EFFECT OF SELECTED TEACHING METHOD ON ACADEMIC ACHIEVEMENT OF BIOLOGY STUDENTS IN CALABAR EDUCATION ZONE

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Abstract
The study examined the effect of selected teaching methods, gender, and school location on students' academic achievement in biology in Calabar Education Zone of Cross River State, Nigeria. Quasi-experimental research design was adopted in this study. One research question and hypothesis were posed and formulated respectively. Study population comprised of 5218 SS 1 Biology students. Stratified, simple random and purposive sampling techniques were used to draw 285 students from the population. Biology Achievement Test (BAT) was the only instrument used for Data collection. Reliability of the instrument was reached using KR-20 to realize .071. Data collected were analysis using three-way analysis of Covariance (ANCOVA). Results obtained shows that a significant interaction effect does not exist between teaching methods, gender and school location on biology students' academic achievement. Based on the found, it was concluded that concept mapping and guided inquiry strategies be used as dominant teaching methods during biology lesson delivery. Also, the study concluded that teaching methods do not have a statistical significant effect on school location and gender. Based on these it was recommend among others that government and stakeholders as in educational sectors should organized regular in-service training on the judicious use of concept maps and guided inquiry teaching strategies.

Keywords: ***Guided Inquiry, Concept Mapping, Gender, School Location and Academic achievement***

Introduction

The principal objective of education has been the development of the whole individual. The hope of every season parent is that the school will be able to develop the child's potentialities in life. The only way of achieving this is by giving the child education that is of high quality and standard. Education involves the total efforts of community to raise its political, social and economics standard of living. Idowu (2001) describe education as the pivot on which the wheel of national development revolves and as a legacy that a nation can bequeath to its citizens.

Biology is a natural science which studies origin, evolution, as well as classification of living things and their contributions to life. As a branch of science and a prerequisite illicit subject for many fields of study, it contributes greatly to technological growth of all nations (Nwagbo & Chike, 2011). Modern biology is a vast and eclectic field that recognizes the cell as the basic unit of life, gene as the basic unit of heredity and evolution as the engine that propels the synthesis and creation of new species. Okeke (2007) opined that biology is a

corner stone for Pharmacy, Biotechnology, Medical Biochemistry, Biochemistry, Medicine, amongst others. Looking at the fundamental importance of biology, it is today viewed as a standard subject of instruction at all levels of educational system.

Biology as a subject is important to the society and her daily life. It is one of the key science subjects in our school's curriculum and its importance cut across every aspect of human life. Biology but nature ought to be an interesting subject to students following its wide application to daily activities. In-spite of its relevance to human and society at large, students' academic achievement in Biology is still questionable. This poor achievement has been attributed to gender, location, in appropriate teaching method and shallow knowledge of the subject matter on the part of the teachers.

This is worrisome to government and the proprietors of secondary schools as well as parents, students and other education stakeholder, Government in response to this alarming situation embarked on renovation of physical facilities in most public schools, posting of school supervisors to visits schools on regular basis and writing of indigenous high quality textbooks across all subjects at subsidized rate, as well as the organization of annual teacher capacity building workshop. Yet, it is doubtful whether learner's achievement in biology has reached acceptable standard (Nyong 2017) The present study therefore sought to answer this question in order to address the present situation: to what extent do teaching methods (guided inquiry and concept mapping), gender and school location affect biology students academic achievement in Calabar Education Zone. Araoye (2009) opined that exposure to biology education offers the learners a wide range of relevance in all aspect of life. The idea behind biology as a course of study is to produce knowledge, highly motivated , professionals and effective teachers of biology who will be able to develop in students an application and understanding of biology process and principles.

Despite the benefits of biology to man and society, there still exist some reports of poor academic achievement in internal and public examination. This suggests the need for more effective teaching methods that can improve students' academic achievement in biology. Notable among the teaching methods are guided inquiring method, concept mapping. Demonstration, discussion, lecturer and assignment methods. Based on this, the researcher wishes to put to test the efficacy of concept maps and guided inquiry teaching methods on student's academic achievement in biology.

Jack (2013) investigated concepts mapping and guided inquiring as effective techniques for teaching difficult concept in chemistry. The main purpose of the study was to determine how the adoption of concept mapping and guided inquiry instructional strategies could enhance more meaningful understanding of difficult concept in chemistry and increase students' academic achievement. Results of the finding show a significant deference between the achievements of students exposed to experimental group (concept mapping and guided inquiry) and the control group (expository method). However, the study adopted non-random pretest-posttest quasi experimental design with control group.

Karakuyu (2010) examined the effect of concept mapping and guided inquiry methods on attitude and achievement in physics. The researcher also at determined gender effect as well as school location using quasi experimental design with control groups. Concept mapping and guided inquiry method were used for the experimental groups, while conventional method was for the control group. Results of the finding were presented as follows: urban students generally perform better than their rural counterpart; male and female students in both rural and urban areas each were slightly different in achievement though not significant. The mean scores of those taught physics with concept maps in the urban was 52.08 while those in rural with same concept maps had 39.59. Similar results for guided inquiry for both urban and rural schools were recorded in favor of urban location and male for gender. On the whole, the study findings hold that that in experimental groups outperforms those in control group. With these results it is pertinent to physical teachers for ensure equal opportunities for both male and female as well as urban and rural students irrespective of the method used in the process of teaching. Several studies on concept maps and guided inquiry have over time shows effect while some maintain no effect on students' academic performance in sciences and biology in particular.

Ushie (2016) assessed effect of concept mapping and guided inquiry on the teaching of difficult concepts in biology among NCE II students in Cross River State College of Education, Akamkpa. A quasi- experimental design that ensured intact class for both experimental and control groups was used. Results of the findings hold that students taught using concept maps, guided inquiry and conventional methods had a mean score of 15.1447, 13.813 and 8 8613 respectively. Ushie recommended the continuous use of concept mapping as effective teaching method that will always place the learners on advantage over other teaching methods. The author in his founds reported that NCE II male students significantly perform better than the female students.

Birbili (2006) studied concept mapping knowledge in early childhood education and reported achievements gap among learners. The researcher used guided inquiry and demonstration methods as moderator variables. Results of the findings reveal that a significance difference between boys and girls exist in academic achievement as well as urban and rural achievement. Metz (2004) believed that school location, gender and teaching methods have a significant effect on student's academic achievement in sciences. Metz states that students can achieve maximally in sciences (Biology in particular) if taught using activity oriented methods such as concept maps, guided inquiry, and experimentation among others.

Conclusively, the author hold that gender as a factor, may or may not affect students' academic achievement in school subjects if taught with innovative methods. Also, location to the author is not a good predictor of students' academic achievement. Namani and Oyibe (2016) studied gender and academic achievement of secondary school students in social studies taught with concept maps in Abakiliki Urban, Ebonyi State and reported significant higher mean achievement scores in favor of female students. Similarly, Otis and Johnson (2006) conducted a search

on combating poor achievement in mathematics in Nigeria. The aim of the study was to use different approaches in teaching and learning a beat meaningful and also check for gap in achievement across gender. The study findings reveal that male and female students' means scores differ in favor of the female students. Mohammed (2015) also assessed the effects of conceptual maps strategies in teaching foundations curriculum on the achievement of Afif College of Education Students, Saudi-Arabia. The aim of the study was to examine how male and female students taught with concept maps and conventional teaching methods differ in achievement. Results show that male students out-performed their female counterparts in their achievement. Also, the findings also show that a positive correlation exists between concept maps application and students understanding of concepts taught. The background and review provided so far shows that, although there are endorsement that secondary school students perform low in sciences and biology inclusive, it is not clear whether guided inquiry and concept maps teaching methods, schools location and gender have any significant effect on Biology students' academic achievement in Calabar Education Zone of Cross River State.

Purpose of the study

The aim of the present study is to determine the effect of selected teaching methods on biology students' academic achievement. Specifically, the study seeks to:

- Examine the effect of selected teaching methods, gender and location on student's academic achievement in biology

Research question

One research question guided the study as follows: In what way do guided inquiry and concept maps teaching methods, gender and school location affect biology students' academic achievement?

Hypothesis

One null hypothesis was formulated for analysis in this study at 0.05 level of significance. It states thus; there is no significant interaction effect of selected teaching methods, gender and school location on student's academic achievement in Biology

Methodology

The study adopted pretest-posttest intact class quasi-experimental research design with no control group. The study population comprised 5218 SS1 Biology Students in Calabar Education Zone. Stratified, simple random and purposive sampling techniques were used in the study to draw 285 students from the study population. Stratified sampling technique was use to consider gender and each local government under study as a stratum. The Local Government Area that was finally used for the study was selected through simple random approach. Moreso, purposive was used to select three schools for the study. Female consist of 157 while male were 128. Biology Achievement Test (BAT) was the only instrument used during pretest (before treatment) and posttest (after treatment) for data collection. 50 items multiple choices was used to measure students' academic achievement taught biology using concept maps and guided inquiry strategies and to also check for disparity in achievement between gender and schools after treatment. The items were drawn

from ecological concepts (20), soil (13) and nutrition (17). Face and content validity of the instrument was established via experts in Biology Department and Measurement all in University of Calabar. Reliability estimate of 0.71 was ensured using KR20. The instrument was administered by the researcher in the selected schools before and after treatment. All the scripts were collected assemble and score. Data collected for both pre-test and post-test were analysed using three –way analysis of covariance (ANCOVA) and results presented in Table 1.

Results and discussion of findings

The hypothesis which guided the study is hereby re-stated and analyse and shown in table 1.

There is no significant effect of selected teaching methods, gender and school location on students' academic achievement in Biology

Table 1: Summary results of (3x2x2) Three-way Analysis of Covariance (ANCOVA)

Source	Type III of Squares	Df	Mean Squares	F	Sig	Partial Eta Square
Corrected model	18703.236[a]	12	1558.603	53.431	.000	.702
Intercept	1280.841	1	1280.841	43.909	.000	.139
Pretest	10187.176	1	10187.176	349.227	.000	.562
Treatment	829.756	2	414.878	14.222	.000	.095
Gender	.116	1	.116	.004	.950	.000
Schools location	1.225	1	1.225	.042	.838	.000
Treatment*gender	97.432	2	48.716	1.670	.190	.012
Treatment*school location*	12.116	2	6.058	.208	.813	.002
Treatment*gender* *school location.	25.795	2	12.898	.442*	.643	.003
Gender* location	14.452	1	14.452	.495	.482	.002
Error	7934.413	272	29.171			
Total	**151903.000**	**285**				
Corrected total	**26637.649**	**284**				

*p>.05

Results in Table I indicate that the calculated F-values for the treatment, gender and school location (F=.442, P= .643) is not significant at .05 level and (2,272) degree of freedom. This means that the academic achievement of male and female students in urban and rural schools taught biology using guided inquiry, concept mapping and lecture method do not significantly differ. Thus, the null hypothesis is upheld. The eta squared value of 0.3 implies that only .3% of the variance in students' achievement can be accounted for by the interaction of gender, school location and treatment.

Discussion

Result of the findings shows that there is no significant difference on academic achievement of male and female students in urban and rural schools taught with concept maps, guided inquiry and lecture method. This is because, the F-value for the interaction

of treatment, gender and school location (F=.442), P=6.43 is statistically not significant at .05 level. The result of this study is in agreement with the findings of Karakuyu (2010) who reported a better achievement between urban and rural students. The author hold that male and female students differ slightly in achievement but not significant. However, the author further added that those taught physics using concept maps and guided inquiry perform better than those taught using a conventional method.

On the contrary, Ushie (2016) found that a significant difference exist between those taught biology, using concept map, inquiry and lecture methods. The author also reported that male and female students had a mean score of 10.693 and 7.067 respectively. The author concluded that concept mapping and guided inquiry were superior to lecturer method and has a significance effect on students' achievement academically.

The present findings also contradicts the study of Birbili (2006) who reported a significant achievement gap among learners taught biology, with guided inquiry, concept maps demonstration methods in favor of guided inquiry and concept maps between male and female students in both, urban and rural schools. The present result is at variance also with the studies of Metz (2004); Namman and Oyibe (2016); Otis and Johnson (2006) and Mohammed (2015). The authors reported a significant effect of treatment on students' academic achievement in favor of concept maps.

Nonetheless, the present study contradicts with most of the reviewed literature. This could be attributed to the fact that students in the study area may not have been taught using concept maps and guided inquiry strategies. Again, prior to treatment, the research assistant who participated in the study may have increased their chance of coping with the lesson, though the teaching method may be strange to them. It could also be that the research assistants may find it difficult to make meaning out of the concepts taught during this period of study and students find it difficult to adapt to the new methods. Hence, poor academic achievement in biology.

Conclusion

On the basis of the findings, it was concluded that treatment, gender and school location do not significantly affect students' academic achievement in biology. To this end, the hypothesis which stated no significant interaction effect of selected teaching methods, school location and gender was retained.

Recommendations

Based on the findings of the study, the following recommendations were made;

a) Guided inquiry and concept maps should be adopted as dominant teaching methods for biology teaching
b) Government and stakeholders should in educational sector organize regular in-service training on the judicious use of concept mapping and guided inquiry strategies to improve the profess

References

Araoye, F. (2009). The Effect of Inquiry Teaching Method on Biochemistry and Science Education Process Skills Achievement. *Biochemistry Education*, 22, 29-32.

Birbili, D. (2006). Effect of Using Concept Maps Method in Teaching Female Students in Basic Education in the Capital Sana Republic of Yemen. *Arab Journal of Educational Scientific-Yemen*, 1(1), 148-158

Idowu, I. C. (2001). Assessing Science Understanding: A constructivities view San Diego: Academic Press.

Jack, G.U. (2013). Concept Mapping and Guided Inquiry as Effective Techniques for Teaching Difficult Concepts in Chemistry: Effect on Students' Academic Achievement. *Journal of Education and Practice*. 4(5), 10-15.

Karakuyu, Y. (2010). The Effect of Concept Mapping on Attitude and Achievement in a Physics Course. International; *Journal of Physical Sciences,* 5(6) 724-729.

Metz, K. (2004).Children Understanding of Scientific Inquiry: their Conceptualization of Uncertainty in Investigation on their own Design. Cognitive Instruction, 22(2), 219-226.

Mohammed, K.A. (2015). The Effect of Conceptual Maps-Strategy in Teaching Foundations Curriculum on the Academic Achievement of Students in Afif Education College in Saudi-Arabia. *British Journal of Education,* 3(4), 37-47.

Namani S.C. & Oyibe, O.A. (2016). Gender and Academic Achievement of Secondary School Students in Social Studies in Abakiliki Urban of Ebonyi State. *British Journal of Education,* 4(8), 72-83

Nwagbo, C. & Chikelu,U. (2011). Effect of Biology Practical Activities as Students' Process Skills Acquisition *Journal of the Science Teachers Association of Nigeria* , 46(1) 58-70.

Nyong, N.E(2017) Socio- Psychological Factors and Chemistry Achievement of Secondary Two Students in Uyo Education Zone, Akwa Ibom State of Nigeria. Department of Science Education, Unical.

Okeke, E.A. (2007). Sex Difference in the Understanding of Some Important Biology Concepts. *Nigeria Journal of Education* 2(1), 125-132.

Otis, L.V. & Johnson, D. W. (2006). Social Skills for Successful Group work in Sciences. *Educational Leadership,* 42(4), 29-33

Ushie, F.O.(2016). Effect of Concept Mapping on the Teaching of Difficult Concepts in Biology Among NCE II Students in COE, Akamkpa. *Niger Delta Journal of Education* 3(1), 85-99.