EFFECTS OF PRACTICAL ACTIVITIES ON BASIC SCIENCE ACADEMIC PERFORMANCE OF LOWER PRIMARY SCHOOL PUPILS

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Abstract

The study determined the effectiveness of practical activities in enhancing Basic Science academic performance of lower primary school pupils. The study adopted pre-test, post-test, non equivalent control group quasi-experimental Design. Two primary schools were selected in Ondo West Local Government Area of Ondo State, Nigeria using simple random sampling technique. Primary three pupils from two intact classes with class size between 18 to 25 pupils were purposively selected for the study. The instruments used for data collection was "Pupils' Basic Science Practical Activities Test" (PBSPAT) which was designed to test pupils' knowledge of Basic Science. The reliability coefficient (r) was calculated for Pupils Basic Science Practical Activities Test (PBSPAT) using test- retest method of spearman's rho (ρ). The reliability value for PBSPAT was found to be 0.75. Data collected was analyzed using t-test. The result showed that there was a significant difference in the academic performance of pupils' in practical activities group compared with that of the teacher-directed group. The study concluded that the practical activities strategy is more effective in improving Basic science academic performance of lower primary school pupils and therefore, recommends that primary school teachers should employ the use of this strategy in enhancing teaching and learning of Basic Science.

Introduction

The development of any nation is indicated by the overall social, economic and political progress and dependent upon man's activities in his natural environment. These activities revolve around science and its technological applications (Famakinwa, 2014). Science is therefore a great enterprise which nations depend on in order to advance technologically. Science is receiving much emphasis in education because of its significance and relevance to life and society. Basic Science as the foundation of sciences and the prerequisite subject for many fields of learning contributes immensely to the scientific and technological growth of a nation. This includes medicine, forestry, agriculture, biotechnology and nursing. The study of Basic Science in lower primary school can equip pupils with useful skills, concepts, principles and theories that will enable them face the challenges of science subjects in the future.

Science learning is expected to produce individuals that are capable of solving their problem as well as those of the society. Such individuals are expected to be autonomous, confident and self reliant. Science and technology constitute the basis of advancement in nearly all fields of human endeavours. In order to realize this goal, associations such as Science Teachers Association of Nigeria (STAN) and Nigerian Integrated Science Project (NISP) were set up to look into the various curricula used at various levels of Nigerian educational system. The various curricula developed, have their objectives which have to be achieved for a successful science education and attainment of the national goals and aspirations. These goals and aspirations cannot be realized except through the effective effort of the classroom teachers.

According to Nwagbo (2001), a number of factors have been identified as contributing to the non-acquisition of skills by secondary school students which invariably lead to poor academic performance and one of the factors is the teacher variable, that is, the teachers' method of teaching.

Okoli (2006) observes that many science teachers prefer the traditional expository/lecture method of teaching, that is, a teaching technique in which one person, the teacher, presents a spoken discourse on a particular subject and shy away from activity-oriented teaching methods which are student centered (such as inquiry method, discovery method, and investigative laboratory approach). Nwagbo (2006) observes that such teacher-centred approach which places the teacher as the sole possessor of knowledge and the students as passive recipients of knowledge may not enhance achievement or promote positive attitude to biology. Obiekwe (2008) reports that all is not well with science instruction in Nigerian secondary schools and noted that science teaching lays extreme emphasis on content and the use of "chalk and talk"

method neglecting the practical activity method which enhances teaching and learning. This negligence and 'shy-away' attitude from activity oriented-method of teaching has led to abstraction which makes the students less active and more prone to rote memorization.

Practical activities in Basic science provide opportunities for pupils to actually study science as opposed to learning about science. Nzewi (2008) asserts that practical activities can be regarded as a strategy that could be adopted to make the task of a teacher (teaching) more real to the pupils as opposed to abstract or theoretical presentation of facts, principles and concepts of subject matters. Nzewi (2008) further suggests that practical activities should engage the pupils in hands-on, mind-on activities, using varieties of instructional materials/equipment to drive the lesson home. Nwagbo (2008) recommends that the use of practical activities (approach) to the teaching of biological concepts should therefore be a rule rather than an option to Basic science teachers, if we hope to produce pupils that would be able to acquire the necessary knowledge, skills and competence needed to meet the scientific and technological demands of the nation. The search for a more effective approach for the teaching and learning of Basic science that will enhance the acquisition of Basic science knowledge has persisted over the years. This is because the acquisitions of practical activities knowledge is the basis for scientific inquiry and the development of intellectual skills and attitudes that are needed to learn science concepts. Practical activities knowledge is abilities which can be developed by experience and used in carrying out mental and physical operations.

Apart from teaching methods, gender is also implicated in pupils' learning outcome in science. The issue of gender and gender stereotyping permeate every aspect of human endeavour. Okeke (2007) observes that the consequences of gender stereotyping cut across social, economic, political and educational development, especially in the areas of science and technology. However, there have been conflicting reports in respect to gender and achievement in science (Abonyi, 1998 and Ezeliora, 1999). This study is therefore expected to contribute to the debate. Based on the conflicting reports in respect to gender and achievement in science, the Federal Government of Nigeria is emphasizing the teaching and learning of science process skills and principles which will lead to fundamental and applied research in the sciences at all levels of education (FRN, 2004).

A lot has been done to improve science teaching in secondary schools in Nigeria. In spite of that, students continue to perform poorly in science subjects. This situation has created the need for more effective teaching methods. It then becomes necessary to explore the efficacy of alternative

method of redressing this situation. In Nigeria, many studies (Odutuyi, 2019; Akpan, 2012; Aladejana & Aderibigbe, 2007) have been conducted on the effectiveness of practical activities on students' learning outcomes. However, most of the these efforts were targeted only at the secondary school level with little or no attention paid to the primary school level as far as practical activities are concerned. This paucity of literatures in this regard gives room for the need to conduct a scientific study on investigating the effects of practical activities on academic performance of lower primary school pupils, hence this study.

The following research hypotheses guided the study.

- There is no significant difference between the effect of the strategies on academic performance mean scores of pupils who got and did not get the practical activities strategy according to their pre-test result in basic science;
- There is no significant difference between the effect of the strategies on academic performance mean scores of pupils who got and did not get the practical activities strategy according to their post-test result in basic science;
- There is no significant difference between the effect of the strategies on academic performance mean scores of boys and girls who got and did not get the practical activities strategy according to their pre-test result in basic science;
- There is no significant difference between the effect of the strategies on academic performance mean scores of boys and girls who got and did not get the practical activities strategy according to their post-test result in basic science.

Method

The study adopted Pretest-Posttest control group quasi-experimental design involving one treatment and one control group.

The design is represented schematically as follows:

0_1 X_1 0_3 – Teacher Directed Strategy (TDS) group

0_2 X_2 0_4 – Practical Activities Strategy (PAS) group

0_1 and 0_2 are the pre-test measures of TDS and PAS groups respectively.

Also, 0_3 and 0_4 are the post-test measures of TDS and PAS groups respectively, while X_1 and X_2 are the Teacher Directed Strategy (Control) and Practical Activities Strategy (Experimental) respectively.

The study population comprised all pupils in lower primary schools in Ondo Town, in Ondo West Local Government Area (LGA) of Ondo State. The sample consisted of two public primary schools randomly selected from the chosen LGA. One arm out of primary three (3) classes consisting of pupils of intact class in each school was randomly assigned to one of the instructional strategies, making a total of forty one (16 boys and 25 girls) pupils used for the study.

The instrument is a self-designed instrument titled "Pupils Basic Science Practical Activities Test" (PBSPAT). The PBSPAT was designed to determine the academic performance during the lesson. The PBSPAT instrument contained twenty (20)-item multiple choice tests on primary three basic science module. Each item in the PBSPAT carried five marks each and a total mark of 100.

The reliability coefficient (r) was calculated for Pupils Basic Science Practical Activities Test (PBSPAT) using test- retest method of spearman's rho (ρ). The reliability value for PBSPAT was found to be 0.75. This was an indication that the instrument was reliable and suitable for the study.

The "Instructional guide" (IG) was used to arouse the learners' performance in the Basic Science subject that was demonstrated during the lesson in the class. Two instructional guides of the same content were used for the study. All the instructional guides contained the procedures for the control and experimental groups that were used for the study. The IG were subjected to face and content validation by experts in Basic Science and Early Childhood Education. The instructional guides were given to primary science experts and some primary three Basic Science teachers for validation. They went through them with respect to the adequacy, structure, language and relevance of the instrument.

The process of data collection for the study took six weeks. The administration of pre-test, the application of treatments in the control and experimental groups lasted for two periods per week. The procedural steps that were used to carry out the demonstrations were provided for each treatment. The post-test was administered to all the pupils that participated in the study after the completion of treatments. The PBSPAT results for both pre-test and post-test were scored, collated and analyzed, using t-test.

Results

Table 1: Pupils Basic Science Academic Performance means Scores of Pre-Test of TDS and PAS Groups.

Variable	Number	Mean	Standard Deviation	t	df	Sig	Remark
Pre-test (TDS)	21	39.67	9.71	-3.207	39	.315	P > .05 Not Significant
Pre-test (PAS)	20	7.65	5.58				

Based on the results presented in Table 1, there is no significant difference between the effect of strategies on academic performance mean score of the TDS ($\bar{x}$ = 39.67) and PAS ($\bar{x}$ = 47.65) before the treatment. The PBSPAT academic performance mean scores of both groups were close to each other before the treatment (t (39) = -3.207, p > .05). Hence, hypothesis 1 is hereby not rejected.

Therefore, there is no significant difference between the effect of the strategies on academic performance mean scores of pupils who got and did not get the PAS according to their pre-test result in basic science.

Table 2: Pupils Basic Science Academic Performance means Scores of Post-Test of TDS and PAS Groups.

Variable	Number	Mean	Standard Deviation	t	df	Sig	Remark
Post-test (TDS)	21	45.10	8.53	-7.482	39	.000	P < .05 Significant
Post-test (PAS)	20	66.80	8.79				

When Table 2 is examined, it is seen that there was a significant difference between the effect of strategies on academic performance mean scores of the TDS ($\bar{x} = 45.10$) and PAS ($\bar{x} = 66.80$) groups after the treatment and when the averages of both groups were examined in order to determine the difference. It is seen that there was a significant difference in favour of PAS group (t (39) = -7.482, p < .05). Hence, hypothesis 2 is hereby rejected.

Therefore, there is significant difference between the effect of strategies on academic performance mean score of pupils who got and did not

get the practical activities strategy according to their post-test result in basic science.

Table 3: Pupils Basic Science Academic Performance means Scores of Pre-Test of TDS and PAS Groups by Gender.

Gender	Number	Mean	Standard Deviation	t	Sig	Remark
Pre-test (Boys)	16	62.31	8.65	6.103	.018	P < .05 Not Significant
Pre-test (Girls)	25	51.44	15.00			

Levene's test for the equality of variance is significant ($p < .05$) as shown in Table 3.

Based on the results presented in Table 3, there is significant difference between the effect of strategies on academic performance mean score of the Boys ($\bar{x} = 62.31$) and Girls ($\bar{x} = 51.44$) before the treatment. The PBSPAT academic performance mean scores of both groups were not close to each other before the treatment ($t(6.103) = .018$, $p < .05$). Hence, hypothesis 1 is hereby rejected.

Therefore, there is significant difference between the effects of the strategies on academic performance mean scores of Boys and Girls who got and did not get the PAS according to their pre-test result in basic science.

Table 4: Pupils Basic Science Academic Performance means Scores of Post-Test of TDS and PAS Groups by Gender.

Gender	Number	Mean	Standard Deviation	t	df	Sig	Remark
Post-test (Boys)	16	62.31	8.65	2.94	39	.006	P < .05 Significant
Post-test (Girls)	25	51.44	15.00				

Using an alpha level of .05, an independent sample t-test was conducted to evaluate whether boys and girls differed significantly on a pupil basic science academic performance test (PBSPAT).

When Table 4 is examined, it is seen that there was a significant difference between the effect of strategies on academic performance mean scores of the boys ($\bar{x} = 62.31$) and girls ($\bar{x} = 51.44$) groups after the treatment

and when the averages of both groups were examined in order to determine the difference. It is seen that there was a significant difference in favour of boys ($t(39) = 2.94$, $p < .006$). Hence, hypothesis 4 is hereby rejected.

Therefore, there is significant difference between the effect of strategies on academic performance mean score of boys and girls who got and did not get the practical activities strategy according to their post-test result in basic science.

Discussion

The result obtained showed that the pupils exposed to the PAS obtained higher basic science mean scores. They achieved better compared to the TDS. The PAS was more effective than the TDS. The findings from this research also indicate that the performance of PAS improved the academic performance of basic science over TDS. The result showed that there is difference in the mean score of both boys and girls but the overall result revealed that gender has significant difference on Basic Science. This is in line with the findings of Shaibu and Mari (1997) and Adeoye (2000) that carried out a research on the effectiveness of laboratory-based and lecture methods on students' achievement in Biology and obtained significant differences in the performance of boys and girls who are exposed to practical activities. Also, Kolawole (2007) found that boys performed better than girls in both cooperative and competitive learning strategies when he conducted a research on the effects of competitive and cooperative learning strategies on Nigerian students' academic performance in mathematics.

Conclusion

The findings indicate that practical activities strategy is related to improvement in the academic performance of basic science in lower primary school pupils. These findings may begin to form a foundation for development of research-based guidelines for instructional strategies aimed to improve academic performance in basic science in classroom settings.

Based on the findings of the study on the effects of basic science practical activities on pupils' Basic science knowledge acquisition in Ondo West Local Government Area, the following conclusions were made: Practical activity method enhanced and facilitated the acquisition of basic science knowledge more than the conventional method and Practical activity method fosters acquisition of basic science knowledge in both boys and girls in lower primary school.

Recommendation

The researcher therefore recommends that practical activities strategy may be used as an intervention in the classroom.

1. Teachers should encourage pupils to develop interest in practical activities by engaging them in practical and providing instructional materials that will challenge them to be actively involved during practical lessons.
2. Ministry of Education and professional organizations like STAN should organize workshops, seminars and conferences for basic science teachers on delivering of activity based lesson.
3. Basic science concepts should be taught with practical activity so that the pupils will do science instead of learning about science.

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