on teacher improvisations.

S/	Items	SA	A	SD	D	SA & A%	SD & D%
1	Teachers are knowledgeable in construction of improvised materials	141	143	85	81		
2	Teachers improvise instructional materials in the absence of practical materials	31.33%	31.78%	18.89%	18.00%	63.11%	36.89%
3	All biology teachers conduct practical in your school						

**Source:** Field Work 2023

The table above also comprises of three items in which the students responded to the research questions. 63.11% of the students responded strongly agree and agree to the question while 36.89% of the students responded strongly disagree and disagree to the questions which indicates that teachers improvised instructional materials for the conduct of biology practical.

4. Do teachers create humour and good relationship with their students during biology practical?

**Table 4:** Percentage analysis of research question 4 based on good relationship between teachers and students.

S/	Items	SA	A	SD	D	SA & A%	SD & D%
1	Learning of biology is most appreciated and better understood in the laboratory	244	135	31	40		
2	Teachers are role model for their students to follow during practical works	54.22	30.00		8.89%	84.22.%	15.78%
3	Good practicals environment for the teachers and students enhance better learning						

**Source:** Field Work 2023

Table 4 shows that, 84.22% of the respondents respond strongly agree and agree to the item while 15.78% of the respondents responded strongly disagree and disagree to the items of which states that, teachers create humor and good relationship with their students while carrying out biology practical, indicating that teachers relate well with their students during biology practical.

### Research Hypothesis

**Ho<sub>1</sub>:** There is no significance difference between ill-equipped and well-equipped laboratory in the conduct of biology practical.

**Table 5:** Chi-square analysis of difference between ill-equipped laboratory and well equipped laboratory in the conduct of biology practical.

S/N	Ill-equipped laboratory and well equipped laboratory	Nf	Ef	Df	X <sup>2</sup> cal	x <sup>2</sup> crit	Remarks
1	Inadequate materials	150	145				Not significant
2	Functionality and good condition	150	145	3	0.32	07.81	

**Source:** Field Work 2023

From the data analysis in table 5 above, the hypothesis was retained. This goes against the back drop that Ill equipped and well-equipped laboratory affects biology practical positively or negatively. However, results obtained from the research shows that ill equipped laboratory does not affect biology practical, this could be because teachers improvised materials in the absence of the real ones.

**H<sub>0</sub><sub>2</sub>:** There is no significance difference between improvised materials and student's failure in biology practical.

**Table 6:** Chi-square analysis of difference between provision of improvised materials and student's failure in the conduct of biology practical.

S/N	Ill-equipped laboratory	Nf	Ef	Df	X <sup>2</sup> cal	x <sup>2</sup> crit	Remarks
1	Teachers pay for improvised materials	18	17.8				Not significant (NS)
2	Schools management lack adequate funds in setting up standard laboratory	18	17.8	6	0.600	12.6	
3	Teachers improvised instructional materials	18	17.8				

**Source:** Field work 2023

The results obtained from table 6 shows that there is no significance difference between ill-equipped laboratory and student's failure. Once again this goes against the fact that an ill-equipped laboratory has an effect on students' failure or success. The reason for retaining the hypothesis could be attributed to the improvised materials used by the teacher in delivering of his lessons.

**H<sub>0</sub><sub>3</sub>:** There is no significant difference between out-dated equipment and improvisation of instructional materials by the teacher.

**Table 7:** Chi-square analysis of different between outdated equipment and materials and improvisation of instructional materials by the teacher.

S/N	Outdated equipment	Nf	Ef	Df	X <sup>2</sup> cal	x <sup>2</sup> crit	Remarks
1	Equipment or materials outdated	18	17.8				Not significant (NS)
2	Absence of practicals materials	18	17.8	6	0.600	12.6	
3	Equipment and materials are functional.	18	17.8				

**Source:** Field Work 2023

Table 7 above indicates the X<sup>2</sup>cal. value of 0.600 is less than the X<sup>2</sup>crit value of 12.6 from p ≤ 0.05 level of significance. Therefore, the null hypothesis of no significance difference is retained for Ho<sub>3</sub>.



## **Discussion of results**

The analysis made in table 1 indicates that majority of the students are of the opinion that ill equipped laboratory and insufficient practical materials have effect on the conduct of biology practical. This could be in line with the opinion of Chimezie, Ike & Iwu (2002) who opined that many teachers and students are ignorant of the importance of using biology laboratory materials in teaching and appropriate teaching methods to use to effectively actualize educational objectives. This ignorance is further demonstrated in the habit of vandalization in students wanting to destroy properties whenever they revolt against the school authorities.

Table 2 indicates 52.2% respondents who strongly agreed that materials or equipment found in their schools are functional and the teachers teaching the subject are knowledgeable. However, Dahar (2011) argued that the facilities for teaching biology practical in some schools are not up to standard and are inadequate. In table 3 of the data analysis, 63.11% of the respondent strongly agreed that teachers improvise instructional material during the conduct of biology practical in the absence of none which makes it possible for the students to be exposed to biology practical at least once in a week. Table 4 of research items states that the teacher creates humor and good relationship with their students during biology practical, here 84.22% strongly agree while 15.78 disagree. Agun and Imogie (1991) is of the opinion that creating good humor in practical class provide students with opportunity of explaining and establishing relationship between part and event that makes the students to love science.

In table 5 which shows the chi-square analysis of difference between ill-equipped laboratory and well-equipped laboratory in the conduct of biology practical, the results indicate that the null hypothesis was accepted indicating that there is no significance difference between ill-equipped and well-equipped laboratory and the conduct of biology practical. In view of this, Tenew (2015) concluded in his own research that ill-equipped laboratory do not play a significant role always in the conduct of biology practical. Ill-equipped laboratory is a laboratory in which all necessary equipment that is needed for the conduct of practical is not available. Table 6 which are on the difference between provision of ill-equipped improvised laboratory materials and conduct of practical. The results show that the null hypothesis was accepted which implies that there is no significance difference between provision of ill-equipped improvised laboratory materials and conduct of practical and even the lack of funds by schools; teachers are trying by providing materials to make the lesson acceptable. The results show that when the teachers are capable of improvising unavailable materials (equipment) to replace the ill-equipped materials will determine the success of biology practical. Nwaegbo (2005) opined that ability to improvise is one of the characteristics of science teacher when the real equipment or materials are unavailable.

The result in table 7, which is on the difference between out-dated equipment or materials and conduct of biology practical shows that the null hypothesis of no significance difference is retained which implies that the success of every student in biology practical is determined by good equipment and the effort of the teacher. This result agrees with Ali (2004) that production of instructional materials is usually done in two broad ways, by improvisation which is often done by the teachers and occasionally learners and by publishers and

instructional development centers. 36.89% respondents disagree that teachers do improvised instructional materials.

### **Conclusion**

The research work has tried to discuss the issue of ill-equipped laboratory in the conduct of biology practical. It discusses the effect of poor and insufficient practical materials or equipment on the conduct of biology practical, the functionality of the equipment and improvisation of instructional materials among others. The results show that the students taught in a well-equipped laboratory have greater advantage over those taught in an ill-equipped laboratory. It also revealed that teachers should endeavour to improvise instructional materials where there is need for it so as to remedy the real materials that may not be available in the laboratory. Conclusively, the research shows that biology practical is an important aspect of biology curricula; so therefore, time and energy should be put into it for the attainment of its objective.

### **Recommendations**

In the light of implications of findings of this study it is recommended that the Government and all the stakeholders in science education should ensure that there are adequate facilities as follows:

1. Provision of laboratory materials, equipment and facilities so as to enhance effective teaching of biology.
2. Non-Governmental organizations should take interest and bold steps in enhancing the quality of school science laboratories in our various institutions of learning.
3. International donor organizations to assist in equipping school science laboratories with the modern-day laboratories.
4. Teachers should be encouraged to attend regular workshops and seminars on improvisations and laboratory techniques so as to improve their laboratory skills
5. Teachers should not overload themselves with work so as to have enough time to improvise relevant materials they will use to teach.
6. Schools administrators should provide funds for teachers to improvise science equipment.
7. Sufficient time should be created by science teachers to improvise.

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