SCHOOL RELATED VARIABLES AS CORRELATES OF PERFORMANCE IN BIOLOGY AMONG SENIOR SECONDARY SCHOOL STUDENTS IN IBADAN NORTH LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

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Abstract

This study examines school related variables as correlates of performance in Biology among senior secondary school students in Ibadan North Local Government Area of Oyo state. A sample of 286 students was randomly selected among thirteen secondary schools in Ibadan North Local Government Area of Oyo state. Four reliable measuring scales on school related factors were used as well as Performance in Biology test with reliability coefficient of 0.79. Three research questions were raised and analysed with Pearson Product Moment Correlation and Multiple Regression Analysis. A significant combined contribution of the independent variables (class size, peer influence, time management, laboratory facilities and study habit) to the prediction of performance in Biology was found. This suggests that the five independent variables combined accounted for 21.3% (Adj.R^2= .213) variation in the prediction of performance in Biology. The study also shows that four out of five predictor variables (class size, time management, laboratory facilities and study habit) are potent predictors of performance in Biology. The most potent factor was study habit. This is followed by class size, laboratory facilities and time management. But peer influence is not a potent predictor of performance in Biology. This implies that an increase in study habit, time management and laboratory facility will increase the tendency for an improved performance in Biology of the students. But the larger the class size, the lesser the tendency for an improved performance in Biology by the students. Among others, it was recommended that school teachers and school counselors or social workers should help students to develop a good study habit and time management which can be done through the organisation of seminars. Educational bodies and ministry of education should endorse the reduction and enforcement of appropriate teacher–students' ratio so as to enhance effective learning and conducive learning environment for better performance in Biology as a subject by the students.

Key words: class size, time management, laboratory facilities, study habit, academic achievement

Introduction

Natural science subjects like Biology consists of ideas from microscopic organisms to the biosphere in general, encompassing the earth's surface and all living things (Okwo & Tartiyus, 2004). Considering its fundamental characteristics and importance, Biology is today a standard subject of learning at all levels of our educational systems, from pre-primary to tertiary. It is the only core science subject at Secondary School Certificate Examination (SSCE), whose study is very relevant to man's successful living (Akindele, 2009). Araoye (2009) opines that exposure to Biology education offers the learners a wide range of relevance in all aspects of life. Biology is a key subject on the curriculum of Nigerian Colleges of Education under the supervision of the National Commission for Colleges of Education (NCCE).The philosophy behind the subject is to produce knowledgeable, highly motivated, professional and effective teachers of Biology who will be able to develop in students, an appreciation and understanding of biological process and principles.

As a subject discipline, it is quite popular at all levels of Nigerian education. It has a large student enrolment than any other science subject, especially, at the upper basic level of the Nigerian education (Ofoegbu, 2003).This has been attributed to several factors including the students' perception of the subject as simple and non-availability of other science subjects in some schools such that Biology is made compulsory for both science and non-science students. In spite of the popularity of Biology among students, the failure rate has remained very high (Akubuilo, 2004).

Several researchers have pointed out different reasons for students' poor academic performance in Biology. Some of which are due to the abstractness of certain aspects of Biology, lack of understanding on the students' part, certain biological concepts and terminologies, and the like (Okeke & Ochuba, cited in Nzelum, 2010). Some students begin to doubt their intellectual abilities and come to believe that their efforts to achieve are futile. These feelings in turn, lead them to a low persistence level; they give up quickly even as in learning as soon as something appears to be difficult. Hence, there is a great need for students to be motivated to develop positive attitude which is crucial to performance in any subject. Akpan cited in Adedeji (2007), says that poor attitude of students and even of teachers to Biology is a destabilizing factor to increased performance in Biology. However, considering school related factors (class size, laboratory facility) and the students (study habit, peer influence, and time management) in question, learning could be improved, all things been equal.

A habit is something that is done on a scheduled, regular, planned basis and that is not relegated to a second place or optional place in one's life. It is simply done with no reservations, no excuses, and no expectations. A study habit is; dedicating scheduled and un-interrupted time to apply one's self to the task of

learning. Study habits tell a person how much he will learn and how far he wants to go, and how much he wants to earn. These could be decided with the help of one's study habits throughout life. The importance of study habits in students' life is that it plays a major role in their academic achievement, because without learning, no one can succeed. In studying as a habit, students should use different techniques to ensure good outcomes. Every student has different study habits. While some students are in the habit of studying in a noisy environment, others prefer a calm and silent environment. Many students fail not because they lack ability to study but because they do not have adequate study habits (Tanveer & Qasmi, 2012). Study habit is the tendency of a student to learn in a systematic and efficient way when opportunity is given. It is also defined as the devotion of time and attention to acquire information or knowledge especially from books. In other words it is the pursuit of academic knowledge by a detailed investigation of a subject regularly.

Educational psychologists and researchers have argued that there are many determinants of academic performance (Chamorro-Premuzic & Furnham, 2003). Danskin and Burnett cited in Okwo & Tartiyus (2004) discover that students getting higher marks had more effective study habits compared to students who had ineffective study habits and thus lagged behind in their studies. Similarly, Crow and Crow cited in Okwo & Tartiyus (2004) discover that academically poor achievers have less effective study habits compared with academically high achievers. In the same context, Rana & Kausar (2011) find that pupils who got more scholarships had better study habits than the pupils who did not win scholarships. For academic achievement, being smart is more important than being intelligent and hardworking and involves being practical, having common sense and using better organisation and application of good study habits, Rana & Kausar, 2011).

Academic achievement can also be influenced by over-crowded class room. Class size is one of the determinants of how lesson can be managed, because it will give the teacher opportunity to relate with the students knowing their names, faces as well as their abilities Numerous studies have investigated the influence of class size on students' attitudes, behaviours, and outcomes. The overwhelming majority of these studies have focused on elementary school and even pre-school effects of class size on students' achievement. The conventional wisdom among parents, teachers, school administrators, and policy makers is that smaller class sizes translate to improvements in student learning and outcomes. This conventional wisdom, however, has not been universally supported by empirical evidence. The difficulties in assessing the causal influence of class size on students' outcomes such as achievement is often not directly observed but rather proxied by pupil-teacher ratios at the state, district, or school levels. Many data sets used to analyze this question are cross-sectional

and do not allow one to control fixed student, teacher, class, or school effects. Also, class size itself may be endogenous in a student's outcome equation.

Nonetheless, the general consensus among researchers examining this issue is that if class size matters at all, its influence is most pronounced at the lowest grade levels. Numerous studies have confirmed that students in the smaller classes performed significantly better on standardized tests in Arithmetic and reading in kindergarten through the third grade than those from larger classes (Nye & Hedges, 2001). Additional researches (Nye & Hedges, 2001; Finn, 1998) find out that class size effects persist at least until the seventh or eighth grade. Krueger (1999) utilizes multiple regression analysis and the composite mathematics and reading score from the Standford Achievement Test. Controlling for numerous family background and school characteristics, he finds that students in smaller classes performed approximately .2 to .3 standard deviations better on this standardized test than students in the larger classes over the first four years of schooling.

Laboratory has been conceptualized as a room or a building specially built for teaching by demonstration of theoretical phenomenon into practical terms. Farombi (1998) argues the saying that "seeing is believing" as the effect of using laboratories in teaching and learning of science and other science related disciplines as students tend to understand and recall what they see than what they hear or were told. Laboratory is essential in the teaching of sciences and the success of any science course is much dependent on the laboratory provision made for it. Affirming this, Ogunniyi cited in Rana & Kausar (2011) says there is a general consensus among science educators that the laboratory occupies a central position in science instruction. It could be described as a place where theoretical work is practicalized whereas practicals in any learning experience involves students in activities such as observing, counting, measuring, experimenting, recording, observation and carrying out field work. These activities are totally different from the theoretical work which involves listening to talks and taking down notes from such talks. Other scholars (Wilcockson, 1994; Lawal, 1995; Ajayi, 1996; Owoeye & Yara, 2011) have variously identified the significance of facilities in teaching and learning spheres. Farombi (1998) discovers that the classroom learning environment in some schools was poor. He cited examples of schools without chalkboards, ceiling, roofing sheets, windows and doors removed among others. This is a situation which the researcher regarded as hazardous to healthy living of the learners.

Gamoran cited in Rana & Kausar (2011), though holding a contrary view, notes that availability of facilities, teachers' salaries, books in the library and the presence of science laboratory had little impact on variation in students' achievement once students' background variables had been taken into account. This statement connotes that before such

student could perform well in higher educational level, he must have been groomed or cushioned by the availability of resources in his elementary days upon which he now uses as spring board. According to Hallak cited in Owoeye & Yara (2011), facilities form one of the potent factors that contribute to academic achievement in the school system. He includes the school buildings, and other instructional materials as major factors aiding students' achievement. He went further to say that their availability, relevance and adequacy contribute to academic achievement. He however, quickly added that unattractive school buildings and overcrowded classrooms among others contribute to poor academic attainment. Describing where these facilities should be located, he suggests that educational facilities should be located in appropriate places, while the needs of the users should be put into consideration.

In another development, Aliyu (2000) finds that there is no significant difference between students in secondary schools with and without adequate instructional facilities. However, he submitted that instructional facilities are indispensible to academic achievement of students in English Language, Mathematics, Biology and Geography while students could perform well in other subjects without adequacy of sophisticated instructional materials. He concluded that the effect of instructional facilities on students' academic achievement is more felt in pure and social sciences (Owoeye & Yara, 2011).

Time management practice could also influence students' performance in Biology. The effective use of time while at the examination hall and at the laboratory is essential to students' success. Britton and Tesser (1991) tested their hypothesis that college grade point averages could be predicted by time management practices. They had ninety entry students and sophomore college students at the High school in Georgia answer a 35 question time management survey and submit their SAT scores. They found that two time management components directly affect the cumulative academic score; planning including utilizing short and long term goals and time attitudes, or, the perception of how their time needs to be spent. Students that practiced both planning and positive time attitudes found that they had much more time to complete their tasks because they felt more in control of how their time was spent, therefore, knowing when they had to say "no" to activities. It was also found that the students who reported using goal-oriented time management had a higher overall academic score.

This seems to indicate that time management practices do have an influence on college academic achievement, but that is not all they affect. A study by Nonis, Hudson, Logan, Ford (1998), examine the effects of utilization of time management skills on several aspects of students' lives, and investigates the theory that 'perceived time management' among college students as a stress coping strategy. The results show, much as Britton's and Tesser's earlier

study had that students who perceived themselves as having a high level of control over their time experienced benefits, in this case a lower level of stress and a higher level of academic performance, problem-solving ability, and sound health than those who believe themselves to be less in control over their time. However, students who do not feel they have control over their time have many other options to ensure a high academic score. Considering other research works, less concentration has been invested on the impact school related factors have on students' achievement in Biology which is the gap this study intends to fill.

Objectives of the study

This study intends to examine school related factors as correlate of students' achievement in Biology. Specifically, it intends to.

1. examine the level of relationship that exists between class size, peer influence, time management, laboratory facilities, study habits and students' academic achievement;
2. determine the combined effect of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of the dependent variable (academic achievement);
3. determine the relative effects of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of the dependent variable (academic achievement).

Research Questions

1. What is the level of relationship that exist between class size, peer influence, time management, laboratory facilities, study habits and students academic achievement?
2. What is the combined effect of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of the dependent variable (academic achievement)?
3. What is the relative effect of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of the dependent variable (academic achievement)?

METHODOLOGY

This section will address the methods used for the study. Areas covered include research design, study population sample, instrumentations, administration and data analysis.

Research Design

The descriptive survey research design of the *ex-post facto* type was adopted for this study. *Ex-post facto* research is a systematic, empirical research technique in which the researcher does not have direct control over independent variables because their manifestations have already occurred, or because they are inherently not manipulated. Inferences about relations among variables are made without direct interaction with independent and dependent variables. Thus, the main focus of the study is to examine school related factors as correlate of students' achievement in Biology.

Study Population

The population of this study comprises of all the senior secondary school students (SS2) in Ibadan North local government area of Oyo State. Ibadan North local government area of Oyo State is the largest among the thirty three (33) local governments in the state. It has about 26 schools within its geographical coverage.

Sample and Sampling Technique

The sample of two hundred and eighty six (286) participants was used for this study using simple random sampling. Thirteen (13) schools were randomly selected from Ibadan North local government area, which is about 50% of the total population of schools in the local government area. Twenty two (22) Senior Secondary Students (SS2) were also randomly selected from each of the thirteen schools, which made a sample of two hundred and eighty six (286) students for this study.

Instrumentation

A structured questionnaire titled "School Related Factors Questionnaire" was used for this study. The Inventory consists of four scales; peer influence scale, time use efficiency scale, study habits inventory and laboratory facilities rating scale. The first section consists of general information such as the name of the school, sex, and class size among others.

Peer Influence Scale

Peer Influence Scale (PIS) is a 12 items self reported instrument developed by Armsden and Greenberg (1987). It measures the degree of the peer's impact on learners. The scale adopts 5-likert response format ranging from 1 = not at all to 3 = completely true. Higher scores indicate higher levels of peer influence. A typical example of this is "My friends are concerned about my well being", my friends listen to whatever I have to say". It has a cronbach's alpha coefficient of 0.78

Study Habit Inventory

Study habit inventory is a 20 item self reported scale developed by CGM Bakare (1970). It measures students' reading culture. The scale adopted 5-likert response format ranging from 1 = strongly disagree to 5 = strongly agree. Higher scores indicate good study habit. A typical example of this is "I like making jottings while the lesson is on", I often go through my note after every class". It has a cronbach's alpha coefficient of 0.72

Time Use Efficiency Scale

Time use efficiency scale (TUES) is a 10 item self reported scale developed by Kelly (2004). TUES is based on how well the participants claim to use their time. The scale adopted 5-likert response format ranging from 1= none of the time to 5= always. Higher scores indicate high level of time efficiency. A typical example of this is "I often finish task within the time frame", I do not summit my assignment late". It has Cronbach's alpha coefficient of 0.70.

Laboratory Facility Rating Scale

Laboratory facility rating scale (LFRS) is a 10 item self reported scale

developed by the researcher. It measures availability and sufficiency of laboratory equipments. The scale adopted Yes or No and 5-likert response format ranging from 1=none of the time to 5= always. Higher scores indicate facilities are available and sufficient. A typical example of this is "Do you have test tubes in your Biology laboratory?" Do you have bouncing burner in your school laboratory?" The reliability was determined after pilot study.

Performance in Biology Test

Performance in Biology test is a 40 items test that covers topical area in SS2 curriculum in Biology. The construction of this test was made with conscious consideration of Blooms taxonomy of educational domains. The test was constructed on the cognitive domain and all items were drawn from the various aspects of the domain so as to draw reasonable inference on the students' achievement in Biology through the use of table of specification. Initially, a pool of 52 items was generated and tried on students outside the sample for this study. The data collected was subjected to kuder Richardson-20 reliability and only 40 items which were found suitable was retained for the main study. Kuder Richardson-20 reliability generated 0.78.

Procedure of Administration

The questionnaire was administrated to the respondents at their various schools. This was achievable through the help of the school management whose permissions were first sought. The respondents were adequately briefed on the importance of the study; they were also assured of the confidentiality of their responses. The administration lasted two weeks; during which questionnaires were administered and subjected to analysis.

Method of Data Analysis

The data collected through the questionnaires were analysed to determine the result of raised research questions. The data were analysed using Pearson's product moment correlation and multiple linear regression.

Result and Interpretation

Research Question 1: What is the level of relationship that exists between class size, peer influence, time management, laboratory facilities, study habit and students' performance in Biology?

Table 1: Correlation matrix showing the level of relationship between study variables

Variables	Mean	Std. Dev	1	2	3	4	5	6
Performance in Biology	58.549	10.405	1.00					
Time Management	23.762	4.664	.156**	1.000				
Class Size	30.532	3.137	-.114	.245**	1.000			
Study Habit	48.004	18.314	.402**	.116	-.037	1.000		
Laboratory	47.322	15.407	.106	.084	-.009	.128*	1.000	
Peer Influence	56.255	9.733	-.115	-.254**	-.423**	-.073	.181**	1.00

*Correlation is significant at 0.05(2-tailed)

**Correlation is significant at 0.01(2-tailed)

Table1 shows the relationship of each independent variables (class size, peer influence, time management, laboratory facilities, study habits) with the dependent variable (Performance in Biology); Performance in Biology positively correlates with study habits (r =.402, p<0.001) and time management (r= .156, p<0.001). Except class size (r= -.114, p>0.05), laboratory facility (r=.106, p>0.05) and peer influence (r= -.115, p>0.05). This implies that time management has little influence on the improvement of students' performance in Biology score, while study habit has moderate influence on the improvement of students' performance in Biology score.

Research Question 2: What is the combined effect of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of the dependent variable (Performance in Biology)?

Table 2: Summary of regression showing the joint contributions of independent variables to the prediction of Performance in Biology

R =.476 R Square =.227 Adjusted R square =.213 Std. Error =9.23045					
Model	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Regression	6998.462	5	1399.692	16.428	.000[a]
Residual	23856.353	280	85.201		
Total	30854.815	285			

Table 2 reveals a significant combined contribution of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of Performance in Biology. The result yielded a coefficient of multiple regressions R= 0.476, multiple R^2 = 0.227 and Adjusted R^2 =.213. This suggests that the five independent variables combined accounted for 21.3% (Adj.R^2= .213) variation in the prediction of Performance in Biology. The other variables accounting for the remaining 78.7% are beyond the scope of this study. The ANOVA result from the regression analysis shows that there was a significant joint effect of the independent variables on Performance in Biology, $F_{(5,280)}$ = 16.428, P<0.001.This implies that all the five variables (class size, laboratory facilities, time management, peer influence and study habit) have joint effect on the improvement of students' performance in Biology.

Research Question 3: What is the relative effect of the independent variables (class size, peer influence, time management, laboratory facilities and study habit) to the prediction of the dependent variable (Performance in Biology)?

Table 3: Summary of regression for the relative contribution of the independent variables to the prediction of Performance in Biology

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
(Constant)	69.094	8.642		7.995	.000
Time Management	.316	.124	.142	2.541	.012
Class Size	-.588	.196	-.177	-3.000	.003
Laboratory	.102	.037	.152	2.782	.006
Peer Influence	-.105	.065	-.098	-1.624	.106
Study Habit	.222	.031	.391	7.283	.000

Table 3 shows that four out of five predictor variables (class size, time management, laboratory facilities and study habits) are potent predictors of Performance in Biology. The most potent factor was study habit (Beta = .391, t = 7.283, P<0.001). This is followed by class size (Beta = -.177, t = -3.00, P<0.005). But peer influence (Beta = -.098, t = -1.624, P>0.05), laboratory facilities (Beta =.152, t = 2.782, P>0.05) and time management (Beta = .142, t = 2.541, P>0.05) are not a potent predictor of Performance in Biology. This implies that an increase in study habit and class size usage will increase the tendency for an improved performance in the subject Biology by the students. But the larger the class size, the lesser the tendency for an improved performance in Biology by the students.

Discussion of Findings

The first research question examines the relationship that exists between class size, peer influence, time management, laboratory facilities, study habits and students' Performance in Biology. The result shows that Performance in Biology positively correlates with study habits and time management, except class size, laboratory facility and peer influence. This implies that time management has little influence on the improvement of students' Performance in Biology score, while study habit has moderate influence on the improvement of students' Performance in Biology score. This result corroborates earlier study of Osa-Edoh and Alutu (2012) who examine the usefulness of imbibing study habits in the students, as a means of enhancing their academic performance. It reveals a high correlation between study habits and students' academic performance. This suggests that it is only when students imbibe or cultivate proper study habits that their academic performance can be improved. Similarly, Nuthana and Yenagi (2009) discover

significant correlation between study habits and academic achievement. It further reveals that reading and note-taking habits, habits of concentration, and preparation for examination had significant correlation with academic achievement.

The second research question examines the combined effect of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of the dependent variable (Performance in Biology). The result shows a combined contribution of the independent variables (class size, peer influence, time management, laboratory facilities and study habits) to the prediction of Performance in Biology. This result corroborates Lavy and Schlosser (2007) who use very similar strategies to Hoxby's to examine classroom level peer impacts, and find that a high proportion of female classmates improve both boys' and girls' academic performance. They find joint effect of study habits and laboratory facilities on students' academic achievement. Also, Ojoawo (1989) in one of his major findings reveals that the class sizes were found to be negatively related to school academic performance. Bolton (1988) discovers that "there was no significant difference in post-test achievement scores between large classes and small class control groups in developmental English". According to Bolton's (1988) experience, "larger is sometimes better". Similarly this study supports Nonis, Hudson, Logan, and Ford, (1998) which shows that students who perceive themselves as having a high level of control over their time experience benefits. In this case, a lower level of stress and a higher level of academic performance, problem-solving ability, and health than those who believe themselves to be less in control over their time.

The third research question examines the relative effect of the independent variables (class size and study habit) to the prediction of the dependent variable (Performance in Biology). The result shows that two out of five predictor variables (class size and study habit) are potent predictors of Performance in Biology. The most potent factor was study habit, followed by class size. However, peer influence is not a potent predictor of Performance in Biology. This implies that an increase in study habit, time management and laboratory facility usage will increase the tendency for an improved performance in Biology by the students. But the larger the class size the lesser the tendency for an improved Performance in Biology by the students. This result corroborates Brint, & Cantwell, A. (2006). They find that making notes of previous studies, having already found that extra study time increases students' academic performance, but their research addressed other potentially beneficial ways of spending free time. The finding of this study also supports previous studies that subsequently identified limitations to Hanushek's analysis of the effect of class size on academic achievement and have provided research to support the idea that decreasing the number of students within the instructional setting does positively

affect learning (Biddle & Berliner, 2002; Gilman & Antes, 1985).

Conclusion

After the examination of the impact school related factors have on students' achievement in Biology, this study discovers that study habit, time management and class size are potent predictors of students' performance in Biology except for peer influence. The result also identifies study habit as the strongest predictor of performance. This study indicates that students with good study culture, effective time management skill, who is taught in a less numbered-class will perform better in Biology, peer influence notwithstanding.

Recommendations

Based on the findings of this study, the following is recommended.

1. This study finds study habit to be the strongest predictor of academic achievement in Biology. Therefore, it is essential that school teachers and school counselors or social workers encourage students to develop a good study habit which can be done through the organisation of a seminar.
2. It is discovered that time management is a good predictor of student performance in Biology. This suggests that parents and teachers should help the students in developing a good time management skill by learning to attach time to every activity of the day.
3. Class size also correlated with students' academic Performance in Biology. This justifies that educational bodies and ministry of education should endorse the reduction and enforcement of appropriate teacher – students' ratio so as to enhance effective learning and conducive learning environment.
4. Laboratory facilities are discovered to be predictor of students' Performance in Biology. This suggests that Federal Government should help in equipping schools with relevant and modern laboratory facilities to enhance students learning and to improve science in Nigeria as a whole.

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