

ASSESSMENT OF THE EFFECTS OF ACTIVITY-BASED TEACHING METHOD ON STUDENTS' PERFORMANCE IN BASIC SCIENCE IN JUNIOR SECONDARY SCHOOLS IN KADUNA STATE, NIGERIA

DAWAKI, J. H., PROF. YUSUF, H. O., & LAWAL, A.

Department of Educational Foundations and Curriculum,
Faculty of Education,

Ahmadu Bello University, Zaria, Nigeria

E-mail: dawakijummai@gmail.com **Phone:** +234-703-023-6961

Abstract

The study assessed the effects of Activity-Based teaching method on students' performance in basic science in Junior Secondary Schools in Kaduna State, Nigeria. The study was carried out with two objectives; determine the Pre-test and Post-test performances of students taught Basic Science using Activity-Based, and to determine the performance of students taught Basic Science using Activity-Based and Conventional method in Junior Secondary Schools in Kaduna State, Nigeria. The study adopted quasi experimental research design. The target population of the study was made up of 119,238 Junior Secondary 2 Students in Kaduna State, of Nigeria. The sample size for the study consisted of two (2) intact classes of 146 Junior Secondary School students. Purposive sampling techniques was used to choose the sample size. The instrument used for data collection in the study was adopted test of multiple choice in Basic Science Junior Secondary Certificate Examination, 2010-2014. The validated instrument was pilot tested and a reliability coefficient of 0.79 was obtained. The statistical tools used for data analysis included descriptive statistics mainly Mean and Standard Deviation which were used to answer the research questions raised in the study. The independent t-test was used to test the formulated hypotheses. The study established among others that the post-test performance of students taught Basic Science using activity-based method was better than the pre-test. Also, students that were taught Basic Science using Activity-Based method had a higher score and significantly performed better than their counterparts that were taught using conventional method. The study recommended that Teachers and school Managers, should provide and encourage the use of Activity-based methods as it has been proved to be effective empirically in enhancing students' academic performance. Also, Curriculum planners, school managers, Communities, Non-governmental organizations and Ministry of Education at Federal, State, and Local Government levels should incorporate and support the use of Activity-based method in teaching Basic Science in Junior Secondary Schools.

Keywords: Activity-based method, Basic science, Conventional method, and Performance

Introduction

Science is believed to be the bedrock of the development of an individual and Nation economically and technologically especially in the 21st-century. The human resource that are needed to drive innovation must be equip with scientific skills and knowledge. However, the lack of solid foundation in Basic science could impede the meaningful learning of science at senior secondary school and higher institution. Basic Science comes from the two words Basic and Science. Basic is simply fundamental or foundational while Science is defined by Shafiu (2014), as a process of description and classification of all forms and processes of life and matter. The Basic Science forms the foundation for Science subjects expected to be offered at the Senior Secondary School level like Biology, Chemistry, and Physics, it is

offered in junior secondary school. In addition, Basic Science is a prerequisite for offering Science at the Senior Secondary School and subsequently at the Tertiary level (Federal Republic of Nigeria -FRN, 2013). United Nations Educational, Scientific and Cultural Organization (UNESCO) cited by Akani (2016), explains Basic Science as a science in which concepts and principles are presented to express the fundamental unity of scientific thought and avoid premature or undue stress on the distinctions between the various scientific fields, and offers the basic training in scientific skills required for survival, sustainable development, and societal transformation.

Basic science is considered paramount and necessary for all students as the present modern civilization is a Scientific civilization where the modern society is completely drawn by the Scientific environment where Science has become integral part of our lives and living in many ways: Health, Agriculture, Nutrition, Energy Production, Transportation and Education just to mention a few. No wonder the Federal Republic of Nigeria in the National Policy on Education stated that Science Education shall emphasize the teaching and learning of science process and principles, so that it can achieve the overall objectives of Basic Science curriculum which are to enable the learners: develop interest in Science and technology; acquire basic knowledge and skills in science and technology; take advantage of numerous career opportunity offered by Science and Technology, and become prepared for further studies in Science and Technology (FRN, 2013). For these objectives to be achieved what comes to mind is the need for the use of effective teaching methods.

Teaching is an interactive process through which knowledge and skills are shared with students with a view of improving understanding and ability to bring about desirable learning. Thus, teacher initiates the communication and interactions through proper instructional process and methods. The Federal Republic of Nigeria (FRN, 2013) in the National Policy on Education emphasized the adequate choice of teaching method and strategy by teachers to solve educational problem and enhance students learning.

Conventional (Talk and Chalk) method is used by many Science Teachers however, the method is said to be ineffective in teaching Basic Science as it does not promote active learning of science through 'minds on, hands on' more so, the Conventional lecture method of Chalk and talk that is largely used by most teachers are challenged for their inability to foster critical thinking, holistic learning environment among learners and does not consider individual differences existing in each class as their abilities vary considerably and thereby not meeting the different needs of the students (Gadzama, 2012; Shafiu, 2014; Maheshwari, 2017).

Rousseur in John (2014) pointed out that the learner should be capable of learning rather than the learner being made a dumping ground for every information the teacher intends to pass across which makes learning uninspiring. Kennedy (2017), stated that in most advanced countries, gone are the days where the teacher stands at the front of the classroom before a blackboard leading a class as a sole conveyer of information. Thus, the Researcher introduced Activity-Based method of teaching and learning in that conventional method does not consider individual differences existing in each class as their abilities vary considerably and thereby not able to meet the different needs of the students. The call for the Student-Centered approach which according to (National Teachers Institute, 2012), appealed to the needs and interest of the learner, thereby motivating continuous learning. The focus is on learner, encourage participation and interaction throughout the lesson period, gender sensitive, collaborative as well as encourage critical thinking. The student-centered therefore is said to be the current thinking about teaching that is active, constructive in which the teacher assumes the role of a guide by emphasizing the learner, guiding the learner, and promoting learner development. That is why the researcher sought to find out whether activity-based and problem- solving method might have a positive

impact over the Conventional lecture method on students' performance in Basic Science. Since studies by various researchers such as Abdullahi (2013), and Ezeaghasi (2014) revealed that Conventional lecture method does not promote effective Science learning and as a result it might lead to poor performance in the various Science subjects.

Statement of the Problem

The 21st-century world is driven by scientific knowledge and skills, given this all nations of the world place more emphasis in the meaningful learning of science at all levels of education. In Nigeria, government have instituted policies to enhance the meaningful learning of science such as the payment of science allowances for science teachers. However, the poor performance of students in Basic Science in Junior Secondary Schools Certificate Examination in Kaduna State, Nigeria is of great concern to all education stakeholders. There has been poor percentage pass at credit level in the year 2010, 2011, 2012, 2013 and 2014 as 29%, 42%, 34%, 46% and 37% respectively (Ministry of Education Resource Centre, 2016). The study is of the opinion that the challenge facing the teaching of Basic Science could be because of poor teaching methodology employed by teachers, a visit to some of the schools have shown that Basic Science Teachers are still a custom with the Conventional method of teaching. Consequently, there is the need for the search of an alternative strategy that could provide more meaningful learning than the lecture method. One of such instructional strategy is activity-based strategy.

In view of this, the study is motivated to assess the effects of Activity-Based method on students' academic performance in Basic Science in Junior Secondary Schools in Kaduna State, Nigeria. The objectives of the study were designed to: determine the Pre-test and Post-test performances of students taught Basic Science using Activity-Based, in Junior Secondary Schools in Kaduna State, Nigeria and to determine the performance of students taught Basic Science using Activity-Based and Conventional method in Junior Secondary Schools in Kaduna State, Nigeria.

Research Questions

This research provided answers to the following questions:

1. What is the Pre-test and Post-test performance of students taught Basic Science using Activity-Based method in Junior Secondary Schools in Kaduna State Nigeria?
2. What is the performance of students taught Basic Science using Activity- Based and Conventional Method in Junior Secondary Schools in Kaduna State, Nigeria?

Hypotheses

HO₁: There is no significant difference between the Pre-test and Post-test of those taught Basic Science using Activity-Based in Junior Secondary Schools in Kaduna State, Nigeria.

HO₂: There is no significant difference between the performance of students taught Basic Science using Activity-Based Method and those taught using Conventional Method in Junior Secondary Schools in Kaduna State, Nigeria

Methodology

The study adopted quasi experimental research design. This is a pre-test and post-test experimental and control groups design. A non-randomized intact class was used. The target Population of the study was made up One hundred and nineteen thousand, two hundred and thirty-eight (119,238) which comprised all the Junior Secondary School Two Students in Kaduna State, Nigeria. The sample size for this study consisted of two (2) intact classes of 146 Junior Secondary School Students. The sample size was arrived at using central limit theory which highlighted that a sample size of 30 will be adequate for an experimental

design study. The activity-based (experimental) group were 70 students who participated in the study, while the conventional (control) group were 76 students.

The instrument used for data collection was an adopted test of multiple choices in Basic Science Junior Secondary Certificate Examination 2010-2014. The content and face validation were done by experts in the field of education and the instrument was pilot tested using test-retest and the data was analyzed using Pearson Product Moment Correlation Coefficient (PPMC) and a reliability coefficient of 0.79 was obtained. The study assessed the effects of Activity-Based method, Conventional methods on students' performance in Basic Science in junior secondary schools in Kaduna State, Nigeria. The study is limited to two teaching methods: Activity-Based and Conventional method in teaching Basic Science. The instrument used was an adopted test of multiple choices for Basic Science Junior Certificate Examination from 2010 to 2014. The lesson plan covered nine (9) weeks. The statistical tools used for data analysis included descriptive statistics mainly Mean and Standard Deviation which was used to answer the research questions raised in the study. The t-test was used to test hypotheses at 0.05 level of Significance.

Results

Research Question One: What is the Pre-test and Post-test performance of students taught Basic Science using Activity-Based method in Junior Secondary Schools in Kaduna State Nigeria?

Table 1: Mean and Standard Deviation of Pre-test and Post-test performance of those taught using activity-based.

Method	N	Pre-test Scores		Post-test Scores		Mean Difference
		Mean	SD	Mean	SD	
Activity Based	70	8.25	5.41	55.61	11.43	46.36

Table 1 shows the difference in pre-test and post-test performance of students taught using activity-based method in Basic Science in junior secondary schools, Kaduna State. The table indicates the mean score of 8.25 in the pre-test and 55.61 in the post test and a standard deviation of 5.41 in the pre-test and 11.43 in the post-test. The mean difference of 46.36 shows that the treatment was effective. Hence, the result indicates that the post-test performance of students taught Basic Science using activity-based method was better than the pre-test.

Research Question Two. What is the performance of students taught Basic Science using Activity- Based and Conventional Method, in Junior Secondary Schools in Kaduna State, Nigeria?

The data collected through the administration of the adopted test of multiple choice in Basic Science Junior Secondary Certificate Examination was analyzed using mean and standard deviation. Table 2 present the analysis of data collected in the study:

Table 2: Mean and Standard Deviation Performance of students taught Basic Science using Activity-Based and Conventional Method

Method	N	Pre-test Scores		Mean Diff.	Post-test Scores		Mean Diff.
		Mean	SD		Mean	SD	
Activity-Based	70	8.25	5.41	1.28	55.61	11.43	5.57
Conventional	76	6.97	4.72		50.03	16.82	

Table 2 shows the Mean and standard deviation of the performance of students taught Basic Science using Activity-Based and Conventional method in junior secondary schools in Kaduna State, Nigeria. The mean scores as displayed on the table showed that students taught Basic Science using Activity-Based had better performance mean scores in pre-test and post-test. For instance, the students taught Basic Science using activity-based had a pre-test mean score of 8.25 and post-test mean score of 55.61 with corresponding standard deviation of 5.41 and 11.43, while students taught using conventional method recorded the pre-test mean score of 6.97 and post-test mean score of 50.03 with standard deviation ranging from 4.72 and 16.82. This showed that students' mean difference in Activity-based and Conventional methods were 1.28 and 5.57 for pre-test and post-test, respectively.

Hypotheses Testing: There is no significant difference between the pre-test and post-test performance of students taught Basic Science using Activity-Based method.

The data collected through the administration of the adopted test of multiple choice in Basic Science Junior Secondary Certificate Examination was analyzed using paired sample t-test. The summary of data collected and analyzed in respect of null hypothesis one is presented in Table 3.

Table 3: Summary of pre-test and post-test paired sample t-test on the performance of students taught Basic Science using Activity-Based Method

Method	N	Mean	SD	Df	α	t-Value (2-tailed)	Sig.	Decision
Pre-test	70	8.25	5.41	139	0.05	4.17	.002	Rejected
Post-test	70	55.61	11.43					

Table 3 shows that there is a significant difference between the pre-test and post-test performance of students taught Basic Science using Activity-Based methods in Junior Secondary Schools in Kaduna State, Nigeria. The table showed $t(138) = 4.17$, $p = (0.002) < 0.05$. The null-hypothesis was thus rejected because there was significant difference in pre-test and post-test performance of students taught Basic Science using Activity-Based methods in Junior Secondary Schools in Kaduna State, Nigeria. Hence, it was established

that students that were taught Basic Science using Activity-Based method had a higher score in their post-test result.

Hypothesis Two: There is no significant difference between the performance of students taught Basic Science using Activity-Based Method and those taught using Conventional Method in junior secondary schools in Kaduna State, Nigeria.

The data collected through the administration of the adopted test of multiple choice in Basic Science Junior Secondary Certificate Examination was analyzed using independent sample t-test. The summary of data collected and analyzed in respect of null hypothesis two is presented in Table 4.

Table 4: Summary of independent sample t-test on the performance of students taught Basic Science using Activity-Based Method and those taught using Conventional Method

Method	N	Mean	SD	Df	α	t-value	Sig. (2-tailed)	Decision
Activity-Based	70	55.61	11.43					
				144	0.05	2.32	.003	Rejected
Conventional	76	50.03	16.82					

Table 14 shows that there was significant difference in the performance of students taught Basic Science using Activity-Based method and those taught using conventional method in Kaduna State, Nigeria. The table showed $t(144) = 2.32$, $p = (0.002) < 0.05$. The null-hypothesis was thus rejected because there was significant difference between the performance of students taught Basic Science using Activity-Based method and those taught using conventional method in junior secondary schools in Kaduna State, Nigeria. Hence, it was established that students that were taught Basic Science using Activity-Based method had a higher score and significantly performed better than their counterparts that were taught using conventional method.

Discussion of Findings

Findings on research question one revealed that there was significant difference in pre-test and post-test performance of students taught Basic Science using Activity-Based methods. The students taught Basic Science using Problem Solving method achieved higher post-test mean score than the pre-test. The result of the test on hypothesis one which stated that there was no significant difference between the pre-test and post-test performance between the students taught using Activity-Based was rejected. The above findings strongly negate the findings of Gadzama (2012), that there was no significant difference in mean scores between students taught integrated science using Problem-Solving and those taught using Activity-Based method. The findings of the study agree with Omeogun and Akani (2014), who buttressed that Activity-Based method proved to be effective in improving students' attitude (affective) towards science.

Findings on research question two revealed that students taught Basic Science using activity-based method had a higher score and performed better than their counterparts taught using conventional method in Junior secondary schools in Kaduna State, Nigeria. The

students taught Basic Science using activity-based recorded higher pre-test and post-test mean scores. However, the standard deviation at various levels indicated that students had a wide varied performance in the test administered. The result of the test on hypothesis two which stated that there was no significant difference between the performance of students taught Basic Science using activity-based method and those taught using conventional method in junior secondary schools in Kaduna State, Nigeria was rejected. This finding was explained in the context of the fact that activity-based method was more effective to teach Basic Science than conventional method. Interestingly, this finding agrees with the work of Shah and Rahat (2014), which revealed that the activity-based teaching was much effective than the lecture method of teaching Science at elementary level. An earlier study by Iwuji (2013), also buttressed this finding that students that were exposed to Activity-based achieved significantly higher than their counterpart taught using lecture method. This finding could be attributed to the fact that students in the activity-based group were actively engage in the instructional process which seem to enhance their performance than the students in the traditional classroom who were passively engage in the learning process.

Conclusion

Based on the findings of this study, it was concluded that there was significant difference in performance of students taught Basic Science using Activity-Based method in the post-test than the pre-test. What this indicates is that the activity-based method was more effective to teach Basic Science as the method enabled students to achieve higher score and perform better than their counterparts taught using conventional method.

Recommendations

Considering the importance that emanated from this study, the following recommendations were made:

1. Teachers and school Managers should provide and encourage the use of Activity-based method as they have been proved to be effective empirically in enhancing students' academic performance.
2. Curriculum planners, school managers, Communities, Non-governmental organizations and Ministry of Education at Federal, State, and Local Government levels should incorporate and support the use of Activity-based methods in teaching Basic Science at junior secondary schools.

Reference

- Abdullahi, J. G. (2013). Comparative study of inquiry and lecture methods on student performance in chemical reaction concept in secondary schools of Kankia Educational Zone, Katsina State: Proceedings of Multicultural African Conference, 513-522
- Akani, O. (2016). An evaluation of classroom experiences of basic science teachers in secondary schools in Ebonyi State of Nigeria. *British Journal of Education*, 4 (1), 64-76.
- Ezeaghasi, N. E.(2014). Repositioning practical Biology teaching for students accessto quality science process skills and attitude in secondary schools of Kaduna State. *Proceedings of Multicultural African Conference* Held at Facultyof Education, ABU Zaria 11-16, August 2014.
- Federal Republic of Nigeria (2013). *National Policy on Education (6th Edition)*. Lagos: Federal Government Press.

- Gadzama, B. I. (2012). Effects of science process skills approach on academic performance and attitude of integrated science students with varied abilities. An Unpublished PhD thesis. Ahmadu Bello University, Zaria, Kaduna, Nigeria.
- Iwuji, N. P. (2012). Effect of activity-based teaching strategy on academic achievement and retention in Basic Science concepts among Junior Secondary School Students. Unpublished MED dissertation. Ahmadu Bello University, Zaria, Kaduna State, Nigeria, Nigeria.
- John, E. O. (2014). A philosophical appraisal of rousseau's child-centred education and its impact to Nigeria's leadership. *Journal of Education and Practice*, 5(24): 28-40.
- Kennedy, R. (2017). *Progressive Education: How children learn*. Retrieved from <https://www.thoughtco.com> on 10/11/2017
- Maheshwari, V. K. (2017). *The problem-solving method*. Retrieved from <http://www.V.K.maheshwari.com/wp?p=> on 11/11/2017.
- National Teachers Institute (NTI), (2012). *Nigeria certificate in education course book on educational cycle*. NTI Institute Kaduna.
- Omoegun, O. M., & Akani, O. O. (2014). Effects of problem solving and mastery learning strategies on Junior Secondary School Students' attitudes towards Mathematics. *Journal of Studies in Education*, 14(1), 263-277.
- Shafi'u, S. M. (2014). *Impact of science process approach strategy on students' perception, academic achievement and retention of Basic Science concepts in Zaria, Kaduna State, Nigeria, Nigeria*. Unpublished M.Ed Dissertation. Ahmadu Bello University, Zaria, Kaduna Nigeria.