Effect of Hands-On, Activity Base Strategy on Students' Interest in Basic Science in Kwande, Benue State.

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ABSTRACT

This study investigated the effect of hands-on, activity base strategy on students' interest in Basic Science in Kwande, Benue State, with a focus on gender as a moderating variable. Two research questions and two hypotheses guided the study. A pretest-posttest control group, non-equivalent quasi-experimental design was used for the study. The sample size of 167 students from intact classes were drawn from the population of 2,523 (1315 males and 1208 females) Basic 8 students from public secondary schools in Kwande Local Government Area of Benue State. The four schools were assigned to experimental and control groups. The Basic Science Interest Rating Scale (BSIRS) was used for data collection. The BSIRS items of the instrument were subjected to face and content validation. The reliability of the instrument was established using Cronbach Alpha formula. The reliability coefficient of the instrument was found to be 0.84. A hands-on, activity base lesson plan was used for classroom instruction in the experimental group while the control group used lesson plan on lecture method for instruction. The research questions were answered using mean and standard deviation, while the hypotheses were tested at 0.05 alpha level of significance using Analysis of Covariance (ANCOVA). The findings from the study revealed that learners taught using the hands-on, activity base strategy significantly improved students interest more than those in the control group. The study also revealed that the male students showed higher interest in Basic Science than their female counterpart after treatment with hands-on, activity base strategy. Based on the findings, it was recommended that hands-on, activity base strategy should be used in teaching *habitat* in Basic Science in Basic 8 to enhance students' interest in the subject

Keywords: Hands-on-activity base strategy, students interest, Basic Science, Basic 8 students and Gender.

Background to the Study

Science is a crucial endeavour on which nations rely for technological progress. Muaz and Mohammed (2024) defined science as a complex human activity that leads to the production of a body of universal statement called laws, theories or hypotheses, which serve to explain the observable behavior of the universe or part of it, which, in themselves, have predictive characteristics. Similarly, science has been recognized as a tool relevant to life and society as its applications to every sphere of life ranging from agriculture, health, bioengineering, technology, communication, and transportation has made it an indispensable tool for national development (Christian-Ike, Nnalue and Nwuba, 2024). Science & Technology not only have the potential to sustain the growth and development of any nation but also have the power to improve the quality of life of its citizenry. Scientific & Technological development has helped peoples to resolve their problems and raise their standard of living (Mahila, 2021).

In Nigeria, science and technology is present in three different levels; tertiary, post-basic (secondary level) and basic level of education. At the basic education level, science is taught as Basic Science and Technology. Basic science is taught in a holistic manner to express the integration of elementary biology, chemistry and physics as a scientific knowledge at the basic education level. Basic Science is a preparatory science curriculum developed and planned for students considering a vocation in science (Atoo, Adeniran & Atsuwe, 2019). The subject emphasizes scientific literacy and research-oriented learning as well as teaching of science in which concepts and principles are presented to express the fundamental unity of scientific concepts, without any bias to the compartmentalized science.

Basic Science houses all science subjects which includes Biology, Chemistry, Physics. It is a subject that cuts across the school curriculum and needed in all branches of sciences, applied science and social science. Basic

science prepares learners for senior secondary school science subjects and future career in science related fields. Ochu, Adeniran and Atoo (2017) stated that basic science is a fundamental subject that provides the needed foundation for learning science at the senior secondary school level and subsequently for science-related courses at tertiary institutions.

The objectives of basic science at the Basic Education level is to enable students acquire basic science process skills such as observation, reporting, organization, measurement, classification and generalization of information and prediction skills (Jirgba, Ajangem, & Atoo, 2022). Despite the importance of basic science in the development of scientific knowledge in the nation's educational system, the achievement of students in the subject in Basic Education Certificate Examination (BECE) is not encouraging. The poor achievement in subject at the Basic Education level remains a theme of concern, because of the role it plays in the subsequent learning of science at a higher level (Ityobee, Okwara, Jirgba & Atsuwe, 2024). Study such as Enemarie, Ogbeba & Ajayi, 2018 noted that the poor achievement of students in BECE in Basic science is a reflection of their later achievement in sciences at higher level of education. However, students' poor achievement in the subject may be attributed to socio economic factor, gender, lack of well-equipped laboratory, lack of qualified teachers and strategies of teaching the subject employed by teachers.

In an attempt to improve achievement of students in Basic Science, Odili, Ebisine, & Ajuar (2011) carried out a research on teachers' involvement in implementing the Basic Science and Technology curriculum to ascertain teachers' knowledge of the policy as well as evaluate their perceptions of the adequacy and achievability of its contents. Similarly, Achor (2013) investigated the Status, Problems, availability and utilization of resources for Implementing Basic Science and Technology Curricula to find out whether material resources are available and are utilized for the implementation of Basic and Technology curriculum, furthermore Sambo (2015) evaluated the mode of implantation of the Basic Science curriculum to find the most appropriate way of implementation. In another research, Jirgba and Bur (2019) compared teaching methods with the aim of identifying which method is best at teaching Basic Science, while While (2016), examines the attitudes of students towards learning of Basic Science. Yet, students' achievement in the subject has not reached the desired level. Research such as Okwara and Atoo (2021) revealed that achievement in Basic Science will remains low until student interest in the subject is given right attention.

Interest is an emotional factor that has the predisposition to make or mark a student's participation in the subject. Hence, interest, as viewed by Okardi and Ebikebuna (2022), is a psychological oriented actions that determines students' energy and zeal for resolving educational programs or other activities. Interest is an important aspect of the learning process because the learners' interest is an essential factor for imparting the right knowledge, skills, values, and attitudes that the curriculum seeks to attain. It helps in sustaining concentration, purpose, commitment to learn, and cooperation with the teacher in the learning process. According to Obeka (2010), interest is the course of certain actions that acts as drive that propels people to act in certain ways and as the effect of an activity from which a child learns to pay attention as the lesson goes on, if the student is interested in the same particular lesson and the method of instruction. It has been shown that students are usually attentive to certain subjects or topics that appeal to them but show laziness to others that do not appeal to them (Iji, Abah, & Anyor, 2017). Therefore, without the interest and personal efforts of the students in learning sciences including Basic Science, they can hardly perform well in the subject. It is however, the responsibility of the teacher to identify and use the appropriate instructional strategies that will make students develop an interest in learning the subject.

Instructional strategy is a tool the teacher uses for reaching the set goals and objectives. Atoo, Zam and Tafi (2021) maintain that, for effective teaching to take place, the teacher must stimulate, encourage and maintain active participation of the students through the selection of appropriate teaching strategy. In a quest for improving active participation and students' interest in basic Science, researchers such as Apochi, Umoru and Onah, (2018) identified various strategies that are presently used by teachers to teach students namely; concept mapping, problem solving, guided inquiry, advance organisers, think-pair-share, hands-on activity based amongst others.

The hands-on activity-based approach is one of the instructional strategy that can actively engage students; thereby making them learn and resulting in great realization of the objectives of basic science curriculum. Hands-on activity based is an instructional strategy where a student carrying out learning activities with their hands to

enhance their experiences, therefore increasing their interest in such concepts (Ajayi, 2017). Similarly, Abudullai (2013) viewed hands-on activity based as an instructional situation where the teacher guides the students to engage actively in class activities with the use of their hands and intellect. The interest of students in Basic Science might also be influenced by students' gender.

Gender refers to cultural and social construct which describes or analyzes the roles, expectations, behaviours, characteristics and attributes of male and female based on their biological sex (Oriakhi and Igbudu, 2015). The inconsistency in the interest of males and females in the sciences including Basic Science has been studied over the years (Ajai and Imoko, 2015). Some of the studies showed that boys have higher interest when compared to girls in Basic science at upper basic education in Nigeria (Maichibi, Ozoji, & Chollom, 2023). On the contrary, Ajiboyi (2015) and Lakshmi (2015) found that female students have higher interest in sciences than their male counterparts. Meanwhile, Hur-Yagba, Dajal, & Ojelade (2025) revealed that gender had no effect students interest in basic science. These inconsistent findings have prompted the engagement of gender as one of the variables for this study. Therefore, the question, does hands-on, activity base strategy has any effect on students' interest in Basic Science with regards to gender in Kwande, Benue State?

Statement of the Problem

Basic Science is the foundation for science in Benue State and Nigeria at large. However, there is a problem of low achievement in the subject which is a predictor of later achievement in science and science related subject at the senior secondary school and beyond. This low academic achievement of students could be due to their lack of interest in the subject which had originated from the type of teaching method that was used to teach the subject.

The use of lecture method dominated basic science classroom in Kwande, Benue and Nigeria at large, which is a teacher-cantered teaching method, reducing the interest of students in the subject and resulting to poor students' academic achievement. Thus, the lack of interest in Basic Science and science related course is reflected in poor enrolment into science and science related courses in higher institutions, unemployment problems and hence slow advancement in science and technology in the country.

However, if Basic Science is taught using an effective instructional strategy, students interest in the subject and other science related subjects will be aroused. Students' academic achievement might also increase. Student interest and academic achievement might be influenced by the instructional strategy employed by teacher, because it is the only factor that can easily be manipulated by teacher to achieve learning objectives. Hence, this paper investigates the effect of hands-on, activity base strategy on students' interest in Basic Science on upper basic students in Kwande, Benue State.

Objectives of the Study

The objective of this study is to determine the effect of the hands-on, activity base strategy on Upper Basic students' interest in Basic Science in kwande, Benue State. The study specifically sought to:

1. determine the mean interest rate of students taught Basic Science with hands-on, activity-base strategy and those taught with conventional method.
2. examine the difference in mean interest rate between male and female students taught Basic Science with hands-on, activity-base strategy.

Research Questions

The following research questions were asked to guide the study

1. What is the difference in the mean interest rating of students taught Basic Science with hands-on, activity-base strategy and those taught with lecture method?
2. What is the difference in the mean interest rating of male and female students taught Basic Science with hands-on, activity-base strategy?

Hypotheses

The following research hypotheses were formulated and tested at 0.05 level of significance

$H0_1$: There is no significant difference in the mean interest rating of students taught Basic Science with hands-on, activity-base strategy and those taught with lecture method.

$H0_2$: There is no significant difference in the mean interest rating of male and female students taught Basic Science with hands-on, activity-base strategy.

METHODOLOGY

The study was a pretest-posttest, nonrandomized control group, quasi-experimental design. This design was employed because it is not possible for the study to randomly sample and assign subjects to groups as this will disrupt the normal classroom organization of the school. Therefore, intact classes were assigned to experimental and control group. The population for the study was 2,523 consisting of 1315 males and 1208 females Basic 8 students offering Basic Science in public secondary schools in Kwande Local Government Area of Benue State. Purposive sampling technique was used to select four schools in Kwande local government area on the premise that the schools are coeducational, have been presenting students for Basic Education Certificate Examination (BECE) for over five years, have at least three basic science teachers. The choice of co-educational schools was because gender is a moderating factor in this study. The sample for the study consisted of 167 Basic 8 students obtained from intact classes. Simple random sampling technique of toss of a coin was used to assign two schools to the experimental group and the other two schools to the control group respectively. The experimental group consist of 84 students (43 males and 41 females) while the control group was made up of 83 students (41 males and 42 females). The Experimental classes in each of the schools were exposed to the hands-on, activity based instructional strategy while the other two classes were exposed to lecture method of teaching. The instrument for data collection was Basic Science Interest Rating Scale (BSIRS). The researcher developed BSIRS was a four-point Likert scale with 20. The instrument was validated by three experts, one from Test, Measurement and Evaluation, another from Integrated Science Education Department and an expert Basic Science teacher in the secondary school. The reliability coefficient of the instrument was found to be 0.84, using Cronbach Alpha Formula. Research assistants were employed in order to eliminate bias. A pre-interest was administered to both groups to establish equivalence in terms of interest rate. The experimental group was taught with hands-on, activity based instructional strategy while the control group was taught using the lecture method. A post-interest was administered after the treatment to determine the interest rate after the treatment. Mean and standard deviations were computed for each of the groups in order to answer the research questions. The null hypotheses were tested at 0.05 level of significance using ANCOVA.

RESULTS AND DISCUSSIONS

The presentation follows the sequences of the research questions posed and the corresponding hypothesis that guided the study. The research questions were answered using the descriptive statistic of mean and standard deviation, while the hypotheses were tested with ANCOVA at 0.05 level of significance.

Results

Research Question 1

What is the difference in the mean interest rating of students taught Basic Science with hands-on, activity base strategy and those taught with lecture method?

Table 1: Mean Interest Rating and Standard Deviation of Students in Experimental and Control Groups

	N	**Pre interest**		**Post interest**		**Mean Gain**
Groups		Mean	SD	Mean	SD	
Experimental	84	47.66	3.53	58.87	2.68	11.21
Control	83	44.42	2.72	51.19	2.98	6.77
Mean Difference		3.24		7.68		4.44
Total	167					

Table 1 showed that in Pre-interest, the experimental group had a mean interest rating of 47.66 (SD=3.53) while the control group had a mean interest rating of 44.42 (SD=2.72). The results in Table 1 also indicated that in the post-interest, the experimental group had a mean interest rating of 58.87 (SD=2.68) while the control group had a mean interest rating of 51.19 (SD=2.98).

From the Pre-interest and post-interest rating, the mean gain for the experimental group was found to be 11.21 while the mean gain for the control group was 6.77. The mean difference between the interest rating of the experimental and control group in pre-interest was 3.24 while the mean difference between the experimental and control group in post-interest was 7.68. The difference between the interest gain of experimental and control group was 4.44.

Research Question 2

What is the difference in the mean interest rating of male and female students taught Basic Science with hands-on, activity base strategy?

Table 2: Mean Interest Rating and Standard Deviation of Male and Female Students in Experimental Group

Gender	**N**	**Pre Interest**		**Post Interest**		**Mean Gain**
		Mean	SD	Mean	SD	
Male	41	47.42	3.41	59.16	2.79	11.74
Female	43	47.90	3.69	58.56	2.57	10.66
Mean Difference		-0.48		0.60		1.08
Total	84					

Table 2 showed that in Pre-interest, the male students had a mean interest rating of 47.42 (SD=3.41) while the female students had a mean interest rating of 47.90 (SD=3.69). The results in Table 2 also indicated that in the post-interest, the male students had a mean interest rating of 59.16 (SD=2.79) while the female students had a mean interest rating of 58.56 (SD=2.57).

From the Pre-interest and post-interest rating, the mean gain for the male students was found to be 11.74 while the mean gain for the female students was 10.66. The mean difference between the Pre-interest rating of the male and female students was -0.48 while the mean difference in Post interest rating of male and female student was 0.60. The difference between the mean gain of male and female students was 1.08.

Research Hypothesis 1

There is no significant difference in the mean interest ratings of students taught Basic Science with hands-on, activity-base strategy and those taught with lecture method.

Table 3: Summary of Analysis of Covariance (ANCOVA) of Experimental and Control Groups' Interest Ratings in BSIRS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2503.246[a]	2	1251.623	159.956	.000	.661
Intercept	1745.968	1	1745.968	223.132	.000	.576
Method	1687.382	1	1687.382	215.645	.000	.568
Pre Interest	43.207	1	43.207	5.522	.020	.033
Error	1283.269	164	7.825			
Total	509952.000	167				
Corrected Total	3786.515	166				
a. R Squared = .661 (Adjusted R Squared = .657)						

Table 3 shows the ANCOVA analysis of the data collected from the post-interest rating of students taught Basic science and technology with hands-on, activity base strategy and those taught with lecture method. From the

analysis, F (1, 164) = 215.645, P< 0.05. Since the P-value of 0.02 is less than 0.05. Hence, the null hypothesis, which stated that there is no significant difference in mean interest rating of students taught Basic Science with hands-on, activity base strategy and those taught with lecture method, was not accepted. This means that there was a significant difference in the mean interest rating of students taught Basic Science with hands-on, activity base strategy and those taught with lecture method. This further indicates that there was significant improvement in the interest of students in the experimental group than those in the control group.

Research Hypothesis 2

There is no significant difference in the mean interest ratings of male and female students taught Basic Science with the hands-on, activity base strategy.

Table 4: Summary of Analysis of Covariance (ANCOVA) of Male and Female Students' Interest Rating in BSIRS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	9.024[a]	2	4.512	.621	.540	.015
Intercept	1473.021	1	1473.021	202.731	.000	.715
Pre Interest	1.422	1	1.422	.196	.659	.002
Gender	8.024	1	8.024	1.104	.296	.013
Error	588.536	81	7.266			
Total	291705.000	84				
Corrected Total	597.560	83				
a. R Squared = .015 (Adjusted R Squared = -.009)						

Table 4 shows the ANCOVA analysis of the data collected from the post-interest rating of male and female students taught Basic science with hands-on, activity base strategy. From the analysis, F (1, 81) = 1.104, P> 0.05. Since the P-value of 0.296 is greater than 0.05. Hence, the null hypothesis, which stated that there is no significant difference in the mean interest rating of male and female students taught Basic Science with hands-on, activity-base strategy, was not rejected. This means that there was no significant difference in the mean interest rating of male and female students taught Basic Science with hands-on, activity-base strategy.

DISCUSSION OF FINDINGS

The result of this study showed that hands-on, activity base strategy significantly improved students' interest in Basic Science for upper basic 8 students in Kwande, Benue State, specifically in Habitat. The finding of this study is in agreement with Ajayi (2017) who revealed the use of hands-on, activity base strategy which involves student carrying out learning activities with their hands and minds enhance their experiences and increasing their interest in such concepts. The finding of this study is also in conformity with Apochi, Umoru and Onah, (2018) who revealed that the use of teaching strategy such as hands-on, activity base strategy that incorporate students' active participation in classroom activity increases students' interest. With the use of hands-on, activity base strategy, learners are subjected to different class activities with the use of their hands and intellect that help the increase their interest in learning that topic subject. This explains the overall higher mean interest rating of students exposed to the hands-on, activity base strategy over the lecture method.

The result of this study also indicated that hands-on, activity base strategy had no significant effect on students' interest in Basic Science for upper basic 8 students in Kwande, Benue State, specifically in Habitat. The findings of this study disagree with the outcome of Maichibi, etal., (2023) who revealed that male students have more interest in sciences than female students. In the same vein, the result of this study inconsistent with that of Ajiboyi (2015) and Lakshmi (2015) who in their different research works found that female students have a higher interest in sciences than their male counterparts. Similarly, the outcome of this study is in conformity with the findings of Hur-Yagba, etal., (2025) who found that gender has no significant effect on the interest of students in Basic Science.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made: -

1. The use of the hands-on, activity base strategy has been found effective in improving interest in Habitat in Basic Science, therefore, it should be included in Basic Science curriculum to popularize its use among the teachers and hence bring about effective learning of Basic Science in upper basic 8 students in secondary schools in Kwande, Benue State and Nigeria at large.
2. Seminars, workshops, and conferences should be organized by the government, non-governmental organizations, and relevant professional bodies such Science Teachers Association of Nigeria (STAN) to educate and sensitize the teachers on the use of the hands-on, activity base strategy for teaching Basic Science in Kwande, Benue State.
3. Government agencies and professional associations whose responsibility it is to design and revise the curriculum for secondary schools should incorporate and emphasize the use of the hands-on, activity base strategy in the teaching of Basic Science and other subjects.
4. Government agencies and professional bodies such as NERDC and STAN should sponsor further research on the efficacy of the hands-on, activity base strategy to increase students interest in Basic Science.
5. The government, through the State and Federal ministries of education, should encourage Basic Science textbook writers to write and publish textbooks based on the use hands-on, activity base strategy.

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