

Influence of Self-Concept, Test Anxiety, and Motivation on Achievement in Biology among Senior Secondary School Students in Calabar Education Zone

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Abstract

This study examined the influence of self-concept, test anxiety, age, attitudes towards biology, and motivation to study biology, on achievement in Biology among senior secondary school students in Calabar Education Zone of Cross River State. One hypothesis was formulated to direct the study. Ex post facto research design was adopted for the study. A sample of 456 Biology students was drawn for the study using stratified simple random sampling technique. The instruments for data collection were the Psychosocial Variable Scale (PVS) and Biology Achievement Test (BAT), developed by the researchers. The instruments were face and content validated. Cronbach Alpha and Kuder-Richardson formulae were used to establish the reliability of the instruments, whose estimates were 0.92 and 0.82 respectively. The independent t-test statistical technique was adopted to test the hypothesis under study at .05 level of significance. The results indicated that while test anxiety and motivation had significant influence on students' achievements in Biology, students' age, self-concept, and attitude towards biology had no significant influence. Based on the findings of the study, it was recommended that Guidance counsellors should motivate students to develop confidence in themselves and take their studies seriously in order to improve their achievement in Biology.

Keywords: self-concept, test anxiety, attitudes, biology, motivation

Introduction

Education has been recognized, the world over, as a tool for bringing about needed changes in the society. As a dynamic instrument of change, education possesses the potentials for positive change in people's lives and the environment. It is through

education that societal values, norms, culture, needs and aspirations are inculcated in the people. This explains why government at different levels commits enormous resources into education to ensure that it is made accessible to its citizens. For instance, Nigeria as a nation has made effort in this direction by attempting to provide free, quality and basic education (Eyo, 2005). This attempt is in accordance with the nation's philosophy of education as reflected in the National Policy on Education (FRN, 2013), which is geared towards self-realization of better human reflections, individual and national efficiency, effective citizenship, national consciousness and national unity, as well as towards social, cultural, economic, political, scientific and technological progress.

Biology as a science subject is a branch of science that is concerned with the study of plants and animals. It is primarily concerned with the nature of organisms and their relationship with one another and with their environment. As a science subject, it enables one to understand oneself, and to understand major biological processes that take place within him; for example biological processes like digestion, respiration, circulation, excretion and gaseous exchange. Through Biology, organisms tend to appreciate the effects of these biological processes on the larger environment as a whole. Biology like other science subjects is a practical-oriented discipline which seeks to develop in a learner, scientific inquiry and problem solving skills. The general goal of Biology education is to equip the learner with the basic information, talents and approach towards living an independent and useful life both to himself/herself and the larger community in which she/he lives.

Biology subject caters for the needs of a learner who may pursue his/her studies in the subject and its related disciplines. Besides, Biology has played a very important role in providing knowledge for current biological issues such as biotechnology, genetic engineering, waste disposal and food security. Observation has shown that in spite of the tremendous advantages of Biology in schools, there lingers poor performance of students in Biology.

Biology as the science of life is offered in all senior secondary schools in Nigeria. It is offered by both science-oriented and arts-based students as it is a compulsory science subject. The teaching of Biology is important because it helps the students to comprehend the world around them and equips them with the necessary skills to build a progressive society. Biology also provides a platform for teaching students to develop the ability to apply science concepts and principles in solving everyday life problems. With knowledge explosion all over the world through the Internet, biological knowledge has also expanded. There are advances recorded in fields such as biochemistry, physiology, ecology, genetics and molecular biology, which have made the subject a central focus in

most human activities including concepts like food scarcity, pollution, population, radiation, disease, health, hygiene, family life, management and conservation of natural resources as well as biotechnology, among others.

Notwithstanding the importance of biology, there seems to be a decline in achievements in biology in Cross River State in particular. A lot of efforts have been made by educators to improve students' achievement through the use of effective teaching methods and approaches that will stimulate students' interest, facilitate learning and enhance achievement. Despite all these, students still perform poorly in the subject. This has created the need for more effective teaching methods that can improve students' achievement in biology (Okoye, 2014). The percentage distribution of students' achievement in May/June West African Senior School Certificate Examinations (WASSCE) in Biology in Cross River State between 2013 and 2018 is presented in Table 1.

Table 1: Percentage distribution of students' achievement in May/June West African Senior School Certificate Examinations (WASSCE) in Biology in Cross River State, Nigeria, 2013-2018

Years	Total entry	Total statistics	Credit passes (1-6)	% Credit
2013	8,788	8,635	4,595	53.21
2014	7,318	7,126	3,275	45.95
2015	5,849	5,735	2,142	37.34
2016	5,473	5,394	4,260	78.97
2017	5,447	5,377	3,757	69.87
2018	5,407	5,374	3,397	63.21

Source: Statistics section, West African Examination Council (WAEC), Cross River State Office, Calabar, Nigeria

A number of factors are responsible for this relatively poor achievement of students in Biology, such as the use of inappropriate method of teaching, inadequate facilities, class size, poor spelling of technical terms, time factor and shallow knowledge of the subject matter. The neglect of activity-oriented method of teaching has led to abstractness in what

is taught and these make students less active (passive learners) and more liable to rote memorization. This background prompted the researchers to evaluate the influence of self-concept, test anxiety, age, attitudes towards biology and motivation to study biology on achievement in Biology among senior secondary school students in Calabar Education Zone of Cross River State.

Salami (2007) defined anxiety as an unpleasant emotion that threatens one's well-being; a feeling of nervousness and worry that may be manifested in feelings of inadequacy, helplessness, increased heartbeats, and anticipation of punishment. Also, in relation to achievement of students, anxiety suffered by most students comes when they are about to take a test or an examination. This anxiety, popularly known in Nigeria as "examination fever", is known as "test anxiety".

Inspiration has to do with what exactly stimulates an individual to act with a certain goal in mind. It is a pushing or moving force that causes a person to endeavour to accomplish some objective regardless of challenges. Adepoju (2008) holds that inspiration assists students to show a more ideal demeanor towards school in general and towards learning in particular. Through inspiration, students' interest are continually being sustained. As indicated by Bolaji (2005), the thinking pattern is vital to the learning system. It is relied upon to advance or restrain conduct in the study environment. Thinking patterns influence decision to join in, react, and partake actively in instruction exercises. Positively oriented thinking pattern towards scholarly work guarantees accomplishment of the learners. According to Bakari and Musa (2013), when guardians are exquisite and encouraging, the child creates good sentiments about himself. As he enters school, the endorsement or dissatisfaction of his educators and friends become significant in the foundation of his self-idea. If the teacher censures and disparages his endeavours, the student fosters a feeling of inadequacy, which influences his accomplishment.

Age alludes to the time allotment which a being or thing has existed. Gledhill et al. (2002) contributed that in present day times, the arrangement of school in admitting students for a particular class is dependent on age. As a general rule, students who are brought into the world at about the same year are gathered in a similar class. Sequel to the aforementioned, the researchers therefore sought to determine whether the age variable could influence students' achievement in Biology in Calabar Education Zone of Cross River State.

Academic achievement is often defined in terms of examination performance (Cambridge University Report, 2003). It is also defined "as student's academic performance in school" (Chen, 2007). Higgins (2011) indicated an influence of joint and individual psychosocial variables on students' Biology achievements. Examination has shown that academic

achievement can be influenced by numerous factors like age, thinking pattern towards general science subject, inspiration to concentrate on science subject, parental contribution, family leads, family assets and schoolwork.

One of the psychosocial factors that impact students' academic performance is their scholastic demeanor or disposition towards biology. As indicated by Fishbein (1967), dispositions "are learned inclinations to react to an article or class of items in a good or troublesome manner". Disposition assumes a crucial part in affecting students' performance either positively or negatively. Durojaiye (1976) contended that teacher's uplifting perspectives and encouraging characters are fundamentally identified with students' achievements. Adediwura and Tayo (2007) indicated that there is a positive relationship between demeanor and academic achievement.

Another psychosocial factor that impact academic achievement is the students' academic self-idea, which is the conviction or confidence that an individual can undertake an academic activity successfully. According to Schunk (1991), academic self-idea alludes to people's feelings that they can effectively carry out any academic assignments at any assigned level. This self-idea refers to students' view of their capability to do their classwork (Midgley et al., 2000). Bandura's hypothesis of self-idea indicated that human conduct can be influenced by a singular degree of trust in their capacity to prevail in a particular task (Bandura, 1986). Students' academic achievement might be affected by shifting conviction of their self-idea which may in turn be influenced by their past experience or the outcome of their past efforts (Tenaw, 2013).

Research question

1. To what extent do differences exist in students' Biology achievement on the bases of their self-concept, test anxiety, age, attitudes towards Biology and motivation to study Biology?

Hypothesis

Ho1: Students' biology achievement does not significantly differ on the bases of their self-concept, test anxiety, age, attitudes towards biology, and motivation to study biology.

Methodology

This study adopted Ex post Facto design. According to Isangedighi (2012), an ex post facto design is one in which the researcher cannot manipulate the independent variables because their effects have already occurred. The population of this study was four thousand, five hundred and sixty (4,560) Senior Secondary School Biology students in Calabar Education Zone distributed across the seven (7) Local Government Areas in the

zone including Calabar South, Calabar Municipality, Akpabuyo, Bakassi, Akamkpa, Odukpani and Biase Local Government Areas. This comprises all senior secondary school students, offering Biology in Calabar Education Zone of Cross River State. The study sample were made up of 456 final year senior secondary school students, who were preparing for their Senior Secondary Certificate Examination (SSCE).

The instruments for data collection were Psychosocial Variable Scale (PVS) and Biology Achievement Test (BAT). The BAT was a 50 multiple choice item test used to measure achievement in Biology. The PVS had two sections, A and B. The section A was concerned with demographic information while section B had four parts. Part I was concerned with self-concept, part II measured test anxiety, part III measured attitude towards biology, while part IV was concerned with measuring motivation to study biology. All the parts I to IV had seven items each. The response options and scoring include SA (4), A (3), D (2) and SD (1).

The instrument was validated by giving it to three experts in Educational Measurement and Evaluation in the University of Calabar. The reliability of the instrument was established by administering the instrument to 50 randomly selected students who were not part of the study sample. The Cronbach Alpha statistics was used in analyzing the data and the reliability coefficients ranged from 0.86 to 0.92. The reliability for BAT was established as 0.82 using Kuder Richardson formular 20 (KR-20). The data generated from the study were analyzed using t-test, which was used in testing the hypothesis.

Presentation of results

Ho1: Students' biology achievement does not significantly differ on the bases of their self-concept, test anxiety, age, attitudes towards biology, and motivation to study biology.

The independent variables in the hypothesis were students' self-concept, test anxiety, age, attitudes towards biology, and motivation to study biology while the dependent variable was academic achievement in biology. Independent t-test Analysis was used in testing the hypothesis.

Table 2: Summary of independent t test analysis on achievement of Biology students based on their age, self-concept, test anxiety, attitude towards Biology and motivation to study Biology

Variables	Group/Level	N	Mean	Std. Deviation	Df	t	Sig. level
Age	12-14 years	253	30.16	5.25	454	.125	.901
	15-17 years	203	30.10	5.34			
Test Anxiety	Low	263	30.76	5.23	454	3.014*	.003
	High	193	29.27	5.17			
Self-concept	Low	256	29.97	5.19	454	.735	.463
	High	200	30.34	5.41			
Attitude towards Biology	Low	155	30.14	5.35	454	.038	.970
	High	301	30.12	5.26			
Motivation to study Biology	Low	305	30.53	5.29	454	2.333*	.020
	High	151	29.31	5.20			

*p < .05

The respondents were grouped into two independent groups for each of the sub-variables. For age, they were those that were 12 – 14 years and 15 – 21 years. For test anxiety and self-concept, total scores less than 18, and 18 and above were grouped as low and high self-concept respectively. The expected minimum and maximum total scores for both variables are seven and 28 respectively. For attitude towards biology, those that had total score less than 18 were considered to have low attitude while those that scored 18 and above were classified as having “high” attitude, while for motivation to study Biology, those that scored a total less than 18 were said to have low motivation and those that scored 18 and above were said to have high motivation. The results of data analyses are shown on Table 2.

The results on the table showed t-cal. for age as 0.125 with a p-value of .901 which is greater than .05 significant level at 454 degree of freedom. This means that students in the two age groups do not significantly differ in their achievement in Biology. Similarly, for

self-concept, the calculated t-value is 0.735 with p-value of .463, which is also greater than .05 significant level at 454 degree of freedom. This implies that students with low and high self-concept do not differ significantly in their achievement in Biology. Also, for attitude towards Biology, the calculated t-value is 0.038 with a p-value of .970. This is greater than .05 significant level at 454 degree of freedom. This means that students with low and high attitude towards Biology do not significantly differ in their achievement in Biology. However, for test anxiety, the t-cal. is 3.014 with a p-value of .003 which is less than .05 level of significance at 454 degree of freedom. This means that students with low and high test anxiety significantly differ in their achievement in Biology. Also for motivation to study Biology, the t-cal. is 2.333 with p-value of .020 which is less than .05 significant level at 454 degree of freedom. This means that students with low and high motivation to study Biology differ significantly in their achievement in Biology. These results therefore, mean that the null hypothesis is retained for students' age, self-concept and attitude towards Biology but rejected for students' test anxiety and motivation to study Biology.

Discussion of the findings

The result of testing the hypothesis indicated that for the five independent variables: students' age, test anxiety, self-concept, attitude towards biology, and motivation to study biology, students' achievement in Biology significantly differs based on the level of students' test anxiety ($t = 3.014$, $p \text{ value} = 0.003$, $p < .05$) and the level of motivation to study biology ($t = 2.333$, $p \text{ value} = 0.020$, $p < .05$). The finding of this aspect of the hypothesis is in agreement with Higgins (2011), who found a significant influence of combined and individual psychosocial variables on students' Biology performance. From the results, only two of the independent variables, namely test anxiety with $t = .003$, $p < .05$ and, motivation to study Biology having $t = .020$, $p < .05$, indicated that there is difference on the students' achievements, while the other three did not vary, including students' ages, self-concept and attitude toward Biology. Additionally, the finding of this study is in disagreement with Tenaw (2013) who reported a positive relationship between self-idea and students' achievement.

Conclusion

Based on findings of the study, it was concluded that students' biology achievement differs significantly on the bases of their test anxiety and motivation to study biology, but there was no difference on the bases of age, attitudes towards biology, and self-concept.

Recommendations

Based on the findings of the study, the researchers recommended that Guidance or school counsellors should motivate students to develop confidence in themselves and take their studies seriously in order to improve their achievement in Biology.

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