# Effects of Action Learning and Concept Mapping Strategies on Academic Performance of Biology Students in Senior Secondary School in South West Nigeria.

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**Abstracts**
*The study investigated the effects of action learning and concept mapping strategies on Academic performance of Biology Students in Senior Secondary Schools in South West Nigeria.The study also examined the gender difference and school location on the performance of students in Biology. The study was a quazi-experimental pre-test, post-test and control group design. The population comprised all SSSII Biology student in all the secondary schools in South West Nigeria. The sample was made up of three hundred (300) Biology students selected from six school from three states out of six states in South West Nigeria. The selection was done by using multistage sampling procedure. Three groups were selected, two experimental groups and a control group. The student in experimental groups were taught using Action learning and concept mapping strategies while the control group were taught with conventional method. Biology Achievement test (BAT) was used to collect relevant data for the study. The face and content validity of the instrument was ascertained by expert in science education and their suggestion and correction was effected. The reliability of the instrument was ensured by using test retest method and reliability coefficient of 0.05 was obtained.*

*Findings of the study showed that, there was significance difference in the performance mean score between the experimental groups and control group. The study also revealed that, there is no difference in the performance means score of male and female students but there is difference in the performance of students based on location*

*It was recommended that teachers should adopt the use of Action Learning and Concept mapping strategies for the teaching of Biology being an innovative method to enhance better teaching and learning. Biology teachers should be encouraged by government to attend seminars on teaching methods for exposure to more innovative methods for teaching Biology.*
**Key Words:***Effect, Action Learning, Concept Mapping, Strategies, Performance, Student.*

## I. Introduction

Education came into existence through the agitations from societal beliefs, needs and values. The cherished beliefs and values of the society are always passed from one generation to another. There is no doubt that, education is indispensable to national growth, believing that the wealth of any nation can only be shown by her level of education.

Science educators in recent years gave attention on how to improve science instruction and teaching in schools by going beyond the stereotypic methods of obtaining knowledge in science. Science according to Feynman (2011) has become such an indispensable tool that no nation, developed or developing, wishing to progress in socio-economic society will afford to relegate the learning of science in school to the background.

Biology for years has become so important to the survival of human being and its technological development cannot be under estimated in any society globally. Biology according to Okenyi (2015) can be defined as a structured to equip the students with the knowledge of relevant concepts and scientific skills.

The method adopted by biology teachers are important in order to understand biological concepts. Sakiyo (2014) explained teaching method as pedagogical strategies designed and adopted by teachers to facilitate teaching on the teacher's part and learning on the part of leaners. Dorgu (2015) believed that, there are many teaching methods which varied in different ways, considering among others the age of the learners, body configuration or physique of learners, (able or disable learners). Teaching of Biology required that the teachers should be knowledgeable in the various methods and strategies for teaching the subject. No wonder, Milen (2015) is expected teachers to implement a range of instructional strategies that will bring academic success to all the science students.

Action learning strategy originates from Professor Reginald Revans in the middle of the 20th Century. He developed this method in the coal board and later in livseitals in UK in the 1940s, he concluded that the conventional instruction method was largely ineffective. Afolabi (2012) believed that Action learning involves working on real problem, focusing on learning and actually implementing solution. It is a form of learning by doing which give room for active participation of students.

Fantuzol Walker, 2002 discovered that Action learning instruction have shown promising result in increasing the achievement of low-achieving students. Also, Afolabi (2012) reported that body of literate shows how researchers are using Action learning intervention in urban setting.

In 1992 at Cornel University, Novak developed concept mapping strategy to improve science teaching and learning. Concept mapping simply means a diagrammatic representation of concept using arrows to indicate their relationship in order to represent a new knowledge structure. Concept mapping according to Ojebiyi and Salako (2013) is a powerful but simple way of using diagrams to show information in the same way one think, in order to infuse easy understanding, extension and communication of complex information in the classroom setting. Ajaja (2013) in his study revealed that students scientific mapping outscored those in lecture group but there is no significant difference in their achievement based on gender. Also, Akeju, Rotimi and Kenni (2011) believed that concept mapping instructional strategy contributed to learning achievement, retention of learned materials and learning attribute of students.

**Statement of the problem**

The advocate for quality and effective instruction delivery has been a desired aim of science education. In spite of all the curriculum innovation and other efforts aimed at promoting science teaching in schools, the performance of student in science most especially biology was dwindling every year. The researcher observed that most students believed that Biology is too voluminous; consider some concepts very difficult to understand. This could be as a result of the instructional method used by biology teachers. The researcher observed that, most teachers used conventional method of teaching which seems not to help the students to understand some concepts in biology talk-less of developing their analytical reasoning. The need to reduce the dwindling in the performance of student and erroneous notion held by the student about difficult concepts in biology necessitated the use of action learning and concept mapping strategies on students' performance in Biology

**Research hypothesis**

$Ho_1$: There is no significant difference between the pre-test mean scores and post test mean score of the students taught with action learning, concept mapping and the control group.

$Ho_2$: There is no significant difference between male and female students' performance in experimental and control groups.

$Ho_3$: There is no significant difference between the performance mean scores of students in rural and urban location in the experimental and control group.

## II. Methodology

**Design**

The design used for this study is quazi-experimental of pre-test, post-test, control group design. The design will give room for determination of the effect of the treatments. The experimental group will be taught with action learning strategy and concept mapping strategies, while the control group will be taught using conventional method.

The pattern of the design is shown below;

$E_1$ = $O_1$ $X_1$ $O_2$
$E_2$ = $O_3$ $X_2$ $O_4$
C = $O_5$ $X_C$ $O_6$

Where

$E_1$      Experimental Group 1
$E_2$      Experimental Group 2
C      Control Group

$O_1, O_3, O_5$      Pre-test Observation
$O_2, O_4, O_6$      Post-test Observation
$X_1$      Action learning treatment
$X_2$      Concept Mapping
C      Conventional Method for Control group.

**Participants**

The population for the study consisted all the SSII Biology students in South West Nigeria. The sample was made up of 300 biology students selected by using multistage sampling procedure. First stage involved the random selection of three states within the six geo-political zones in South West Nigeria which include Ekiti, Osun, and Oyo. Second State involved selection of two Local Government Area from each state selected. The next stage was selection of 50 students from six schools from both urban and local areas involving twenty-five (25) females and males.

**Instrumentation**

The research instrument used for the study is Biology Achievement test. BAT consisted of two section: A and B. section A was drawn to elicit information on student bio data such as sex and location of school. Section B contained 40 items multiple choice question with five option (A-E) which intends to measure students, performance in biology. The validity of the instrument was ensured by biology teachers and experts in science education. The reliability was ensured by using test retest method which yielded reliability coefficient of 0.62

# III. Results

Hypothesis 1: There is no significant difference between the pre-test mean scores of students taught with action learning, concept mapping and the

**Table 1:** Analysis of variance (ANCOVA) showing the performance mean score of students in experimental and control group.

| Source | SS | Df | Ms | Fcal | Pvalue |
|---|---|---|---|---|---|
| Corrected model | 1196.442 | 3 | 377.554 | 56.610 | 2.4 |
| Covariate (pretest) | 46.217 | 1 | 142.418 | 24.125 | 3.6 |
| Group | 997.533 | 2 | 473.635 | 68.622 | 3.01 |
| Error | 2007.156 | 296 | 5.176 | | |
| Corrected total | 5513.397 | 299 | | | |
| Total | 102429.001 | 300 | | | |

$P < 0.05$

**Table 1**: reveals that Fcal (68.622) is greater than Pvalue (3.01) at 0.05 level of significance. The hypothesis is not accepted. This implies that there is significant different in the performance mean score of students taught with Action learning, concept mapping and control groups.

In order to determine the effect of treatment on students' performance multiple classification analysis was carried out. The result is shown in table 2.

Multiple classification analysis on student's performance means scores treatment.

| | | Grand | Mean 20.60 | | |
|---|---|---|---|---|---|
| Variable + category | N | Unadjusted Devn' | Eta$^2$ | Adjusted for independent + Covariate | Beta |
| Action learning | 100 | 0.40 | | 4.03 | |
| Concept mapping | 100 | 4.13 | .43 | 0.51 | .47 |
| Conventional method | 1000 | -4.53 | | -4.54 | |
| Multiple R | | | | | 0.423 |
| Multiple R$^2$ | | | | | 0.080 |

**Table 2**: revealed that student exposed to Action learning strategy had the highest adjusted mean score of 24.63 (20.60+4.03), followed by student in concept mapping group 21.11 (20.60+0.51), while student taught with conventional method had the least adjusted mean score of 16.06 (20.60+(-4.54). thus, the use of Action learning and concept mapping strategies would enhance student performance in biology. The treatment accounted for about 43% (Eta$^2$=0.43) of the observed variance in students' performance in Biology.

Hypothesis 2: There is no significant different in male and female students' performance in experimental and control group.

**Table 3:** ANCOVA of performance mean score of male and female students experimental and control groups

| Source | SS | Df | MS | Fcal | Pvalue |
|---|---|---|---|---|---|
| Corrected Model | 1015.075 | 2 | 205.217 | 24.516 | 2.11 |
| Sex | 1.201 | 1 | 1.201 | 1.77 | 3.62 |
| Group | 1053.225 | 1 | 516.132 | 64.312 | 3.01 |
| Sex*Group | 3.865 | 1 | 1.645 | 257 | 3.01 |
| Error | 2140.500 | 297 | 5.735 | | |
| Total | | 299 | | | |
| Corrected Total | | 300 | | | |

P>0.05

The result in table 3 revealed that there is no significant difference in the performance mean scores of male and female students in the post test of the experimental and control groups ($F_2$, 2.297=0.257; P>0.05). The null hypothesis is not rejected, this implies that, there is no significant difference in the performance mean score of male and female students in experimental and control group.

Hypothesis 3: There is no significant difference between the performance mean score of students in rural and urban location in the experimental and control groups.

**Table 4**: ANCOVA showing the performance mean score of students by location.

| Sources | SS | Df | MS | Fcal | Pvalue |
|---|---|---|---|---|---|
| Corrected Model | 1249.325 | 2 | 265.705 | 36.421 | 2.11 |
| Location | 104.601 | 1 | 104.601 | 17.035 | 3.62 |
| Group | 1052.225 | 1 | 713.123 | 76.321 | 3.01 |
| Location*Group | 92.241 | 1 | 48.241 | 6.150 | 3.01 |
| Error | 2044.130 | 297 | 7.101 | | |
| Corrected Total | 5517.575 | 299 | | | |
| | | 350 | | | |

P<0.05

Table 4: reveals that Fcal (6.150) is greater than Pvalue (3.01) of 0.05 level of significance. The null hypothesis is rejected. This implies that there is significant difference between the performance mean scores of students in rural and urban location in the experimental and control groups.

## IV. Discussion

The study showed that Action learning and Concept mapping strategies had positive effects on the performance of students in Biology. This was supported by Sakiyo (2014) that teaching methods as pentalogical strategies, are designed and adopted by the teacher to facilitate teaching on the teacher's part and learning on the learners. Also, it was revealed from the result of the finding that there is no difference in the performance mean score of male and female students in experimental and control groups. This implies that gender has no significant effect on student's performance. The results is in agreement with Azman, Kameruding, Ong and Maaulot (2018) that gender is not associated with the scores of biology among the students, Also, it was in contract with the finding of Amuda, Ali and Durkwa (2016) they found difference in performance of male and female in several different subjects examined at the secondary school level.

The finding further revealed a significant difference in the performance of student in the rural and urban location. This was in agreement with Afolabi (2012) who reported that body of literate shows how researchers are using Action learning influence to produce effective classroom learning intervention in urban setting.

## V. Conclusion

The major conclusion from the study is that, the use of Action learning and Concept mapping teaching strategies enhance better Academic performance of Biology students than the conventional strategy. Students taught with Action learning strategy performed better in Biology, followed by Concept mapping and lastly Conventional strategy.

Also, both strategies would be rewarding for student Academic performance if given consideration

## VI. Recommendations

1. Action learning and Concept mapping strategies should be adopted to the teaching of Biology. This will enhance classroom teaching learning activities and also bring improvement to learners' performance.
2. Teachers should be encouraged to use Action learning and Concept mapping regularly in the teaching of Biology.
3. Government should give support to the school administrators to organize workshops and seminars on the use of innovative method of teaching

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