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ASSESSMENTS OF SCAFFOLDING AS AN INSTRUCTIONAL STRATEGY IN TEACHING AND LEARNING OF BIOLOGY FOR EDUCATIONAL DEVELOPMENT IN NIGERIA

BY

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Abstract

The student academic achievement in both internal and external examination in sciences with reference to Biology is worrisome. The future of Nigeria to move from developing Nations to developed Nations based largely on her scientific breakthrough. The teaching pedagogy used to teach the students must be relevant to the students to achieve optimal goal. The research was conducted on teaching strategies and the use of better instructional teaching strategy to teach the students at secondary school level. The research was carried out using quasi-experimental research design .The intact class of 132 students were used for the research and categorized into two groups; experimental or treatment group and control group. The experimental group was 19 students and control group were 113 of intact classes. Three null hypotheses were formulated and tested at 0.05 alpha level of significance. All the $t_{-cal} > t_{-crit,}$ *therefore, the hypotheses were rejected which means there are significant impact of scaffolding on the students achievement when used in teaching and learning of Biology concept. Recommendations were made for teachings, policy makers and stakeholders in education industries, students' academic achievement and retention of scientific ideology in Biology.*

Keywords: Assessments, Impact, Scaffolding, Re-energizing and Achievement

Introduction

Generally speaking by the global world, it is belief that the qualities and standard of education given to future generation in Africa were less compared to advanced countries of the world. It will be a right thinking for any scholar in Africa to investigate on pattern and structure of education in advanced countries and domesticated the ideology in Africa context. Such developmental strategies must consider the exceptional factors of developing countries of Africa .The peculiarities and Africa phenomena in relation to education lied majorly on what ,how, when and who of the teachers. The teachers are pillars of successful implementation of educational development in Africa. Hence, their teaching strategies must be modified, moderated and overall relevancy to blended technological breakthrough of the global world. The teaching strategies by Africa's teachers reference to Nigeria was considered in this research.

In education, the use of information, computers, and internet as a form of blended technology has been receiving increased attention and consideration. Additionally, increasing attention is being paid towards scaffolding mechanism that can be integrated into classrooms in order to solve technological challenges. Ikhsan, Kurnianto, Apriyanto and Nurdin (2019) in their research of effectiveness of environmental education in scaffolding students ecological literacy in university of Jember, Indonesia used survey method and conducted at the faculty of teacher training education which involved the heads of the study program, lecturers, staff and students. They analyzed the data using descriptive for both dependent and independent variables on non-parametric test. The results discovered that there was a significant favorable influence of scaffolding on the implementation of policy, instructional method, campus culture and curriculum on students' ecological knowledge at <0.05 alpha level of significance.

Nimatuzahroh, Uunzulfiana, and Mein-woei Suen (2019) all the scholars are formidable member of association conferences of psychologist, counselling and humanities (ACPCH) they research on analysis of a scaffolding collaborative contextual method of inclusive teacher toward the students with special needs in elementary schools. They are researchers from various universities in Taiwan. They used scaffolding as collaborative contextual method as means of providing assistance and collaboration of inclusive teachers to the students with special needs in accordance with the situation of students and

schools so that students can exceed their potential. The data was collected their potential. The data was collected through observation and interview. The data was analyzed using qualitative method by performing data reduction, classification and collaboration in teachers' competence, facilities and students' characteristics. They established that the collaboration between inclusive teachers and other tears were generally good. Students performed mutual cooperation in form of sharing learning methods and sharing tasks in dealing with inclusive classes.

Suparino, Sukardiyono, Triutami, Erlin, and Evelin (2019), in international conference on educational research and innovation (ICERI) research on effectiveness of interactive physics mobile learning media with scaffolding approach to improve students tolerance and students' self-regulated learning conducted the research to determine the effect of the use of scaffolding approach to improve students tolerance and students self-regulated learning in Bima city and Pontianak city. The study used pretest and posttest control group design. The data were obtained through questionnaire regarding tolerance and self-learning. The results showed an increase in students' tolerance and their self-regulated learning with experimental group scoring higher than control group. Lyndd, Staccy, Katte and Hennessey (2016) they research on effect of scaffolding employability on undergraduate degree in criminology and established that the employability of students is increasingly seen as an important outcome for the Griffith University. The research followed students' life cycle approach using the employability framework and students activities both in and out of university were described using scaffolds. The study demonstrated how students can begin to develop their university and skills in the area of employability prior to commencing their study and progress through their degree programmme.

Ingeborg, Kennneth and Palmyre (2019) in their research peers, teachers and guides: a study of three conditions for scaffolding conceptual learning in science centre established that the implications of scaffolding variations on low students make sense of game-based exhibit qualities that trigger interest and develop knowledge of scientific phenomena. The data were gathered during a field trip by high school students (aged 16 -17 years). The students were grouped into; peer-supported, teacher-assisted and facilitated by scaffolds of museum guide. Interaction in each case were video and recorded, transcribed and analyzed. The analysis shows how scaffolding demonstrated excellent in students' conceptual learning. The third group scored higher than group 1 and 2. The scaffolding interaction is more effective.
A way of improving disseminating of information from the sender (teacher) to the receiver (students) is by introducing different devices that will serve as intervention for the teaching strategies used by the teacher. The challenges of teaching strategies have been flagged by scholars at different fora but the intervention used during teaching calls for more attention. According to Durowoju (2018) established that scaffolding is a process of setting up a situation to make teaching and learning easier for both the teacher and student by gradual pulling back each of the fold until the child skillful on the concepts on the folders. This study therefore examined the effects of scaffolding as an intervention during the teaching of science in secondary schools in Abeokuta.

Adeniji (2018), explained further that in scaffolding the teacher helps the students master the task or concepts that the student is initially unable to grasp independently and when the students take responsibility for or master the task, the teacher begins the process of fading or gradual removal of the scaffolding, which allows the students to work independently. Scaffolding will establish the significant concepts of science and bring about conceptual change in students' understanding of science.

Statement of Problem

Instructional strategy must be well designed to improve educational system in Africa. "What you do not have, you cannot give". Teachers in Africa lack practical application of theory learnt in science concepts. The quality and standard of education attained by an individual is based on curriculum content and the teachers who implement the curriculum of scaffolding as an instructional strategy to improve learning dissemination has been discovered by researchers such as Lyndel, Staccy, Katte and Hennessey (2016),

Martina, Roald, and Marieke (2017), Durowoju (2018), Adeniji (2018), Hans-Jurgen (2018), Ikhsan, Kurinanto, Apriyanto and Nurdin (2019), Nimatuzahroh, Uunzulfiana, Mein-woei Suen (2019), Suparino, Sukardiyono, Triutani and ErlinEvelin (2019). It is against this background that the researcher assessed the influence of scaffolding on instructional strategy to teach Ecology in Biology. The private and public secondary schools in Abeokuta were used for this research. The practical application of scaffolding do teach subjects concepts has been identified by scholars in advanced countries as a panacea for instructional dissemination. Therefore, the assessment of efficiency of scaffolding using each of the scaffolds to teach the concepts of Ecology was thoroughly examined. The discoveries of this research will either in support of the existing discoveries or against them. Teaching pedagogy/strategy used in Africa classroom determines the quality and standard of education attained in the continent.

Purpose of the Study

The study focused on the following objectives;

To examine the impact of scaffolding on the conceptual assimilation of students in ecology

1. To determine the impact of the treatment on achievement of students
2. To determine the impact of gender on conceptual changes of students in ecology

Research Hypotheses

HO_1 there will be no statistically significant impact of treatment on students' academic achievement

HO_2 there is no statistically significant impact of scaffolding on students' conceptual knowledge of ecology

Methodology

The study adopted a conceptual group pre-test, post-test quasi experimental design. In which the treatment at 3 levels was crossed with gender 2 levels and cognitive style at 2 levels. The fractional matrix for the study is 3×2×2. The schematic layout of the design is as follows;

Experimental group $O_1 \times_1 O_2$

Control group $O_1 \times_1 O_2$

O_1 = represents pre-test achievement in ecology

O_2 = represents post-test achievement in ecology

$\times_1$ = Teaching Strategies/Methodology

$\times_2$ = Scaffolding Instructional Strategy on ecology

$\times_3$ = Conventional teaching method (chalk and talk)

The population of this study consists of secondary schools students in private and public schools in Abeokuta. The population include male and female student of junior secondary school three. Target population: the city of Abeokuta has about two hundred secondary schools of both private and public school where private schools carried the larger numbers. The target population is junior secondary school three of one private schools and one public school. The rationale for this was that the population of one public school is ten times of private school. Also, the research requires intact classes to ascertain the effect of the scaffolding on the schools used. One public school was used for convectional teaching strategy as the control group.

Quasi experimental technique was used since the intact class was used for the sample. The one private school; Anointed fortune college, Abeokuta was used as experimental group with the population of 19 students in JSS 3 while the public secondary school used for control group was Federal College of Education model secondary school, Abeokuta with the sampled population of 113 students. The total population of students used for the research was 132 students of junior secondary school three.

Research Instrument

The instruments were self-developed by the researcher. These include;

i. Pre-achievement test on ecology (PATE)

ii. Students' questionnaire on impact of scaffolding on conceptual knowledge of ecology (SQISCKE)
iii. Post achievement test on ecology (POATE)

The research instrument (PATE, SQISCKE and POATE) were subjected to face and content validation by three experts in Biology education of not less than Chief lecturer and Associate professor of Federal college of Education, Abeokuta and Lagos state University, Ojo. They were also chosen because of their experiences in research to ensure the test items were within the ability of the students, free from ambiguity and covered the needed area of ecology. The reliability of the study was determined using the Pearson Product Moment Coefficient (PPMC). The coefficient obtained was 0.89. Hence, the instrument was reliable for the study. The statistical tools used were ANCOVA. Three tables were analyzed, each on the set hypotheses. The intact classes of both experimental and control group were maintained. The internal and external validity was controlled using equivalent group for the treatment and control, duration of the research was also control to avoid morbidity of sample.

Table 1: Result of Achievement Test

Secondary School	Students Enrollment		Mean Score	Status
	Male	Female		
AFC	7	12	43.2	Experimental
FCE Model	44	69	45.8	Control
Total	51	81		

Key: AFC: Anointed Fortune College.
FCE Model: Federal College of Education Model Secondary School.

The table 1 shows the Pre-test achievement of both the experimental and control group before the treatment to ascertain the entry achievement of the students. The mean score 45.8 and 43.2 were obtained for both experimental and control group. This indicates before administering the treatment.

Table 2: Significant impact of scaffolding on students' conceptual knowledge of ecology

Group	**Sample**	**Mean Score**	**Standard Deviation**	**Df**	**Calculated Value**	**Critical Value**	**Remark**
Experimental	19	60.30	8.81	98	2.95	1.671	Significant
Control	113	48.89	6.28				

The table 2 shows the impact of scaffolding on the teaching and learning of ecology. From the table, the calculated t-value is 2.95 while the critical value is 1.671 at a degree of freedom 98. Therefore, since the tcal > tcrit, the hypothesis HO_2 is tested at 0.05 level of significant is rejected. This means scaffolding has impact in the teaching and learning of ecology in secondary school which in turns improves student academic achievement.

Discussions of Findings

Table 1 shows the pre-test achievement of students before the treatment. The result revealed the mean score for both the experimental and controlled groups calculated at 45.8 and 43.2 respectively. The hypothesis I analysed established that students performed poorly by using conventional method of teaching. The pre-test of the two secondary school involved in this research on Ecology were below average in their mean score. This implies that students need teaching innovation to perform better in their academics. The data analysed on hypothesis two established that the mean score of Experimental group was above average at 60.30 after the treatment (scaffolds) was used. The control group was 48.89 with calculated value of 2.95 and critical value of 1.671. This implies that scaffolds used on ecology content itemized have improved students' academic achievement in Biology.

The **table 2** established the significant difference between the mean achievement scores of students of experimental and control group. The calculated value of the two hypotheses was greater than the critical

value. Hence, all the null hypotheses were rejected. The research revealed that scaffolding as an instructional strategy to teach ecology is successful in secondary school. The conceptual knowledge of ecology can be presented in each of the scaffold to meaningful present the in-depth of ecological knowledge. The research also makes the teaching and learning of ecology so simple for students' assimilation. The posttest administered on the experimental group established the impact of the scaffolding on student with excellent achievement. The instructional strategy of scaffolding can be better produced by the teacher and the school management at a low cost to achieve optimal on the teaching and learning of Biology concepts. The discoveries of this research were in-line with Lyndel, Stacey, Katte and Hennessey (2016), Martna, Roald, and Manieke (2017), Han-Jurgen (2018), Ikhsan, Kurnianto, Apriyanto and Nurdin (2019), Nimatu Zahroh, Uunizulfiana, and Meim-weeisuen (2019), Suparino, Sakardiyono, Triutami, and Erlin erelin (2019), all the scholars corroborated the same philosophical position and discover the same thing.

Conclusion

Based on the findings of the research scaffolding as an instructional strategy enhances academic achievement in Biology in secondary schools. It also enhances easy dissemination of scientific idea from the sender (teacher) to the receiver (students). The scaffolding allows creativity of ideas from both the teachers and learners. The production of scaffolds can be cheaper based on creative ability of the teacher. It enhances in-depth acquisition of knowledge of concepts presented.

Recommendations

i. Authorities of secondary school both private and public should endeavor to train Biology teachers in the effective use of scaffolding as an instructional strategy through properly organized workshop and seminars.
ii. Production of scaffolding can be cheaper and better increasing the creativity capacity of both the sender and receiver. Hence, teachers need to be more proactive and be hardworking.
iii. Ideas of each Biological concepts can be transfer from each of the scaffolding to students mobile phone for regular studies instead of social media menace and games that have occupies these young generations.

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