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EFFECTS OF PRACTICALS ON THE ACADEMIC PERFORMANCES OF STUDENTS IN PHYSICS AT THE SENIOR SECONDARY SCHOOL LEVEL (A CASE STUDY OF SOME SCHOOLS IN IKA NORTH EAST LGA)

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Abstract

This study sought to determine the effect of practical work on the academic performance of students in Physics in Ika North east Local Government Area of Delta State. In particular, it intends to determine whether or not physics practical work has influence on students' academic performance. The result of such study would supply argument for or against, the view that practical work affects students' academic performance in Physics. Field study was carried out between March 2014 to July 2014. The results showed that the schools that do practical work in Physics even for a period of just one hour a week performed above average, while those schools without any practical experience performed below average in school certificate examinations. Although there are Physics Laboratories buildings in the schools covered, there are virtually no equipment and laboratory attendants for physics practical. It is inferred that a little effort to conduct physics practical for students will expose them to practical knowledge which also lead to excellent performance in Physics in the West African School Certificate Examinations. It is therefore recommended that all schools should be equipped with functional laboratories to enable students, not only pass physics in their West African School Certificate Examinations but also have good practical knowledge of physics in their schools.

Introduction

Science is a means of achieving technological transfer. Science includes physics, chemistry, biology and even mathematics. The teaching of the concepts sometimes looks more or less abstract than concrete, since teachers as well as teaching materials are not available for students practical work in some schools. The importance of science education might then be summarized as:

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- It leads to better retention of information and acquisition of scientific interest.
- It increases the ability for critical and creative thinking.
- It facilitates problem solving strategies.
- It leads to better understanding of basic concepts and facts of science.
- It can be used to illustrate regulative principles of science and the development of laws.

According to the Committee of High School Science Laboratories on the Role and Vision, National Academy of Sciences, Washington, DC (2004) ,the learning science should involve seeing, handling and manipulating real objects and materials, and that teaching science will involve acts of 'showing' as well as of telling.

By 'practical work' we mean tasks in which students observe or manipulate real objects or materials or they witness a teacher demonstration, (Hodson, 1990).

Practical work in science is acknowledged and widely accepted as an important component in the teaching and learning of science concepts (Topis and Allen 2012; Kibirige et al. 2014), but is also regarded as a complex process (Donnelly et al. 2012: Abrahams 2009). Practical work is any teaching and learning activity which involves learners in observing or manipulating real objects and materials which also has a central role in science education (Millar 2004). Accordingly, practical work is essential for giving students a 'feel' of measurement and an appreciation of the ever-presence of uncertainty hence if there are any impediments to doing practical work, they need to be eradicated in order for learners to be successful in mastering scientific concepts and developing scientific knowledge, Miller (2004), in Heeralal (2014).

Thus, practical work can:

- motivate pupils, by stimulating interest and enjoyment
- teach laboratory skills
- enhance the learning of scientific knowledge
- give insight into scientific method and develop expertise in using it.

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- develop 'scientific attitudes', such as open-mindedness and objectivity

The 6-3-3-4 education system of Nigeria emphasizes practical-technology and modern approach of teaching of physics so as to lay emphasis on practical exercises and laboratory Investigations since these makes physics real.

Physics being a science subject should be taught with experiments and demonstrations with the view of highlighting the principles underlying them. The student in turn, should not be allowed to learn by memorizing facts (rote learning) for later regurgitation but should be led to discover principles through his own Initiative. Practical work constitutes an integral part of sciences. In fact scientific concepts and generalization, gain prominence in the literature only after they have survived series of empirical testing, such as observation, counting measuring, experimenting, recording, and carrying out field work.

The science policy makers, science teachers in particular have paid “lip service” to practical work in physics in Nigerian schools.

Abdullah (1982) argued that most modern science curricula emphasize students’ involvement in practical work in the laboratory. Such emphasis was in keeping with the demand of science which requested certain skills, including the ability to perform experiment and interpret the results. How can the students achieve these skills since there are no facilities available to aid the teachers in disseminating knowledge to motivate students’ interest and involvement?

Nigeria as a developing country will realize that there cannot be technological growth without the development of science and technology. The consequence is the continuous reliability on many countries for her manpower needs as being practice today. Apart from the daily importation of cars, machinery, raw materials and other items from the outside world, the country stands a chance of developing our technology if more emphasis is laid on practical work.

Physics as a science subject and the bedrock of science and technology should be given further room for advancement. This can be achieved if theoretical concepts are made more real in terms of practical. Since practical transfers what is learnt in the class to actual life, it becomes necessary that students should take part in practical’s so as to achieve this objective. But most of the secondary schools in the country equip their laboratory with cupboards and charts instead of standard apparatus.

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Statement of the problem

Many schools have been characterized with poor facilities in terms of standard science apparatus. This poor state has also contributed to why practical work is not often done in the schools which consequently affects negatively the academic performance of the students in those schools. There is the ability to represent observations by illustrations and elate forms and functions. The ability to perform simple experiments and draw inferences from the results obtained interpretation of data which illustrate certain known physics principles are virtually lacking in the students. An adequate coverage of physics calls for exposure of students to practical experience that list these objectives.

Practical work may be described as an activity carried out by an individual or a group of individuals which demands participation rather than reception which is characteristic of theoretical work.

Practical work in physics needs to be fully integrated into the theoretical development of concepts. This is to ensure scientific and technological approaches to learning of physics for rational and critical thinking.

However, one of the problems in teaching of physics in schools, is the undesirable method of setting aside practical's or very little practical work done in physics until the students are in the end of second term or few weeks before their certificate examinations. Teachers being very conscious of the fact that the students will face a practical physics examination in West African School Certificate Examination begin to give hasty lectures on how to attempt the examination.

A deeper understanding of physics and the processes can only be achieved through practical work. If the teaching of Physics is to make its maximum contribution to the education and well being of the students and the society, the physics teacher must make it practical process in which the students at every stage are active participants instead of being merely passive recipients of verbal instruction.

The importance of practical work needs not be over emphasized but to be appreciated by the physics teachers in order that desirable attitude to practical work and to the teaching of physics can be fully understood.

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Besides, student enrolment in physics into the various institution of higher learning is far below expectation.

The reasons for this sad situation in our schools have been attributed to many factors which include inappropriate integration of the practical activities together with theoretical work in the teaching of physics in some secondary schools in Ika North East Local Government Area of Delta State.

It is necessary to advance also that most schools lack practical materials for the physics teaching and this could be attributed to inadequate financial support from Government and Parents Teachers Association, few number Professional and experienced physics teachers and lack of well equipped laboratories.

Purpose of study

The purpose of this study is to investigate:

a) How physics practical work is organised in some secondary schools In Ika north east Local Government Area.
b) If involvement of students in practical work has helped to improve their general performance in physics in Ika North East Local Government Area of Delta State.
c) If students' interest in Physics is developed when practical work is used to boost the lesson.
d) Whether or not learning and memorizing of facts by the students are discouraged. If students are motivated to learn and as such participate actively in the lesson.

Significance of study

Physics is a necessity in the current National Pursuit for technological and Industrial growth. The initiation and acceleration of such growth largely depends upon the quality and the availability of the right caliber of scientific and technological manpower.

It is hoped that the result got in this research work can be incorporated into physics teaching programme. This is to enable the government in general and the physics

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Piaget (1982) believes that there is no learning unless the child mentally acts upon information and, in the process, assimilate and accommodate what he encounters in his environment. Unless this occurs, the teacher and students are only involved in psenido learning the retention of which soon Fades.

Umeoduagu (1982) in a paper presented at the 4th science Education seminar of the then Bendel state college of Education, emphasized the importance of practical work in understanding science subject clearly, when he stated that if we are to achieve our desired objectives of equipping our students effectively in our secondary schools come October 1983, we should actually shift entirely from the theoretical to the doing approach.

Cardinal and Cohren (1982) notes: that learning is better through multisensory experiment. Visual audio and mechanical make learning more effective and permanent. Again their techniques are using these aids and the students should be acquainted with them. Experience shows that experiment performed by individual helps to raise students score on measure of factual information more than observing demonstration.

Research questions

For the purpose of this study a number of research questions were formulated and will be answered in the course of this work. These include;

1. Is physics practical work well organized in the secondary schools in Ika North East Local Government Area of Delta State?
2. Are there adequate professional and experienced physics teachers to teach physics practical in the secondary schools in Ika north east Local Government Area?
3. Do Students co-operate with the physics teacher during practical exercise?
4. Are the school laboratories well equipped with laboratory attendants?
5. Does Practical work affect students' general performances in school certificate examination?

Hypotheses of study

There is no significant impart in the performance between the students who were taught normal physics practical and those who were taught only just before exams.

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Limitations of the study

1. Sampling method was employed in this research, with only three Experimental schools and three control schools.

2. Financial problems restricted the researcher to where practical's were thought from the beginning of the fist term.

3. The Investigator also encountered a lot of problem, conveying practical material to the main schools for effective practical work.

The scope of the study

This study covered three secondary schools in Ika North Government Area of Delta State that have their final year student's physics scripts marked by the national examining bodies

The main schools and the number of students offering physics are represented in the table 1

S/n	Name of school	Number of students in physics class
1	Owa Alero Secondary school , Owa Alero,	12
2	Peniel Academy, B/B Owa,	8
3	Owanta Mixed Secondary School, Owanta,	17
4	**Total**	**37**

Table 2 shows the three schools that do not offer physics

S/n	Name of school	Number of students in physics class
1	Idumuesah secondary school Idumuesah	17
2	Concern group of Schools, B/B Owa.	11
3	Alizomor mixed secondary school Owa Alizomor.	14
4	**Total**	**42**

It is a research that concerns only the SSIII students. Physics teachers and principals of the selected schools were also concerned.

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The following assumptions were made.

a) Physics is a difficult subject. That practical work is an important aspect of physics.
b) Most Students run away from physics because of the rigours involved in practical work and that most physics teachers in secondary schools emphasize more on theory than practical.
c) That practical are never taught until a few weeks before the school certificate examinations.
d) Those practical activities in physics make the concepts real.
e) That practical work in physics will reveal the real life application of the subject physics.

Methodology

For the purpose of this research, six senior secondary schools were sampled. While three of these were used as experimental, the other three were used as control. The three experimental schools had thirty seven students while the control schools had forty two. The populations were based on students' enrolment. The teachers in the three experimental schools where provided with means to carry out practical work with their students regularly from the inception of the first term to the time of the examination. The teachers in the three control schools however, were given the free hand to teach physics the way they have been teaching it before in the past(i.e. the fire brigade approach of teaching it when the yellow paper is released) .

Result

Table 3 shows the ssce results for the three experimental schools below:

(i) Owa Alero Secondary school , Owa Alero

Result Grades	Number of Students
A_1	0
B_2	2
B_3	1
C_4	3
C_5	5
C_6	1
D_7	0
E_8	0
F	0
Total	**12**

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(ii) Results of the experimental schools

Peniel Academy B/B Owa

Result Grades	Number of Students
A_1	0
B_2	0
B_3	2
C_4	5
C_5	6
C_6	4
D_7	0
E_8	0
F	0
Total	**17**

(iii) Owanta Mixed Secondary School, Owanta.

Result Grades	Number of Students
A_1	0
B_2	0
B_3	2
C_4	0
C_5	4
C_6	0
D_7	2
E_8	0
F	0
Total	**8**

Table 4 shows the ssce results for the three control schools below:

{i}Idumuesah secondary school Idumuesah.

Result Grades	Number of Students
A_1	0
B_2	0
B_3	1
C_4	0
C_5	2
C_6	0
D_7	7
E_8	0
F	7
Total	**17**

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{ii} Concern group of Schools B/B Owa.

Result Grades	Number of Students
A_1	1
B_2	0
B_3	2
C_4	4
C_5	0
C_6	4
D_7	0
E_8	0
Total	**11**

{iii}Alizomor mix secondary school Owa Alizomor.

Result Grades	Number of Students
A_1	0
B_2	0
B_3	1
C_4	3
C_5	2
C_6	0
D_7	8
E_8	0
F	0
Total	**14**

Table 4: Results of the control schools

Result analysis

The experimental schools and the number of students offering physics are represented in the table 5

	X	F	fx	$(x-\overline{x})^2$	Fd^2
A	4	1	4	3.13	3.13
B	3	7	21	0.59	4.15
C	2	32	64	0.053	1.69
D-F	1	0	0		0
		40	81		8.97

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	X	F	fx	$(x-\overline{x})^2$	Fd^2
A	4	0	0	6.3001	0
B	3	2	6	2.43	4.9
C	2	13	26	0.31	4.08
D-F	1	24	024	0.19	4.65
	10	39	56		13.63

	Total number of students	mean	SD	Difference	T(calculated)	T(Tabulated)	Decision
EXPERIMENTAL SCHOOLS	37	2.23	0.22	77	78.14	1.980	Sig.
SCHOOLS CONTROL	42	1.44	0.59				

From the table value t-calculated is 78.14, while t-tabulated (critical value) is 1.980 at 0.05 level of significance.

Comparatively, since the t-calculated exceeds the critical value, we reject the null hypothesis and affirm that there is significant difference in performance between students taught physics practical's normally, that is, from the inception of the first term of their ss3 class to the period of the final examination and those who were taught just before the exam. The difference was in favour of those taught from the beginning.

Discussions and conclusion

The main problems of teaching physics are lack of qualified teachers and ill-equipped laboratories. The major problem is lack of well equipped laboratories. Even some schools do not have qualified staff and such staff cannot teach practical physics.

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Some teachers are paper qualified but not trained enough to handle practical physics. Such teachers are unable to use the simple physics apparatus for demonstration let alone the relatively complex types, and so such not impact the desired knowledge to the students. The act of laboratory management should form an essential part of the teachers training.

Most schools are poorly equipped. The expensive nature of scientific equipment, the difficulties of purchase and persistent problem of lack of funds have worsened the situation. Most importantly is the increase in school enrolment, which has very much stretched the available science facilities. In this condition of laboratories, one must argued that if science is best learned by doing, the teachers must look for resources beyond the classrooms for its reliance.

It is imperative that teachers should Endeavour to improve their quality of teaching through improvisation so as to make learning a bit more pleasurable and effective. This means that teachers of physics need to explore their different localities with a view to identifying materials and use these maximally to advantage. Again experiments should be designed for the purpose of testing a supposition.

Recommendation

In order to improve the performance of physics students in West African Examination, much has to be done on the practical work. It is therefore recommended that physics practical be introduced in senior secondary one (ss1) instead of only ss3. Schools offering Physics in particular and science subjects in general should as employ not just "qualified" but trained and experienced teachers who can impact the practical knowledge to students which will consequently result in good performance of students in their examinations. Only well equipped laboratories will complement the efforts of the trained practical teachers who will improve the teaching and learning of the physics practical and therefore physics laboratories should be well equipped adequately with physics apparatus for effective demonstrations and subsequent students' understanding.

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