

Students' Post-Practical Experience And Academic Achievement In Senior School Physics

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ABSTRACT

This study investigated, using quasi-experimental design, Students Post-Practical Experience and Academic Achievement in Senior School Physics in Delta State Capital Territory, Nigeria. Two Hundred and Seventy-four (274) Senior School Two (SS 2) Physics students from four randomly selected co-education schools formed the sample. Two schools were randomly assigned to both the experimental and control groups. Seven research questions and seven null hypotheses guided this study. A validated and reliable instrument, Post-Practical Experience Test (PET) was used to collect data in this study. Difference in Mean Score was subjected to Z-test statistic, which was significant in favour of the experimental group and was found to be gender and location friendly. Implications and recommendations were made.

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KEYWORDS: Teaching methods; Science; Practical work; Post-Practical Experience; Senior School Physics; Academic Achievement.

Introduction

The essence of teaching is for the learners to understand what is being taught, with little or no difficulty. For students to understand any science subject/course, a good teaching method(s) must be employed or adopted. Udoh, Fawole, Ajala, Okafor and Nwanain Okonronka (2004) opine that a teaching method is an organised, orderly and systematic way of achieving a given purpose or objective or desired result. Igbojinwaekwu and

Dorgu (2015) define teaching method as a way teachers present their lessons, in order, to make the student attain the behavioural objectives and also for the teachers to attain the instructional objectives of the lesson in course of teaching-learning process. According to Aina, Olutade and Osuji (2009), teaching methods are various ways a teacher, intentionally, transfer knowledge, skills and ideas to students.

The question that requires answer at this point is, which is the best method of

teaching science, in general and physics, in particular? Giving answer to this question requires knowing the meaning of science. According to Igbojinwaekwu(2013), many definitions of science exist, since different scientists have their definitions. Science education, unarguably, is practical oriented, geared towards helping students acquire relevant skills and needed to solve societal problems (Metala in Igbojinwaekwuand Joseph, 2013). This assertion, triggered many definitions of science. Graham (1985) defined science as knowledge based on observation and testing of facts, worked into an orderly system and acting as a base for new knowledge and a guide to ways of getting it. Hornby in Igbojinwaekwu (2013) defines science as the study of the structure and behaviour of the physical and natural and society, especially through observation and experimentation.Ogunniyi in Otuka(2004) defines science as an attempt by human beings to organise their experiences about nature into meaningful

systems of explanations.Tan and Teniz (2003) state that the fundamental purposes of teaching science in contemporary time, are to educate students to conduct research, explore, investigate, make connection between everyday life with topics of science, using scientific methods to solve problems and see the world through the eyes of scientists. According to Utari in Purwandari (2015) learning science should be able to give effect to the expected capabilities, so, it is necessary to think about how the learning process is conveyed to students.

Fromthe definitions of science, it will be safe for one to conclude that science learning involves observations, experimentation and practical work which are carried out in the laboratory. Therefore, the best teaching method to be adopted by a teacher who intends teaching physics at the senior school level is practical work teaching method. Ughamadu in Igbojinwaekwu (2013) refers to practical work as an activity carried out by a particular student or a group of students as to make

personal observation of processes, products or events. Aina, Olutunde and Osuji (2009) assert that practical work is an activity method designed to be carried out by an individual student or group of students for the purpose of making personal observation from experiments in which students can get conclusions by themselves. Urevbu (1990) opines that practical work consists of a range of activities from true experimental investigation to confirmatory exercises and skill learning. He concludes that both experimental investigations to confirmatory exercises take place in the science laboratory. Millar (2004), defines practical work as any teaching and learning activities which involve, at some points, the students in observing or manipulating real objects and materials. Purwandari (2015) asserts that practical work includes experimental, field work and laboratory work.

Science students, depending on the science teacher could be exposed to practical lessons before or after science class theory

lessons. A science student who acquires science practical experience after science class theory lesson, is said to possess post-practical experience. The science student who obtains the science practical experience before the science class theory lesson, is said to have pre-practical experience. This study is concerned with the effect of Post-Practical Experience of students on Academic Achievement in Senior School Physics.

Physics is one of the natural sciences. It is a physical science that concerns, mainly, with matter in relation to energy, various ways in which energy can be transferred from one form to another; it shows how the laws involving the transfer of energy have been investigated.

Physics, being a science subject, contains ideas, facts, principle and theories, which catalyses technological advancement of a nation (Mbah and Leghara, 2007). Learning physics as part of science is, essentially, aimed at fostering students' intellectual competence, such as independent learning, problem solving, decision making and critical thinking

(American Association for the Advancement of Science (AAAS), 1993 in Purwandari, 2015).

According to Joint Admissions and Matriculation Board (JAMB) (2015), the examining body that conducts entrance examination into Universities, Polytechnics/Colleges of Technology, Monotechnics and Colleges of Education, a student needs a credit pass in ordinary level or secondary school physics to qualify for admission into a tertiary institution to study medicine, engineering, pharmacy, medical laboratory science, biochemistry, microbiology, science education and other applied science courses.

Despite the importance of physics in energy transformation and conservation, technological development of nations and as a pre-requisite for admission of students into the university to pursue various science and science related courses, researches (igbojinwaekwu,2014;Achufusi-Aka, 2011;Onwiodukiti and Akinbobola,2005;Ivowi,1999;

AkpaninAchufusi-Aka, 2011) have shown that out of the three natural sciences(Biology, Chemistry and Physics), Physics is the most disliked subject by the senior school students in Nigeria. This, therefore, results in a consistent low enrolment and poor performance in physics in Senior School Certificate Examination (SSCE), conducted by West African Examinations Council (WAEC) and National Examinations Council (NECO),year after year (WAEC, 2014; Oguneye, 1993; Ivowi, 1999; Egbugara, 1986). According to Igbojinwaekwu (2012), students dislike Physics because over 90% of Physics questions in SSCE, conducted by WAEC and NECO, in Nigeria, is Mathematical in Nature.Supporting Igbojinwaekwu, Achufusi-Aka (2011) reports that Physics is highly dependent on Mathematics, a subject that is not so liked by students and this makes the subject, Physics, to be dreaded by many students. Oshome andWittrock (1996) remark that most physics teachers still use lecture methods of teaching in the teaching-learning process. They conclude that only when Physics lessons are concretized

through practical activities that student's academic achievement will be enhanced. Reinforcing Oshome and Wittrock remark or findings, Oguneye (1993) asserts that students will achieve significantly higher scores when an integrated (student centred) strategy is used in teaching Physics concepts than when a diminutive (teacher centred) strategy is used. Urevbu in Igbojinwaekwu and Joseph (2013) insists that practical work is indispensable in science education, because:

Science is experimental and so, any course in science must include laboratory/practical work, it is where one learns why science insists on precise measurement, accurate observation, conciseness, clarity in communication and it is helpful in bridging the gap between abstract ideas and realities. Indicating the importance of practical work in education, Ogunsola (2009) reports that it is only in practical work that students are assessed in the three domains (cognitive, psychomotor and affective) of education. The cognitive domain measures knowledge, psychomotor domain measures

skills, while affective domain measures attitude of students with respect to practical work.

Academic achievement is the score or grade a student obtains after sitting for an examination or a test. It could be an internal or external examination, formal or informal. During teaching-learning process, the teacher has the behavioural objectives which the students will attain by the end of the lesson being taught. The teacher, also, has some evaluative questions, each assessing one behavioural objective. Simply put, if there are five behavioural objectives, there must be five evaluative questions to enable the teacher easily ascertain the extent of attainment to the behavioural objectives. Therefore, academic achievement of student is assessed base on the extent of attainment to the behavioural objectives, by the end of the lesson.

One of the ways of evaluating senior school physics in external examination (Senior School Certificate Examinations,SSCEs) conducted by the recognized examining bodies, WAEC and NECO in Nigeria secondary schools, is through

practical work test. This accounts for about 49%, while essay and objective tests account for 51% out of 100%. This implies that a student who sits for only the practical work test or examination and scores all 49%, automatically, obtains a credit pass in Physics. This is the minimum grade required of a student to be eligible to pursue degree programmes in medicine, pharmacy, engineering, microbiology, science and other science oriented courses in any of the Nigeria universities.

Statement of the Problem

The importance of practical work in science education is no longer disputable (Igbojinwaekwu and Joseph, 2013). According to Akinbobola (2007), the ultimate goal of any instructional activity is to facilitate effective teaching and meaningful learning. It has been mentioned earlier that practical work examination is the only examination that assesses all the three domains (cognitive, affective and psychomotor) of students at the same time. It is during the practical work in the

laboratory that students know that (i) science is experimental (ii) laboratory is a place where one learns, most readily, what questions can be asked, fruitfully and how they must be put, (iii) it is where one learns why science insists on precise measurement, accurate observations, conciseness and clarity in communication, (iv) it is helpful in bridging the gap between abstract ideas and realities and (v) superstition is discouraged (Urevbu, 1990; Igbojinwaekwu, 2013). Also, it is in the laboratory, during practical work, that: positive scientific attitude is developed, one develops critical thinking and curiosity, quality of materials is not compromised, more discoveries are made, valid conclusions are drawn, facts surrounding the existing laws can be subjected to test, one is warned not to falsify results, experimental skills are developed, one becomes creative and so, may become employers of labour.

Despite the great importance accorded practical work in science education curriculum, it is unarguably known that students are not taught practical throughout their six years

secondary school education, except one week to their practical examination in their SSCE. Igbojinwaekwu (2013) had carried out a study on student's pre-practical experience and academic achievement in senior school biology; Igbojinwaekwu and Joseph (2013) had, extensively, studied the comparative effects of pre-practical and post-practical experiences on students' academic achievement in senior school biology. No study, to the best of researcher's knowledge, has delve into the study of students' post-practical experience vis-a-vis academic achievement in senior school physics as a separate study. To close this gap, gave birth to this study. Therefore, the problem of this study is stated thus: how does post-practical experience of students affect their academic achievement in senior school physics?

Purpose of the Study

This study intends to achieve the following purposes: to find out if post-practical experience

- (i) improves academic achieve of students in senior school physics,
- (ii) improves academic achievement of students in rural schools vis-a-vis their counterparts in urban schools and
- (iii) significantly improves academic achievement of male students vis-a-vis their female counterparts.

Research Questions

The following research questions were formulated to guide this study.

- (i) What is the mean score (MS) academic achievement of students with post-practical experience vis-a-vis their counterparts without post-practical experience in senior school physics?
- (ii) What is the MS academic achievement of the male students with post-practical experience vis-a-vis the male students without post-practical experience in senior school physics?
- (iii) What is the MS academic achievement of the female students with post-practical

experience vis-a-vis their female counterparts without post-practical experience in senior school physics?

(iv) What is the MS academic achievement of the male and female students with post-practical experiences in senior school physics?

(v) What is the MS academic achievement of students with post-practical experience and students without post-practical experience in the rural schools in senior school physics?

(vi) What is the MS academic achievement of students with post-practical experience and students without post practical experience in urban schools in senior school physics?

(vii) What is the MS academic achievement of students with post-practical experience in rural and urban schools in senior school physics?

Null Hypotheses

The following seven null hypotheses were tested at 0.05 level of significance on a 2- tailed test, using Z-test statistic.

HO₁: there is no significant MS academic achievement difference between students with post-practical experience and students without post-practical experience in senior school physics.

HO₂: there is no significant MS academic achievement difference between the male students with post-practical experience and the male students without post-practical experience in senior school physics.

HO₃: there is no significant MS academic achievement difference between the female students with post-practical experience and the female students without post-practical experience in senior school physics.

HO₄: there is no significant MS academic achievement difference between the male and female students with post-practical experiences in senior school physics.

HO₅: there is no significant MS academic achievement difference between students with and without post-practical experience in the rural schools in senior school physics.

HO₆: there is no significant MS academic achievement difference between students with and without post-practical experience in the urban schools in senior school physics.

HO₇: there is no significant MS academic achievement difference between students with post-practical experience in the rural and urban schools in senior school physics.

Methodology

The pretest-posttest quasi-experimental research design was adopted in this study. This was because (i) intact classes were used, (ii) complete randomization of the subjects was not possible, due to the rigid administrative set up of schools used in the study and (iii) intact classes were randomly assigned to experimental and control groups.

The population of the study was 960(526 boys and 434 girls) Senior School Two (SS2) physics students from twelve public secondary schools in Delta State Capital Territory, Nigeria. These schools have been presenting students for the SSCE conducted by WAEC and NECO for the past five years and beyond. All the twelve secondary schools were co-educational, at the time this study was conducted.

Through a simple random sampling technique, four schools were selected through balloting. The four schools had 274 physics students (150 boys and 124 girls) in SS2, which formed the sample of the study. Out of these four schools, two were assigned to experimental group, which consisted of 128(53 boys and 75 girls) SS2 physics students. The control group comprised 146 (97 boys and 49 girls) SS2 physics students.

The experimental group of 53 males SS2 physics students which consisted of 40 students in urban schools and 13 from rural schools; 75 female SS2 physics students,

comprised 60 and 15 students in urban and rural schools, respectively. The control group of 97 males SS2 physics students consisted of 67 and 30 urban and rural students, respectively; 49 females SS2 physics students, comprised 32 and 17 urban and rural students, respectively.

An instrument, Post-practical Experience Test (PET) was used to collect data. The instrument was researcher made. PET consisted of two sections, A and B. Section A required personal data of each student, while B had 10 multiple choice objective questions on Ohm's law. Two experts in physics education and another two experts in test construction validated PET, on the basis of coverage of unit of work, relevance in the collection of the needed data and stated behavioural objectives. The reliability index was ascertained to be 0.92, using Kuder-Richardson 21 (K-R21) statistic. The reliability of PET was judged good, enough, to collect data for this study, following Maduabum (2004) and Egbule and

Okobiah (2006) assertions that instrument made to collect data for studies in academic achievement should have a reliability index of not less than 0.50.

Four teachers, each from the four selected secondary schools, in this study, taught the students. This was done to remove Hawthorn effect. The teachers underwent training program for four weeks before being certified, good enough, to teach the students. This was done to remove any inequality among the teachers. Uniform lesson notes, on the concept of ohm's law, were prepared for the teachers by the researcher. This was to ensure that the four teachers teach exactly the same thing using the same steps, method, behavioural objectives, entry behaviours and study questions or evaluative questions. Teachers used in this study had the same years of service experience, marking experience in SSCE and were all degree (B.Sc. Ed.) holders in physics. Also, the same textbook was used

by all the teachers during teaching-learning process.

The students from both experimental and control groups were subjected to the same pretest, using PET, as a test instrument, for 20 minutes. This was to find out whether the groups were comparable and the MS academic achievement standings of both groups, before any treatment. Thereafter, the students in both groups were taught physics theory lesson on the concept of ohm's law for three weeks, after which the students in the experimental group were taught the concept of ohm's law from practical work point of view, for additional two weeks. Both groups were, thereafter, subjected to posttest, using PET, by changing the serial numbers of the ten (10) questions. This was done to avoid easy recall of questions by the students. The difference between MS academic achievement of students in the experimental and control groups were subjected to data analysis, using percentages and Z-test statistics.

Data Analysis and Results

Research Question 1

What is the Mean Score (MS) academic achievement of students with post-practical experience vis-a-vis their counterparts without post-practical experience in senior school physics?

Answer To Research Question 1

The MS academic achievement of students with and without post-practical experience in senior school physics are shown in table 1.

Table 1: Pretest-posttest Mean Scores of SS2 Students in Senior School Physics

Group of students	N	Posttest ed MS	Preteste d MS	MS gain
Experimental	128	86	42	44
Control	146	59	44	15

Data in table 1 show that students in experimental group have pretest MS academic achievement=42, posttest MS academic achievement=86 and MS academic achievement gain=44. Also, students in control group have pretest MS academic achievement=44, posttest MS academic achievement=59 and MS academic achievement gain=15. The pretest MS academic achievement of the two groups are comparable. The posttest MS academic achievements of the students in experimental and control groups indicate that the experimental group has MS academic achievement=27 higher than the MS academic achievement of the control group. Also, students in the experimental group have a higher MS achievement gain than their counterparts in the control group. The implication is that, students in the experimental group who had post-practical experience after their physics theory lesson, have a better MS academic achievement than their counterparts in the control group who did not have the post-

practical experience after their physics theory lesson.

Research Question 2

What is the MS academic achievement of the male students with post-practical experience vis-a-vis the male students without post-practical experience in senior school physics?

Answer to research question 2

The MS academic achievement of the male students in experimental and control groups are shown in table 2

Table 2: Pretest-posttest Mean Scores of SS2 Male Students in Senior School Physics

Male students	N	Posttested MS	Pretested MS	MS gain
Experimental	53	78	39	39
Control	97	52	40	12

The data displayed in table 1 show that the pretested MS of male students in experimental and control groups are 39 and 40,

respectively. This indicates that the students in the two groups are comparable. The posttest MS academic achievement of the male students in experimental and control groups are 78 and 52, respectively. This shows that male students in the experimental group achieved better than their counterparts in the control group. A higher MS gain of male students in the experimental group over their male students in the control group authenticates the superiority of male students exposed to post-practical work after their physics theory lesson to the male students who were not exposed to post-practical work after physics theory lesson in terms of academic achievement.

Research Questions 3

What is the MS academic achievement of the female students with post-practical experience vis-a-vis their female counterparts without post-practical experience in senior school physics?

Answer to research question 3

The MS academic achievement of the female students with and without post-practical experience are shown in table 3

Table 3: Pretest-posttest mean scores academic achievement of SS2 female students in senior school physics

Female students group	N	Posttested MS	Pretested MS	MS gain
Experimental	75	76	33	43
Control	44	50	35	15

Table 3 shows pretested MS of 33 and 35 for the female students in the experimental and control groups, respectively. These MS indicate that the female students in the experimental and control groups are comparable. Besides, the female students in the experimental group have higher posttested MS and MS gain than their counterparts in the control group. This shows that students exposed to post-practical work after the physics theory lesson have better academic achievement

than the ones not exposed to practical work after the physics theory lesson.

Research Question 4

What is the MS academic achievement of the male and female students with post-practical experience in senior school physics?

Answer to research question 4

The MS academic achievement of the male and female students with post practical experience are shown in table 4.

Table 4: Pretest-posttest mean score academic achievement of SS2 male and female students with post-practical experience in senior school physics

Sex of students	N	Posttested MS	Pretested MS	MS gain
Male	53	78	39	39
Female	75	76	33	43

Data in table 4 show that pretestMS academic achievements of male and female students with post-practical experience are 39 and 33, respectively, an indication that

there are comparable. The posttestMS academic achievements of male and female students with post-practical experience are 78 and 76, respectively, showing that the male students have higher MS than the female students. In terms of MS academic achievement gain, the female students have higher score=43 than the male students with a lower score = 39. Although the male students have higher MS academic achievement in both posttest and pretest, the female students MS academic achievement gain was superior.

Research Question 5

What is the MS academic achievement of students with post-practical experience and students without post-practical experience in the rural schools in senior school physics?

Answer To Research Question 5

The MS academic achievement of students with and without post-practical experience in the rural schools are shown in table 5.

Table 5: Pretest-posttest mean scores academic achievement of SS2 students with and without post-practical experience in senior school physics

Students in rural schools	N	PosttestedMS	Pretested MS	MS gain
Experimental	28	80	39	41
Control	47	59	41	18

Table 5 shows pretest MS academic achievement of 39 and 41 for students in the rural schools in the experimental and control groups, respectively; indicating a very comparable groups, although, the control group has a slight higher score. Data in table 5, also, show posttest MS academic achievements of 80 and 59 for the students in the experimental and control groups, respectively, implying that, post-practical work experience has a positive impact in the terms of academic achievement of students in rural setting. The MS academic achievement gains of 41 and 18 for experimental and control groups students in the rural setting, respectively. This, also, authenticates the

superiority of post-practical work experience to non post-practical work experience after physics theory lesson.

Research Question 6

What is the MS academic achievement of students with post-practical experience and students without post-practical experience in urban schools in senior school physics?

Answer to research question 6

The MS academic achievements of students with and without post-practical experience in urban schools in senior school physics are as shown in table 6

Table 6: Pretest-posttest mean scores academic achievement of SS2 students with and without post-practical experience in senior school physics in urban schools

Group of students	N	Posttested MS	Pretest MS	MS gain
Experimental	100	82	51	31
Control	99	61	53	8

Data in table 6 show that SS2 students in experimental group have pretest

MS, posttest MS and MS gain of 51, 82 and 31, respectively. The SS2 students in the control group have pretest MS=53, posttest MS=61 and MS gain=8. This shows that in schools in urban setting, SS2 students in experimental group have higher MS academic achievement and MS gain than the SS2 students in control groups. This, further, implies that post-practical work experience of SS2 students in urban areas sustains higher academic achievement than the SS2 students in schools in urban setting not exposed to post-practical work after physics theory lesson.

Research Question 7

What is the MS academic achievement of students with post-practical experience in rural and urban schools in senior school physics?

Answer to Research Question 7

The MS academic achievements of SS2 students with post-practical experience in

rural and urban schools in senior school physics are as shown in table 7.

Table 7: Pretest-posttest mean scores academic achievement of SS2 students with post-practical experience in rural and urban schools in senior school physics

Students school location	N	Posttested MS	Pretested MS	MS gain
Urban	100	82	51	31
Rural	28	80	39	41

The data in table 7 show that SS2 students with post-practical experience in both urban and rural settings have very high posttest MS academic achievement. The surprising result is that SS2 students in rural schools have higher MS academic achievement Gain than their counterparts in schools in the urban setting in senior school physics

Testing of Null Hypotheses

HO₁ to HO₇ were subjected to Z-test analysis at 0.05 level of significance on a 2-tailed test.

HO₁: there is no significant MS difference between students with post-practical experience and students without post-practical experience in senior school physics

Table 8: Z-test analysis of MS difference between SS2 students with and without post-practical experience in senior school physics

Group of students	N	Post-tested MS	SD
Experimental	128	86	3.0
Control	148	59	3.1
		274	<0.05

Data in table 8 show that $Z_{cal}=73 > Z_{crit}=1.96$. Therefore, HO₁ is rejected. This implies that the difference in MS academic achievement is significant in favour of the SS2 students exposed to post practical work in senior school physics after physics theory lessons.

HO₂: there is no significant MS difference between the male students in post practical experience and the male students without post practical experience in senior school physics.

Table 9: Z-test analysis of MS difference between male students with and without post practical experience in senior school physics

Group of SS2 male students	N	Post tested MS	S D	Df	Z _{cal}	Z _{crit}	P
Experimental	573	78	3.0	4.3	27	1.96	<0.05
control	97	52	3.1	3.9			

Data in table 9 show that $Z_{cal}=27 > Z_{crit}=1.96$. Therefore, HO₂ is rejected. This implies that MS difference of 26 is significant in favour of the male SS2 students in the experimental group.

HO₃: there is no significant MS difference between the female students with post-practical experience and the female students without post-practical experience in senior school physics.

Table 10: Z-test analysis of MS difference between the female students with and without post practical experience in senior school physics

Female SS2 students group	N	Posttest ed MS	S D	Df	Z _{cal}	Z _{crit}	P
Experimental	75	76	5.3	122	2.7	1.96	<0.05
control	49	50	5.1				

From table 10, $Z_{cal}=2.7 > Z_{crit}=1.96$. Therefore, H_{O3} is rejected. This implies that the difference in MS is significant in favour of female SS2 students in the experimental group exposed to physics post-practical work after physics theory lesson.

H_{O4} : there is no significant MS difference between the male and female students with post-practical experience in senior secondary school physics.

Table 11: Z-test analysis of MS difference between male and female SS2 students with post-practical experiences

Sex of students	N	Posttest ed MS	S D	df	Z _{cal}	Z _{crit}	P
Male	53	78	8.4	126	1.35	1.96	<0.05
Female	75	76	8.1				

Table 11 shows that $Z_{cal}=1.35 < Z_{crit}=1.96$. Therefore, H_{O4} is retained. The implication is that the post-practical work experience of both male and female SS2 students has equivalent high score influence on them.

H_{O5} : there is no significant MS difference between students with and without post-practical experience in rural schools in senior school physics.

Table 12: Z-test analysis of MS difference between SS2 students with and without post-practical experiences in rural schools in senior school physics.

Group	N	Posttest ed MS	S D	Df	Z _{cal}	Z _{crit}	P
Experimental	2	80	4.7	1	1.9	1.96	<0.05

ntal	8		7	3	9	6	5
Control	4	59	4.				
	7		3				

From table 12, it is evident that $Z_{cal}=19 > Z_{crit}=1.96$. Therefore, H_{O_5} is rejected. This means that there is a significant difference in MS academic achievement in favour of the female SS2 students in the experimental group.

H_{O_6} : there is no significant MS difference between students with and without post-practical experience in urban schools in senior school physics.

Table 13: Z-test analysis of MS difference between SS2 students with and without post-practical experience in urban schools in senior school physics

Group of students	N	Posttes ted MS	SD	Df	Z _c al	Z _{cri} t	P
Experim ental	100	82	3.7	197	41	1.96	<0.05
Control	99	61	3.5				

Table 13 shows that $Z_{cal}=41 > Z_{crit}=1.96$. Therefore, H_{O_6} is rejected. This indicates that the MS academic achievement difference is significant in favour of the experimental group.

H_{O_7} : there is no significant MS difference between students with post-practical experience in the rural and urban schools in senior school physics.

Table 14: Z-test analysis of MS difference between students with post-practical experience in the rural and urban schools in senior school physics

Students school location	N	Postte sted MS	SD	Df	Z _{cal}	Z _{crit}	P
Urban	10	82	8.7	12	1.06	1.96	<0.05
	0			6			
Rural	28	80	8.9				

Table 14 shows that $Z_{cal}=1.06 < Z_{crit}=1.96$. Therefore, H_{O_7} is retained, implying that the difference in MS academic achievement between SS2 students in rural and urban schools with post-practical experience is not significant. This further means that the

post-practical experience effect on students' academic achievement in senior school physics is not school location bias.

Discussion

This study investigated the effect of post-practical experience on Students' Academic Achievement in Senior School Physics in Delta State Capital Territory, Nigeria. Tables 1, 2, 3, 5 and 6 show persistent higher posttest Mean Scores academic achievement of students who have post-practical experience over the posttest Mean Scores academic achievement of students who do not have post-practical experience in senior school Physics. Tables 8, 9, 10, 12 and 13 show that the persistent higher posttest Mean Scores academic achievement of the students with post-practical experience over those of the students without post-practical experience are significant in favour of the students with post-practical experience. This shows that post-practical experience of students significantly enhances their academic achievement in senior school physics. The findings in this study agrees with the findings

of Urevbu (1990) who confirms that laboratory work is indispensable in the study of science education; Metala in Igbojinwaekwu and Joseph (2013) asserts that science education, unarguably, is practical oriented; Ogunsola (2009) reports that only practical work in science awaken the cognitive, psychomotor and affective domains of students, simultaneously. This alignment in findings might be due to the fact that these studies involved training program for the teachers and probably used students of equal abilities.

Table 4 shows that the male and female Physics students with post-practical experience have posttest Mean Score Academic of 78 and 76 respectively. The male students have a higher MS than the female students. When these MS Academic Achievement were subjected to Z-test statistic, as shown in table 11, the difference was not significant. This shows that students' Physics post-practical experience is gender friendly. This finding disagrees with the findings of Achufusi-Aka (2011) who reported a higher mean

achievement in Physics for girls over the boys. The disagreement may have arisen from the fact that in Achufusi-Aka study, no instrument was manipulated by the students, while in this study, students manipulated instruments during practical work. Table, also, shows a higher MS gain of female students with post-practical experience over their male counterparts with low MS gain. This finding agrees with the findings of Achufusi-Aka (2011) who reported a higher mean achievement in Physics for girls over the boys. This might be because students used in both studies were comparable.

Implications of the Study

This study investigated the effect of students Post-Practical Experience on Academic Achievement in Senior School Physics. The finding of significant higher Mean Score academic achievement of students in the experimental group over their counterparts in the control group implies that science teachers should expose science students to practical

work after science theory classes to ensure sustainable improved academic achievement.

Another important finding in this study is that both Physics students in urban and rural schools have very high Mean Score academic achievements which are not significantly different, statistically. The implication is that science teachers can conveniently use post-practical experience strategy to ensure students' proper understanding of the nature of science, irrespective of the location of the school.

Yet, another vital finding of this study is non-significant high Mean Score for both male and female Physics students who have post-practical experience. This shows that post-practical experience teaching strategy is gender friendly and that teachers need to be fully encouraged to use it in teaching-learning process.

A very important implication of this study is that any science instruction that is based on only theory should be seriously discouraged.

The school laboratory has to be equipped with modern instrument, apparatus, chemicals, etc. this will encourage practical work in the schools.

Recommendation of the Study

The researcher, therefore, recommends that practical allowances should be paid to science teachers to motivate them to adopt post-

practical strategy in the teaching-learning process in the schools. Science teachers should be encouraged to teach practical at least once in a week in all the classes from primary to secondary schools. Seminars and workshops should be organised to properly equip science teachers and make them competent in practical teaching.

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