

EFFECTS OF ANALOGIES STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN BIOLOGY IN NIGERIA**BY****Akintola, David Akinjide (Ph.D.): Department of Science Education, University of Ilorin, Nigeria &****Ayanlola, Gabriel Olawumi: National Teachers' Institute Kaduna in Affiliation with National Open University of Nigeria****E-mail of corresponding Author: akinjide17@gmail.com*****Abstract***

Records from examination bodies have confirmed the persistent poor achievements of senior secondary school students in Biology. Ecology is one of the important areas in Biology that students did not master correctly. The students' poor achievement in this area contributed to the poor achievements in Biology. Therefore, this study investigated the effects of analogies strategy on senior secondary school students' achievements in ecological concepts in Ogbomoso South, Nigeria. The study was a quasi-experimental design. All senior secondary school II Biology students in Ogbomoso South, Nigeria constituted the population for the study. Four intact classes from four public co-educational schools were involved while the sample included 172 students. Biology Achievement Test (BAT) was the major instrument used. Using Cronbach Alpha, reliability value of 0.75 was obtained. Data were analyzed using t-test. Findings of the study showed that there was a significant difference in the achievements of students taught Biology using analogies strategy. It was recommended that Biology students should be exposed to the use of analogies strategy in the learning of Biology.

Keywords: Effect, Analogies strategy, Achievement, Ecological concepts, Ecosystem

Introduction

The place of science and technology in the development of the nation and individuals cannot be over emphasized. The positive influences of science and technology is evident in the development witnessed in education, communication, transportation, agriculture and health across the continents of the world (Isioto, Philip-kpae & Dickso, 2017). The study of Abimbola (2006) expresses that science is an activity carried out through thinking and investigation in order to have perfect understanding of nature. This scientific knowledge is used for invention with the quest to make life better, conducive, safe and habitable. Unfortunately, the achievement of students in science is not satisfactory with particular reference to Biology.

Furthermore, the poor state of achievements of students in Biology has generated lots of concern among stakeholders. West Africa Examinations Council (WAEC) Chief Examiners' reports (2017) indicate that students are performing poorly in biology. In the reports, one of the areas identified as contributors to students' under achievement in biology is Ecology. Moreover, Ayanda (2016) explains that most biology teachers run away from the teaching of ecology and its concepts. Also, the few teachers that teach ecological concepts failed to present their teaching in practical form that will make the lesson real meaningful and permanent. Ecological knowledge as stated by Michael (2012) is needed in prevention of; pollution, flood, epidemics, destruction of natural ecosystem, pathogens among others. These are notable problem militating against lives and property across the whole world. It is evident that flood has claimed a lot of lives in almost every continents while pollution is found to be responsible for numerous health issues. Therefore, the surging achievement in ecology must be prevented and improved upon as a matter of urgency. More so, studies reveal that poor methods of instruction are among the factors that are contributing to poor achievements in ecology and biology at large.

Researchers have observed that methods of instruction contribute in no small way to students' academic achievements in biology. It was argued that the teaching of biology without appropriate teaching strategies could certainly result to lack of interest and poor learning outcomes (Adedeji, 2002; Ezeliora, 2000; Kolawole, 2003). Therefore, Olasheinde (2008) stated that the use of various teaching strategies will facilitate improvement in students' achievements in biology. In the same direction, Adedeji (2002) and Anderson (2002) explain that the use of new and innovative strategies by the teachers enhance better achievements of students in school. Therefore, the use of analogies in teaching ecological concepts is considered needful with immediate effects. Analogies is considered to be investigated in relation to teaching and learning of ecological concepts since it involves the use of familiar situations for the understanding of unfamiliar situations (Calik & Ayas, 2005). Abimbola (2006) sees analogies as the use of the known for the understanding of the unknown by means of comparison.

The position buttressed by Abimbola (2006) was maintained by Ruhl (2003) that analogy is the explanation of common principle by comparing unfamiliar things with familiar things. So, the used of familiar knowledge to the explanation of unfamiliar ecological concepts is believed by the researcher to contribute positively to achievements of students in ecology and biology as a whole. For example, electric fan could be on against particles like leaves, papers, soil among others to blow them off. Analogically, it explains effects of wind in the real situation. Furthermore, the growth of a plant from a seed to woody and fully grown up plant could be likened to the growth of a fertilized egg (zygote) to adult in stages as described by Ayanda (2016). More so, Adedeji (2002) carried out a study on the effect of teachers' use of analogy on the academic performance of students in physical chemistry; one hundred and fifty seven senior secondary school chemistry students from eight randomly selected secondary schools were used for the study. The result of the study showed that the experimental group taught thermodynamics in physical chemistry using analogy instructional strategy performed better in the performance test much more than their control group counterpart. Also, the studies of Anderson (2002), Kenneth (2002) and Oswald (2000) revealed that the achievement of students exposed to analogies instructional strategy were better than those exposed to lecture method. Furthermore, from various researches, gender effects have been investigated in relation to various concepts in biology with inconclusive results. Hence, the researcher is interested in investigating the moderating effects of gender on learning of ecological concepts by the students

Gender has been observed to influence human behaviours, gesture, career, social network and mode of dressing (Oyeniyi, 2003). This is evident in most studies reviewed on the effects of gender on students' performance in biology. The study of Ogunseemi and Daramola (2010) revealed that male students have interest in learning of biology and also performed better than their female counterparts. Furthermore, John (2007) conducted a research on senior secondary school students' perceptions on learning of Biology. It was discovered that no difference existed in the perceptions of male and female senior secondary schools students in Kaduna metropolis on learning of Biology. The study of Akintola (2017) revealed that students' gender had no significant influence on the knowledge of biological drawings possessed by senior secondary school students in Oyo state, Nigeria. But the study of Atotilato (2017) showed a significant relationship in the science process skills of upper basic students in Kwara State in favour of female students. The inconclusive state of gender in various studies reviewed motivated the researcher to investigate the moderating effect of gender when analogies strategy was used to teach ecological concepts in Ogbomoso South, Nigeria.

Statement of the Problem

The observed poor performance of students in biology in WAEC and SSCE has been traced to poor knowledge of students in ecology. Ecology covers more than 45% of questions in biology examinations at the O' level. Various environmental problems affecting lives and property across all continents of the world are connected to lack of the understanding of ecological concepts. Poor method of instruction has been identified as a cause of students' poor achievement in ecology and biology as a whole. Therefore, the

study addressed the effects of analogies in the teaching of ecological concepts at the senior secondary school level in Ogbomosho South, Oyo state, Nigeria.

Purpose of the Study

Specifically, the study determined the:

- i. Effect of the use of analogies strategy on the achievement of students in senior secondary school biology
- ii. Difference in students' achievement in biology based on students' gender when analogies strategy are used

Research Hypotheses

The following hypotheses were generated and tested at 0.05 level of significance:

H₀₁: There is no statistically significant difference in the achievement of students taught using analogies strategy and those taught in the control group.

H₀₂: There is no statistically significant difference in the achievement of male and female students that were exposed to analogies strategy instructional strategy in Biology.

Methodology

The research design was a 2x2x2 pretest, posttest, quasi experimental, non-equivalent and non-randomized control group design. This design was adopted because it allows intact classes to be used without disrupting the school programmes. One experimental groups and a control group was used for the study.

The experimental group was exposed to thorough teaching from the researchers who team taught the concept. A researcher taught the procedure for analogies while the other specialized researcher in biology taught Pond ecosystem and Ecological Succession for three periods of forty minutes, respectively. During the teaching, analogies chart, pond ecosystem chart and ecological succession chart, were the instructional materials used to facilitate the teaching process. The students were later exposed to paper based test of 85 objective questions adapted from (2016). The mark obtained by the students was graded over 85 obtainable marks. The benchmark was 50% also adapted from Ayanda (2016). Any students that scored below the benchmark failed while students that scored between the benchmark and above passed.

The second group was the control group not exposed to analogies instructional strategy but was taught pond ecosystem and ecological succession by the most senior Biology teacher in the school using conventional method and later exposed to the same paper based test (BAT) along with their experimental group counterparts. The dependent variable was the achievement of students in Biology and the independent variable was the treatment which is analogies. The moderating variable was students' gender (male and female).

Out of 15 public senior secondary schools in Ogbomosho south, two were purposively sampled. These were schools that; are coeducational (contained male and female students), have been presenting candidates for WAEC and NECO consecutively for not less than five years. The population for the study was all Senior Secondary School two (SS2) students in Ogbomosho south local government area of Oyo state. One hundred and seventy-two (172) SS2 Biology students participated in the study. These were students available in the intact experimental and control groups from the sampled schools. The instruments for the study were, Biology Achievement Test (BAT) on ecology and analogies lesson note adapted from (2016). Instruments were given face and contents validity through two experts in ecology and a specialist in English language. Reliability index of 0.75 was obtained for BAT using Cronbach alpha. All ethical issues were properly addressed. Inform consent forms were given to; respondents, parents, teachers and principals of sampled schools to ensure their willingness to participate in the study. The respondents' participation was voluntary. Also, the identities of the respondent were kept confidential. The materials

used were not in any way detrimental to the health and lives of the respondents as well. Two hypotheses were generated and tested in the study. Data collected were analyzed using *t*-test.

Results

H0₁: There is no statistically significant difference in the achievement of students taught using analogies strategy and those taught in the control group.

This hypothesis is tested with *t*-test statistics reported in table 1.

Table 1: *Samples t-test of the Students Exposed to Analogies Strategy and those in the Control Group*

Group	No	Mean	Std Dev.	Df	t-value	Sig. (2-tailed)	Remark
Control	79	46.21	9.263	170	7.422	0.000	Rejected
Analogy	93	58.29	11.370				

Table 1 shows the independent sample *t*-test for students' achievement test in Biology for both students in the control group and analogy group. The *t*-test calculated value was 7.422 while the *p*-value is 0.000 at 0.05 significance level. Since the *p*-value is less than 0.05 ($0.000 < 0.05$), therefore the null hypothesis one is rejected which shows that there is significant ($p < 0.05$) difference between the achievement of senior secondary school students taught Biology using analogy and their counterpart in the control group and hereby concluded that students taught with analogies achieved better than the control group.

H0₂: There is no statistically significant difference in the achievement of male and female students that were exposed to analogies instructional strategy in Biology.

This hypothesis is tested with *t*-test statistics reported in table 2.

Table 2: *Samples t-test of the Male and Female Students Exposed to Analogies Strategy*

Group	No	Mean	Std Dev.	Df	t-value	Sig. (2-tailed)	Remark
Male	83	54.43	10.343	170	1.105	0.253	Not Rejected
Female	89	56.29	11.925				

Table 2 shows the independent sample *t*-test for male and female students' academic achievement test in Biology when exposed to analogy strategy. The *t*-test calculated value was 1.105 while the *p*-value is 0.253 at 0.05 significance level. Since the *p*-value is greater than 0.05 ($0.253 > 0.05$), therefore the null hypothesis two is not rejected. This shows there is no significant ($p > 0.05$) difference between the achievement of male and female students taught Biology using analogies strategy.

Discussion

The results obtained from the analysis on hypothesis one showed that students taught Biology using analogies instructional strategy performed better than the students in the control group that were taught Biology using the conventional method. The results from this study agreed with that of Adedeji (2002) that students taught sciences using analogies strategy performed better than the students taught using conventional method. In the same direction, the results of this study is in agreement with that of Anderson (2002), Kenneth (2002) and Oswarld (2000) that the achievement of students exposed to analogies instructional strategy were better than those exposed to lecture method.

Furthermore, the results from hypothesis two revealed that no both male and female students exposed to analogies strategy improved when their pre-test scores were compared with their post-test score. But it was noted that the students' achievements were not influenced by gender. The results from this study is in agreement with the result from the study of Akintola (2017) that students' gender had no significant influence on the knowledge of biological drawings possessed by senior secondary school students in Oyo state, Nigeria. But the results from this study disagreed with that of Atotilato (2017) that a significant relationship existed in the science process skills of upper basic students in kwara state in favour of female students.

Conclusion

Based on the results of the findings of this study, it was concluded that; analogies strategy improves students' achievement in Biology, and both male and female Biology students' achievement could be improved with the use of analogies strategy.

Recommendations

Therefore, the following recommendations were made based on the present study;

- Teachers should adopt the use of analogies in teaching Biology and other science related subjects.
- Curriculum planners can suggest analogies in the curriculum for the teaching of ecology
- Government through the monitoring unit should enforce analogies strategy for teaching ecology in senior secondary schools in Nigeria.
- Seminars through which the use of analogies will be passed across to the teachers by the facilitator should be organized by various stakeholders connected with education.

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