EFFECT OF HANDS ON ACTIVITY TEACHING STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE IN BASIC PROGRAMMING IN BORNO STATE

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Abstract
The study investigated the effect of Hands on Activity Teaching Strategy on Senior Secondary School Students' Academic Performance in BASIC Programming in Borno State. Specifically, the study had three objectives, three research questions and three hypotheses. The design for the study was quasi-experimental with population of 7,527 students in twenty senior secondary school taking computer studies as a subject in southern educational zone of Borno state. Two intact classrooms selected randomly from the experimental; and control groups thus each consisted of 60 students respectively. A purposive sampling was used to select the two schools been the only schools with the required computer gadgets to carry out the study. The research instrument, title as performance test, was used for data collection. The instrument was validated by two experts and the reliability coefficient of 0.75 was obtained. The data collected were analyzed using statistic of mean and standard deviation to answer research questions. Then t-test was employed to test the hypotheses at alpha = 0.05. Findings show that, there was statistically significant difference in the mean performance scores of students taught BASIC programming using hands on activity method. There was no significant difference in the mean performance score of male and female students taught BASIC programming using hands on activity method of teaching. Based on the findings of the study, it was recommended that, government through the ministry of education should fund the computer laboratories that will enhance the interest of both male and female students mainly to improve the students' academic performance in computer studies in general and BASIC programming in particular.

Key words: Science, Science Education, Hands on Activity, Programming, Programming Language

Introduction
Education is seen as a lifelong procedure by which individuals develop their capabilities and become valuable to themselves, his fellow beings and thus contribute to the development of the society in which they belong (Taiwo, 2014). According to the World Economic Forum Global Competitiveness

Report (WEF, 2016), education is the stock of abilities, capabilities, and other productivity, enhancing characteristics of individuals. Education has been generally recognized not only as a fundamental human right but also as a facilitator for sustainable development and a vehicle for confronting the challenges facing societies in terms of socio-economic, environmental and ecological realities. (Hanachor & Wordu, 2021).

Science is a systematic inquiry of nature with a view to understudy and attaching them to serve human desires. Science is an area of learning that is completely necessary for development for the reason of its linkage to technology and industry (Delyser, Goode, Guzdial, Kafai, & Yadav, 2018). It is the process of penetrating nature with the aim of discovering the laws that aid man to live sustainably. Science is a filed for inquiry, which absolutely provide advancement. Thus, it is a procedure in which the natural environment is explored with the aim of assisting man to live happily.

Science education on the other hand, identifies natural phenomena appropriate to students' interest and skills. Also, science education equips teachers, learners and the society with knowledge, skills, equipment and freedom to perform noble task useful for improving socio-economic standard. In addition, science education courses are designed to produce capable scientists who contribute meaningfully to academic progress of the society to raise the economic level of the nation (Lewis, 2015; Cutts, Robertson, Donaldson & O'donnell, 2017; Delyser, et al., 2018).

Program is the sequence of instruction written in a language such as Beginners all Purpose Symbolic Instruction code (BASIC) understandable by the computer to execute a particular function on the computer. A well written program parceled well to form an application package customized for solving specific type of problem on the computer system (Ogunkunle & Ajobiewe, 2019). They further stated that programming language are artificial symbolic language created or developed to use in preparing coded instruction on the computer for later execution by the computer. They are generally composed of series of usage rules (syntax) that define the meaning (semantics) of expressions written in the language. Each programming language comes accessible with its own translator that is interpreter or compiler as the case may be.

Hands-on-activity has been able to promote students' positive attitudes and enhance motivation for effective learning in Computer Studies (James, Ugwu & Eze, 2019). The use of practical instructional guide as 'hands on' activity in learning supports the development of practical skills, and help to shape students' understanding of concepts and phenomena through guiding and engaging students, helping them to develop important skills, understand the process of practical investigation, and develop their understanding of practical concepts, leading to improved students' achievement, interest and retention of what is taught in a classroom (Belfield, Britton, Buscha, Dearden, Dickson, Van Der Erve, & Zhu, 2019).

Hands on activity therefore, facilitate learners' cohesion in which enhancement of reinforcement for sustainable classroom instruction is obtained. Hands on activity serves as route through which the student comprehend much more, the relation between what is learnt theoretically and that of what is put into practical skills. Apart from revealing the segments of programming language, hand on activity motivate learners' interest.

According to Obiunu and Emakpor, (2020), gender has to do with a range of characteristics that pertains to being feminine or masculine. It points to categorical distinction between male and female. Gender is a sociological experience of being a male or female, with personality and central components of self-concept. The influence of gender revealed the laxity which determined male and female academic performance. Gender is an attribute and identity associated with being a male students or female students. Gender is the individualities that apply to sex variation of either being a girl or a boy. Gender indicates discrepancy between male and female sex. Gender is the determinant kind of initial that categorize people to fall in a set of group ranges from male or female which as well affect academic performance.

Though many studies have look into hands on activities in numerous subjects, and the role it plays in making what is learnt as theory to become permanent to the students, not much study is known on the effect of hands on activity teaching strategy in BASIC programming language.

The constructivism theory of learning associates the learners learning by constructing their own conception through experience and knowledge which argues that individuals generate knowledge and meaning from interrelations between their experience and ideas. Constructivism is thus associated with the teaching strategies that facilitated active learning or learning by doing. Shittu (2013) opined that learning setting is capable to consider as learner-centered rather than teacher-centered, especially at secondary education level. Through which the learners master what they get from theory in science education so as to improve in learning process.

Constructivism theory has bearing on the knowledge structures students gained in classroom. These knowledge structures encompass subject matter areas that describe the sciences (Physics, Chemistry, Biology, Computer Studies). The epistemological perception of constructivism considers these sciences as a totality and not in their compartmentalized form. The nature of basic science is highly empirical in approach and founded on a number of laws and theories. Any scientific derivation implying that whatever is the result of any finding or discovery must be investigated through the scientific method and confirmed to be valid. Teaching science implies using many and different sequence of actions. Yusuf (2003), stated that to study science is to do science, and doing science by students entails more than providing opportunities to interact with the environment. The social constructivist theory stated that learning takes place in a social context and in interaction with others through hands on activity (Vygotsky, 1978).

From the beginning of the 18th century to date, educators and researchers have studied the Value of hands on activity and its important role in scientific fields such as chemistry and biology. Numerous studies showed that hands on activity confers many advantages, including development of laboratory skills and scientific knowledge, as well as comprehending science concepts and theories (Schwichow, Zimmerman, Croker & Härtig, 2016). In support of hands on activity in the scientific fields, Fadzil and Saat (2013) designed a booklet on high quality practical activities in science, in which stated: Students achieve a deeper level of understanding by finding things out for themselves and by investigating with techniques and procedures that have enabled the secrets of our bodies, our environment, and the whole universe to be exposed.

Hands on activity refers to as a setup where students actively participate in the learning experience rather than sit as passive listeners. Active participation in hands on activity teaching method is quite different from that traditional method of teaching because: (a) the active role and participation of students in the classrooms and (b) collaboration amongst other students in a learning environment. Aim to establish a positive learning and teaching atmosphere in the classroom (Ēelik, 2018). Festus (2013) stated that Hands on activity teaching strategies encourage students or learners to construct mental models that allow for higher-order performance such as applied problem solving and transfer of information and skills.

Research Objectives

The main purpose of this research is to determine the effect of Hands on activity teaching strategy on the Senior Secondary School Students performance in BASIC programming language in Southern Educational Zone in Borno State. The study specifically determined:

1. the difference in the performance of students taught BASIC programming language using Hands on activity and those thought using lecture method in Senior Secondary School in Southern Education Zone in Borno state.
2. the difference in the performance of male and female computer studies students in programming language after exposure into Hands on activity method of teaching.

Research Hypotheses

The following hypotheses were formulated to be tested in the study at level of 0.05;

$HO_{1:}$ There is no statistically significant difference between the mean performances scores of students taught BASIC programming using Hands on activity Method and those taught using lecture Method.

$H0_2$: There is no statistically significant difference between the mean academic performances of male and female computer students in BASIC programming using hands on activity method of teaching.

Methodology

This study adopted quasi-experimental research design. The study conducted in the Southern Educational Zone of Borno State. The population of the study consisted of all the 7,527 senior secondary school II students in southern educational zone of Borno State, offering computer studies as a subject. A purposive sampling used for the study. The researcher randomly selected participants despite every member has equal chance of being chosen. The sample size of the population was 120 students. The instrument used was BASIC Programming Performance Test (BPPT). The instrument was used to test the student theoretical computer programming knowledge in BASIC computer programming language. The developed BPPT were given to two experts for validation, one from Abubakar Tafawa Balewa University Bauchi from Computer Science Education, and the other from Nigerian Army University Biu from Department of Computer Science for content and face validity. The reliability of the instruments i.e. BASIC Programming Performance Test (BPPT)

were established using test-retest method on sample of thirty (30) students from school that does not partake in the study thus reliability coefficient of 0.75 was obtained. The performance test was developed by the researcher. Pre-test and post-test administered to both control and experimental class at the beginning and at the end of four weeks classroom instructions. Descriptive statistics of mean was used to show the average score of the respondents and standard deviation indicated the spreading of a set data from its mean score. T-test was used to find the significant differences between students' performance in the control and experimental group at 0.05 alpha level. Nuance

Result and Discussion

Research Question One: What is the difference between the mean performance scores of students taught BASIC Programming using Hands on activity method and those taught using lecture method?
Table 1: Post-test Mean and standard deviation of Experimental and Control groups' performance in BASIC Programming.

Group	N	Mean	SD	Mean Difference
Experimental	60	59.85	15.1812	38.58
Control	60	21.77	8.5100	

Source: field work (2023)

Table 1 above present the finding of research question one. The result shown that the experimental group (students taught BASIC programming language using hands on activity) had a mean score of 59.85 in the post-test with standard deviation of 15.1812 while the control group (students taught BASIC programming language using lecture method) had a mean score of 21.77 in the post-test with standard deviation of 8.5100 and the mean difference is 38.58. The finding indicated that the post-test mean of both control and experimental groups are not equal. This shows that, students exposed to the Hand-on Activity performed better than those exposed to lecture method.

Research Question 2: What is the difference in the mean performance scores of male and female students taught BASIC programming using hands on activity method of teaching?

Table Two: Post-test Mean and standard deviation of Experimental group for Male and Female students' performance in BASIC Programming.

Group	N	Mean	SD	Mean Difference
Male	40	59.98	14.8764	.38
Female	20	59.60	16.1650	

Source: field work (2023)

Table 2 present the result of research question two. The result show that the male students in the experimental group (students taught BASIC programming language using hands on activity) had a mean score of 59.98 in the post-test with standard deviation of 14.8764 while the female students had a mean score for the post-test is 59.60 with the standard deviation of 16.1650 respectively, with mean difference of 0.38 which shows that, there is a slight difference between the performance of male and female students taught BASIC programming using Hands on Activity Teaching Strategy. The indication of this is that hands on-activity method is gender friendly.

Test of Hypotheses

Hypothesis One (Ho_1): There is no statistically significant difference in the mean academic performances of students taught BASIC programming using Hands on activity Method and those taught using lecture Method.

Table 3: t-test Analysis of Students' Post-test of the Experimental and Control Groups

Group	N	Mean	SD	Df	t_cal	p_value
Hands on Activity Method	60	59.85	15.1812	118	16.950	.000
Lecture Method	60	21.77	8.5100			
(į-value = 0.05)						

Source: field work (2023)

Table 3 show, the result obtained that t-cal (16.950) and also p-value (.000) < į-value(0.05) indicating that, there is significance differences in the academic performance of senior secondary school students taught BASIC programming using Hands on Activity over those taught using lecture method as such the null hypothesis was rejected.

Hypothesis Two ($H0_2$): There is no significant difference between the mean performances scores of male and female computer students in BASIC programming using Hands on Activity Method of teaching

Table 4: t-test Analysis of Male and Female Post-test Scores for the Experimental group

Group	N	Mean	SD	Df	t_cal	p_value
Male	40	59.98	14.8764	58	.089	.929
Female	20	59.60	16.1650			
(į-value = 0.05)						

Source: field work (2023)

Table 4 show, the result obtained that t-cal(.089) and p-value(.929) > į-value(0.05) indicating that, there is no significant difference between the performance of senior secondary schools male and female students taught BASIC programming using Hands on Activity method of teaching method and therefore the null hypothesis is accepted.

Discussion of Results

From the data collected to answer research question one, the result revealed that the experimental group performed better than the control group this is due to the exposure of the students to BASIC programming using Hands on Activity method, the researcher rejected the null hypothesis which stated that there is no statistically significant difference between the mean performances scores of students taught BASIC programming using Hands on Activity method and those taught using lecture method. This is an indication that the exposure of students to BASIC programming in computer studies really improved their performance. The findings corresponded with Afyusisye and Gakuba (2022), who found that students who were taught using concepts and principles with experimental based activities performed significantly better than those of control group in cognitive learning task. The results also corroborate with the findings of Soleymani and Rekabdar (2016) on the relation between mathematics and self-efficacy and mathematics achievement with control of mathematics attitude, the result shown that, there is significant relationship between self-efficacy and mathematics achievement. The findings corresponds with that of Afyusisye et al., (2022) who found that chemistry students who were taught mathematics concepts and principles using hands-on-activity method performed significantly better than the control group in cognitive learning task.

Another finding from the study revealed that there is no significant difference in the academic performance of male and female students taught BASIC programming using Hands on Activity. This shows that, Hands on Activity Teaching Method is gender friendly. This finding agrees with that of Nneka and Zitaobi (2020) who found that there was no significance difference of gender with regards to the academic achievement in science. Udoh (2015), also agreed that in a classroom setting where male and female students are actively involved in an interactive lesson with the teacher, there will be no difference in their academic performance. Abidoye (2021) also opined that gender is not a significant factor to be associated with students' performance. If given equal opportunity with the right teaching and learning process, male and female students will achieve equally. The observation agreed with Udoh (2015) which showed that no significance difference in gender on students' performance and retention in biology when taught nervous coordination using computer simulation and charts. Akinwumi and Falemu (2020) posited that when students are given practical tasks to carryout in science, the sex of the students was a non-significant contributor to their academic performance.

Conclusion

The study found out that pre-test mean scores of both the experimental and control groups were low and almost the same from the beginning of the study, which showed the homogeneity of the level of knowledge of the students at the start of the study. Therefore, the study concluded that:

1. Experimental group performed better that the control group due to the exposure of the experimental group to hands on activity.
2. Hands-on activity is gender friendly since no significance difference was recorded between the performance of male and female students.

Recommendations

From the findings of this study, the following recommendations were made:

1. Since computer studies students of the experimental group performed better that the control group on BASIC programming using Hands on activity. Therefore, secondary school management through ministry of education require to equip computer laboratory. This will promote the usage of Hands on-activity among the teachers and student in a computer class-room.
2. Government and school administrators should organise workshops and seminars where the effective usage of Hands on activity method will be taught to teachers.
3. Since hands on-activity was found to be gender friendly, both male and female students should be encourage to engage in learning of programming language using the metho

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