

## Effect of Concept Mapping on Students' Performance in Genetics, in Selected Public Schools in Obio/Akpor

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### **Abstract**

*The intent of the study was to discover the effect of concept mapping on students' Performance in Genetics in selected senior secondary school in Obio/Akpor metropolis. The research design used was quasi experimental design which consisted of a pre-test and post-test group. The population of the study consisted of 6168 SS2 students in Obio /Akpor metropolis, from which sample size of 90 SS2 students was arbitrarily chosen from two public co-educational schools. The experimental groups were taught genetics with concept mapping teaching method, while the control groups were taught using lecture method. Genetics performance test (GPT) was the instrument used for data collection. The instruments were validated and the reliability coefficient was established as 0.72 using Cronbach Alpha  $\sigma$  Reliability method. Four research questions and four hypotheses guided the study. Mean and standard deviations were used to answer research questions. Hypotheses one and three were tested using ANOVA while hypothesis two and hypothesis four was tested using ANCOVA at 0.05 level of significance. Results from the study showed better achievements of students' results in favour of concept mapping instructional method to the conventional method of teaching. Concept mapping teaching method enhanced students' performance in biology especially genetics. Base on the findings, it was recommended among others that there should be regular and adequate training of teachers on the use of concept mapping for instruction of perceived difficult concepts in science topics and other subjects.*

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**Key Words:** *Biology Achievements, Concept mapping and Genetics*

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### **Introduction**

Currently as well as in the precedent the areas teachers find difficult in biology (and other science courses) and students' poor performances in those areas have been some of the Perturbing issues in Education, Altin [2002]; Adlaon,[ 2012]; Ioana et al, [ 2011). Genetics is one of such topics in biology that students find difficult to learn and this constitute some pedagogical problem to the teacher, Ozorji [1998]

Understanding genetics helps the student's the students to know a lot about variability of individuals, sex determination in man and how offsprings inherit features of their parents.

An evaluation of the west African Examination councils (WAEC) chief Examiner in charge of biology reports, showed a down, poor performances of students in Genetics (and ecology) in the last decades of May June / and November /December Examination ,WAEC [2009-2016). Poor remarks made by the WAEC chief Examiner in charge of biology includes "inability to grasp quickly some genetic vocabularies", "Not-familiar with concepts in genetics," "Low performances in relation to genetic questions" amongst others were used to express the flaws of students in the stipulated years of biology Examination ,WAEC [2009-2016).

Poor performances in genetics, will lead to decrease in the students' interest to go into courses that are related to Genetics which includes Genetics Engineering, Medical Genetics amongst others. Osiagbo (1998) in her study discovered that inadequate teaching method makes a topic difficult for students' to comprehend. Osuofor and Okigbo (2013) affirm that persistent use of traditional lecture method of teaching contributes to students' poor performances in biology.

Abimbola and Ozorji (1998) attributed poor performances of students in genetics to unsatisfactory work and poor teaching methodology used in teaching this topic.

To effectively teach and meaningfully learn genetics, concept mapping strategy has been recommended as a vital tool to improve students performances in biology especially genetics, Agboghroma and Oyovwi [2015).

Concept mapping is a procedure of arranging facts or data in way of maps as two-way diagram which comprises of concept connected by stipulated outline to illustrate relationship among words, Canas [2013)

According to Henderson (2003) concept map can be used in the following ways:

- i) Teaching and revision of topic-, which help learner, convey a clear general picture of topic, their relationship to their students and also help learner discover key concepts
- ii) Reinforcing understanding –concept maps help to discover key concepts and summarize relationship.
- iii) Check learning and identify misconceptions- it serves as an evaluating tool in teaching and learning process.
- iv) Assessment- students' achievement can be tested or examined by concept maps. It also helps the instructor diagnose the misconceptions that make the instruction ineffective, Ross [1991). Suen et al., (1997) affirmed that concept maps are generally used to either express or conceptualize issues to others or even help students understand the conceptualization of an issue.

Concept map is used to stimulate the generation of ideas and are believed to aid creativity, Anderson and Leber [1998)

The method of concepts mapping was originated and used by Joseph D. Novak and his investigation group at Cornell University, New York, United State in 1970's.

Concept maps facilitate putting together these new ideals with existing knowledge according to Safdar (2010). It helps students to grasp newly introduced science concepts and make meaning out of what was studied consciously. Adlaon (2002) in his work discovered that concept maps is a tool that enables students summarizes texts and identify main ideas as well as provide useful ways to assess student understanding of a topic.

Poor performances in genetics, will lead to decrease in the students' interest to go into courses that are related to Genetics which includes Genetics Engineering, Medical Genetics amongst others. Osiagbo (1998) in her study discovered that inadequate teaching method makes a topic difficult for students' to comprehend. Osuofor and Okigbo (2013) affirm that persistent use of traditional lecture method of teaching contributes to students' poor performances in biology.

The major purpose of this study is to find the effect of concept mapping in teaching genetics at selected senior secondary schools

### **Purpose of the Study**

Specifically the purposes of the study are to ;

1. Determine the differences in the performance of learners introduced to lecture method and those introduced to concept mapping as showed by their pre and post cumulative test scores.
2. Determine the effects of concept mapping teaching method on students' academic results in biology based on gender as shown by their pre-test and post-test scores.

### **Hypotheses**

**H<sub>01</sub>:** There is no significant difference in the performance of learners introduced to lecture method and those introduced to concept mapping as showed by their pre and post cumulative test scores.

**H<sub>02</sub>:** There is no significant differences in the effects of concept mapping teaching method on students' academic results in biology based on gender as shown by their pre-test and post-test scores.

### **Method**

Cluster sampling technique was technique applied to choose two co-educational schools comprising of 603 SS2 students from the stipulated fourteen public senior secondary schools in the area of study. An SS2 class each was arbitrarily chosen from the two schools. Ninety (90) students of SS2 were used as sample size, with a total of 53 females and 37 males. The experimental group SS2A has a total of 50 students [32 females and 18 males] and the control group SS2B 40 students [21 females and 19 males]. The experimental group was concept mapping group while the control group was taught the lecture method group.

### **Instrument**

The research instrument used for the data collection is Genetics performance Test (GPT). GPT was constructed from topics on genetics covering all the areas the students was taught. Two tests were used to measure performance, one a pretest and the other a post test. Item Difficulty index was conducted using question one of the GPT and difficulty index of 56% was obtained. The GPT comprised of 25 items of multiple-choice questions developed by the researcher. The researcher administered the instrument for the study personally with the assistance of the two other researchers in the school. The items introduced to the students consists of ten (10) lesson plans and five each for both experimental group (SS 2A) and control group (SS2B).

The first five lesson plan were taught the experimental group (SS2A) using concept mapping teaching method while the remaining five lesson plans were taught the control group (SS 2B) using lecture method of teaching. Both groups were taught genetics [genetic concepts, genetic inheritance and sex determination]. One of the researchers did the class teaching.

Data gotten from the pre and post-test groups were subject to analysis utilizing means and standard deviation to solve the research questions while T-test, ANOVA and ANCOVA were used to analyze the hypotheses. These statistical methods took care of the inequality in the results.

### **Methods**

**H<sub>01</sub>:** There is no significant differences in the performance of learners introduced to lecture method and those introduced to concept mapping as showed by their pre and post cumulative test scores.

### ANOVA of the Experimental and Control Groups

Source of variation	SS	DF	MS	F	P value	F <sub>[c v]</sub>
Between Groups	273.241	3	102.723	22.431	.420	.272
Within Groups	1021.2	87	143.21			
Total		90				

From the Table 1, there is significant difference between the experimental and control group. Since P calculated value of 0.420 which is higher than the F critical value of 0.272 at  $P > 0.5$  (Two – tailed test). Hence the null hypotheses is rejected at 0.05 level of significance

**H<sub>02</sub>:** There is no significant differences in the effects of concept mapping teaching method on students' academic results in biology based on gender as shown by their pre-test and post-test scores.

### ANCOVA

Sources of variation	SS	DF	MS	F	F <sub>cv</sub>
Covariates	1243.261	1	1243.261	22.241	
Main Effects	70.321	1	70.321	.421	.325
Gender	70.321	1	70.321	.421	.325
Explained	1402.112	2	2542.621	8.026	
Residual	3273.219	37	43.624		
Total	4675.331	39			

Source: Field Study

Table 2: Showed that there is significance difference in the effects of concept mapping teaching method on students' academic results in biology based on gender as shown by their pre-test and post-test scores. From the results, F cal =.421 is greater than F cri=.32 at 0.5 level of significance .Hence null hypothesis is rejected. This means there is no significant difference of students' academic achievement between male and female in the concept mapping group.

### Discussion of findings

From the Table 1, there is significant difference between the experimental and control group. This implies that students taught with concept mapping teaching method performed better than those taught with lecture method.

The variation in the means as show in table 4.4 was statistically big. This makes us reject the null hypothesis .This agrees with the findings of Ozorji (2010)who provided empirical evidence showing the efficacy of concept mapping instructional method in promoting meaningful learning and understanding of concept which enhances students' academic performance. Asiga (2005) expressed her view in the review of literature that concept mapping method motivates learners and this increases learning outcome positively and also Also Table 4.8 Shows that there is significance difference in academic performance of students in biology based on gender as determined by their pre-test and post test score in concept mapping. ( $F_{47} = 31.614$ ,  $P < 0.05$ ) level.

This agrees with the findings of Jegede, O.J. and Okebukola, P.A.O. (1992). In the Difference in socio-cultural environment perceptions associated with gender in science

classroom. The results revealed that females had higher scores than males in their test scores. This may infer that females concentrate more on their studies than males

### **Recommendation**

From the result of this study, the following recommendations are made:

1. Teachers who teach Biology are advised to use effective teaching method in teaching biology. It is also important for instructors to be educated on the use of concept mapping method for instruction when teaching Biology. This singular act will help to stimulate and sustain the student's curiosity in Biology and other science subjects. This will in turn help to enhance facts and comprehension of perception.
2. The Government should relinquish funds to education sector, where this fund will be used to coordinate workshops, seminars and promote up to date innovations programmes for teachers on better ways of using concept mapping in teaching in order to effectively teach abstract and difficult concept in science.

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