Classroom Learning Environment and Performance of Secondary School Students in Biology

James Ayodele Oluwatayo Ph.D.
Department of Tests, Measurement & Evaluation,
Faculty of Education,
Ekiti State University, Ado-Ekiti, Nigeria
E-mail: ayotayor@yahoo.com

Olufolake Basirat Oyeboade M.Ed.
Olufolake Basirat Oyeboade M.Ed
Faculty of Education
University of the Witwatersrand
South Africa.
E-mail: folakeoyeboade79@yahoo.com

ABSTRACT

The study investigated classroom learning environment (CLE) and performance of secondary school students in Biology. Participants were 30 Biology teachers and 300 SSII Biology students selected from 30 public senior secondary schools in Ibadan North Local Government Area of Oyo State based on multistage sampling technique. Two types of research instruments were used for data collection. The first was a 25-item CLE assessment questionnaire in which the teachers were asked to rate on a four-point scale: Highly Favourable (HF)=4, Favourable (F)=3, Unfavourable (UF)=2 and Highly Unfavourable (HUF)=1 with a reliability coefficient=0.703 using Cronbach-α. The second instrument was a 50-item Multiple Choice Biology test (BT) drawn from the syllabus of SSII Biology with difficulty indices ranging from 0.43 to 0.87 and reliability coefficient=0.79 using KR-21 formula. Data were collected in May 2013 using trained research assistants and analysed using frequency counts, percentages, means, standard deviations and Pearson Product Moment Correlation (r) tested at 0.05 level of significance. Results showed that classroom learning environment in Biology was adjudged favourable by the teachers. Moreover, the performance of students in Biology was fairly favourable with 44% of the testees scored 25 and above 50% plus, while 35% scored between 20 and 44 (40% and 49%). Further, the relationship between CLE and performance in Biology was significant (r=0.411) indicating that the better the CLE, the better the performance of students in Biology. Based on the findings, it was recommended that teachers should justify their rating of CLE by creating higher conducive environment for better performance of students in Biology.

KEYWORDS: *classroom learning environment, performance, secondary school students, Biology*

INTRODUCTION

Science and technology have been widely acknowledged as the weapons towards finding solution to human problems. As noted by Kellerman (2004), the

solution to any nation's problems lies in the development of science and technology which have the potential of boosting the nation's economic and financial base. Relatedly, Adesoji (2002) reports that science and its associated disciplines, including Biology and technology play significant role in solving some of the problems confronting man thus improving the quality of life.

Biology is an integral part of science. It is a subject that deals with the living system. Umar (2011) describes Biology as a natural how it functions and what these functions are, how it develops, how living things come into existence and how they react to one another and with their environment. Much earlier, Hiebert (2006) notes that the study of Biology enables individuals to relate himself or herself with the environment. Moreover, the interrelatedness between Biology, Chemistry and Physics has made the development of several techniques that led to advancement in medicine, pharmacy, petrochemical, agriculture and engineering possible. Further, through the understanding of phenomena such as genetics, photosynthesis, atomic structure, optics and electricity, one could infer that science, particularly Biology has gone a long way to improve the social and economic prospect of mankind.

Unarguably, for the teaching of Biology to be meaningful and attractive to the students, both the theoretical and practical aspects of the curriculum must be comprehensively emphasised in the classroom so that students can easily apply the knowledge gained to solve their personal and societal problems. Indeed, the National Policy on Education (2004) states the importance of studying Biology, noting that it has potential of bringing about some educational challenges including high expectation of better health for all, abundance food for all, better knowledge of man, animals, plants and less polluted environment with sulphur (IV) oxide and radioactive substances.

Sadly, the performance of students in Biology in the Senior Secondary Certificate Examination (SSCE) conducted by the West African Examinations Council (WAEC) in recent years has not been impressive (Adesuli, 2013). For example, in the SSCE conducted by WAEC in May/June 2010, 2011 and 2012, less than 50% of the candidates that enrolled for Biology had credits and above while over 50% failed (Uwadiea, 2010,2011,2012). The abysmal performance of students in Biology is worrisome, indicating that the nation's quest for developmental growth in medicine and related disciplines could hardly be achieved due to deficiency of the students in Biology. This development raises a pertinent question, 'Why do students fail Biology?'

Meanwhile, studies by Fraser (1981), Wilson (1996), Onwuakpa and Akpan (2000), Seweje (2000), Mucherah (2008) and Tsavga (2011) concur that poor classroom learning environment is one of the factors militating against desirable performance in science subjects, particularly Biology at the secondary school level. Wilson (1996) describes classroom environment as a space or place where a dynamic participation and interaction between teachers and students, including usage of tools and information resources hold in order to pursue and facilitate different learning activities. Similarly, Mucherah (2008) describes classroom environment as a place where learners and teachers interact with each other using variety of tools and information resources in their pursuit of learning activities.

Classroom learning environment plays a vital role in determining how students' perform or respond to circumstances and situation around them. Onwuakpa and Akpan (2000) classify classroom learning environment into three structures namely, physical environment, psychological environment and sociological condition of the classrooms. The physical environment of the classroom, according to Onwuakpa and Akpan (2000) include age of the classroom (whether modern or old), colour of the classroom (whether attractive or distractive), level of space (whether spacious enough to accommodate the students), level of available furniture (seats and desks), good ventilation, good lighting, roof/ceiling and smooth floors, electricity, portable drinking water. In addition, physical environment includes availability of relevant textbooks, availability of standard preparatory room, accessibility of microscopes, overhead projector, availability of relevant charts and specimen for demonstration and others. It is obvious that to bring about the best in the students, academically, the classroom learning environment of the students must be conducive enough for learning activities. The question remains, 'Are the afore-mentioned physical facilities available in schools to enhance favourable performance in Biology?'

The psychological environment, according to Onwuakpa and Akpan (2000) includes the level of speed of teaching, cohesiveness, distractions, interest, motivation, anxieties, confusion and difficulty of classroom learning activities. Beyond speculation, a desirable performance of students in Biology requires a professionally trained, experienced, matured and dedicated teacher to create a positive learning environment for his or her students to strive. Moreover, the classroom structure and population, laboratory facilities, human resources and instructional materials must be accorded proper attention in order to help the students overcome psychological challenges, failure of which may lead to frustration and depression thus causing undesirable performance in Biology.

The sociological environment includes the level of classroom interaction between the teacher and the students, plus the teaching aids (Onwuakpa & Akpan, 2000; Owolabi, 2004; Jegede & Seweje, 2005). It shows how friendly the teacher and the students are in the classroom. Indeed, the teacher's relationship with his or her students is a pivotal aspect of any learning environment (Tsavga, 2011) which can lead the students to love or hate Biology. In fact, a genius who finds himself or herself in a class managed by a warm, tolerant and accommodating teacher may perform brilliantly. In essence, the learning environment created by the teacher must provide opportunities for all the students in the class (Spady, 1994) in a way that encourage them as well as their peers without perceiving that they are being treated differently.

The foregoing suggests that learning environment variables can influence desirable performance in Biology or mar it. However, for optimum performance by students, learning environment should provide for a supportive non-threatening environment to enable students achieve in their learning. Moreover, creating a positive learning environment will optimise students' learning, help the teacher in the discharge of his or her classroom activities and build a cohesive classroom community and a pleasant work environment for both teacher and students. The question may be asked, to what extent will classroom learning environment influence students'

performance in Biology with particular reference to Biology students in Ibadan North Local Government Area of Oyo State, Nigeria.

Purpose of the Study

The purpose of the study was to find out how Biology teachers would rate classroom learning environment of their students in Biology. The study also investigated the performance of students in Biology as well as determining whether classroom learning environment of students in Biology and their performance in Biology test are related.

Research Questions

The following research questions were raised to guide the study:
1.   How do the teachers rate classroom learning environment of their students in Biology?
2.   How do the students perform in Biology test designed for the study?
3.   Is classroom learning environment of students in Biology related to their performance in Biology?

Research Hypothesis

Only one hypothesis was tested at 0.05 level of significance.
HO: Classroom learning environment of students in Biology and their performance in Biology test are not significantly related.

METHODOLOGY
Research Design

The research design used in this study was a survey type. Survey was used in order to describe the classroom learning environment of students in Biology as it affects their performance in Biology test. The design involved an observation and analysis of the variables as found in their natural phenomena.

Sample and Sampling Techniques

The sample for the study consisted of 30 Biology teachers and 300 SSII Biology students selected from 30 senior secondary schools in Ibadan North Local Government Area of Oyo State, Nigeria using multistage sampling technique. The first stage involved random sampling of one out of 11 local government areas of Ibadan. The second stage involved random selection of 30 out of 86 senior secondary schools in the local government area. The third stage involved purposive selection of teachers who taught the students in Biology in SSI during 2011/2012 who presumably could assess the classroom learning environment of the students objectively. The fourth stage involved random selection of 10 SSII Biology students from each of the 30 schools selected for the study.

Research Instrument

Two research instruments were used for data collection. The first was a 25-item Classroom Learning Environment (CLE) assessment questionnaire each item rated on a four-point scale namely: Highly Favourable (HF)=4, Favourable (F)=3, Unfavourable (UF)=2 and Highly Unfavourable (HUF)=1 with a reliability coefficient=0.703 using Cronbach-α. The second instrument was a 50-item Multiple Choice Biology test drawn from the syllabus of SSII with difficulty indices ranging from 0.43 to 0.87 using 33½ upper and lower with reliability coefficient=0.79 using Richard-Kinderson (KR) 21 formula.

Data Collection and Analysis

Data were collected in May 2013 using trained research assistants. Data collected were analysed using frequency counts, percentages, means, standard deviation and Pearson Product Moment Correlation (r), tested at 0.05 level of significance. The assumption in CLE questionnaire was that the ranges of means were defined as follows: 1.00—1.49 (Highly unfavourable), 1.50—2.49 (Unfavourable), 2.50—3.49 (Favourable) and 3.50—4.00 (Highly favourable).

RESULTS AND DISCUSSION

Results

Question 1: How do the teachers rate classroom learners environment of their students in Biology?

Data were analysed using means and standard deviations as presented in table 1.

Table 1: Means and SD on CLE

S/N	Statement: CLE	Mean (SD)	Interpretation
1.	Provision of special laboratory for Biology	3.41 (0.43)	Favourable
2.	Location of Biology laboratory	3.42 (0.53)	Favourable
3.	Enrolment of students in Biology class	2.67 (1.02)	Favourable
4.	Space to accommodate students in Biology class	2.34 (0.73)	Unfavourable
5.	Ventilation across the classroom	3.11 (0.52)	Favourable
6.	Provision of electricity in Biology class	2.57 (0.52)	Favourable
7.	Provision of tap water in Biology laboratory	2.48 (0.61)	Unfavourable
8.	Availability of adequate furniture (tables and stools) in the classroom	2.53 (0.42)	Favourable
9.	Arrangement of seats for free movement in the class	3.31 (0.54)	Favourable
10.	Provision of equipment, specimen and reagents for practical work	2.74 (0.66)	Favourable
11.	Provision of microscope and overhead projectors	2.73 (0.58)	Favourable
12.	Availability of charts and relevant Biology textbooks	3.13 (0.45)	Favourable
13.	Availability of computer set and internet facilities to aid instruction	2.14 (0.57)	Unfavourable
14.	Availability of standard preparatory room for practicals	2.67 (0.72)	Favourable
15.	Availability of supporting staff to assist teachers	3.47 (0.41)	Favourable

	and students		
16.	Student-teacher relationship	3.38 (0.51)	Favourable
17.	Disposition to students' needs during lessons	3.25 (0.63)	Favourable
18.	Opportunity for students to work independently in the class	3.03 (.0.47)	Favourable
19.	Opportunity for students to work collaboratively in the class	3.12 (0.43)	Favourable
20.	Ensuring that students perform experiments under clear rules and regulations (orderliness, return of used equipment, etc)	2.94 (0.66)	Favourable
21.	Keeping records of attendance and time book in class	3.43 (0.48)	Favourable
22.	Adherence to time scheduled for active teaching and learning	3.15 (0.38)	Favourable
23.	Students' response to practical work in the laboratory	2.84 (0.71)	Favourable
24.	Monitoring of students' activities in the class (note writing and note submission for correction)	3.01 (0.56)	Favourable
25.	Level of speed for teaching Biology	2.83 (0.47)	Favourable

3.41(0.43), 3.42(0.53), 2.67(1.02), 2.34(0.73), 3.11(0.52), 2.57(0.52), 2.48(0.61), 2.53(0.42), 3.31(0.54), 2.74(0.66), 2.73(0.58), 3.13(0.45), 2.14(0.57), 2.67(0.72), 3.47(0.41), 3.38(0.51), 3.25(0.63), 3.03(0.47), 3.12(0.43), 2.94(0.66), 3.43(0.80), 3.15(0.38), 2.84(0.71), 3.01(0.56), and 2.83(0.47)

Deductively, the classroom bearing environment of students in Biology was favourable except in the provision of tap water and computer set to aid instruction.

Question 2: How do the students perform in Biology test?

Data were analysed using range of scores categorised as Excellent (35—50), Very Good (30—34), Good (25—29), Fair (20—24) and Poor (below 20). The frequency counts and percentages are as presented in table 2.

Table 2: Range of scores, frequency counts, percentages and interpretation of students' performance in Biology Test

Range of Scores	N	%	Interpretation
35—50	17	5.67	Excellent
30—34	42	14.00	Very Good
25—29	67	22.3	Good
20—24	108	36.0	Fair
Below 20	66	22.0	Poor
Total	*300*	*100.0*	

Minimum score = 0   Maximum score = 50

Table 2 shows that 17 students representing 5.67% scored between 35 and 50 inclusive, 42 students representing 14.0% scored between 30 and 34 inclusive, 67 students representing 22.3% scored between 25 and 29 inclusive, 108 students representing 36.0% scored between 20 and 24 inclusive while 66 students representing 22.0% scored below 20. These results showed that 41.97% of the students scored 50% and above in the test. However, if those with fair category were added, the percentage rose to 77.97% while 22.0% failed.

Testing of Hypothesis
H0: Classroom learning environment and students' performance in Biology are not significantly related

Data were analysed by computing the mean score of students in Biology for each school and correlated with teachers' assessment of classroom learning environment using Pearson Product Moment Correlation coefficient as presented in table 3.

Table 3: Correlation between CLE and students' performance in Biology

Variables	N	r	r_{table}
Teachers' assessment of CLE	30		
		0.411	0.296
Students' performance in Biology	30		

P<0.05 (significant result)

Table 3 shows that the r-calculated between CLE and students' performance in Biology test was 0.411 while its corresponding table value at 0.05 level of significance was 0.296. Since $r_{cal}>r_{table}$, it implies that there existed significant relationship between CLE and students' performance in Biology test.

Discussion

The study investigated classroom learning environment of students in Biology as related to students' performance in Biology test. Preliminarily, the results in table 1 showed that classroom learning environment of students in Biology was favourable except in the provision of tap water and computer set to aid instruction. The fact that the teachers rated the classroom learning environment of their students in Biology as being favourable is not surprising because the instrument used could be regarded as self-assessment device and the likelihood of ascribing low rating to the classroom environment where they operate as teachers in remote. Though self-assessment device is a matter of conscience, its real value is the opportunities for teachers to demonstrate their perception of the classroom learning environment of their students and have reflective approach for self-development. Beck, Livne and Bear (2005) note that self-assessment helps teachers to learn and grow as well as helping them to reflect on their learning goals for students to experience high quality learning in a supportive environment. Nevertheless, since the teachers rated the classroom learning environment as being favourable, it implies that they concur with the physical,

psychological and sociological environment of the classroom as emphasised by Onwuakpa and Akpan (2000).

The results in table 2 showed that the performance of students in Biology test was fairly favourable as more than 70% of the participants scored 40% and above. Though 44% of them scored 50% and above, perhaps the testees could have done better if the test happened to be a competitive one. Deductively, one could assume that the students utilised the physical and human resources in the classroom environment to gain experience resulting into performance exhibited in the test. This tallies with Ebong (2009) that conducive classroom environment stimulates students' learning which often results in high academic achievement.

The results in table 3 showed the magnitude and direction of relationship between classroom learning environment and performance in Biology test. The r-calculated, 0.411 was moderately high (significant) and positive which provided opportunity to make a decision. That is, the better the classroom learning environment, the better the performance of students in Biology (Howell, 2002).

Conclusion

It could be concluded in this study that classroom learning environment of students in Biology had significant relationship with their performance in Biology, though inadequate provision of tap water and computer facilities in schools could pose a serious threat to academic quality and performance of the students.

Recommendations

The following recommendations were made from the findings:
1.   Teachers should justify the rating ascribed to classroom learning environment of their students in Biology by creating more conducive environment to enhance better performance of students in Biology to both internal and external examinations.
2.   Students should take advantage of favourable classroom learning environment in Biology to strive harder for better performance at both the internal and external examinations.
3.   School authorities should not relent in their efforts to provide basic amenities such as tap water in the laboratories and computer set to aid instruction for favourable performance of students in Biology, both internal and external examinations.

REFERENCES

Adesoji, F. A. (2002). Rethinking the science curriculum, designing content of the curriculum: A guide to practice. 96—98. Ibadan: Maybest Publisher.

Adesulu, D. (2013). Causes of poor performance in West African School Certificate Examination. *America Journal of Educational Research*; 1(9): 366—368.

Beck, R. J.; Livne, N. L. & Bear, S. L. (2005). Teachers' self-assessment of the effects of formative and summative electronic portfolios on professional development. *European Journal of Teacher Education*; 28(3): 221—244.

Ebong, M. A. (2009). A study on causes of poor academic performance and lack of effective learning among students in post-primary schools in Abi Local Government Area, Cross River State. Calabar: University of Calabar Press.

Federal Republic of Nigeria (2004). National policy on education. Lagos: NERDC.

Fraser, B. J. (1981). Learning environment in curriculum evaluation: A review. *Evaluation in Education Series*. Oxford: Pergamon Press.

Hiebert, J. (2006). Problem solving as a basis for reform in curriculum and instructions: The case of Biology. *Educational Research*; 25(4): 12—21.

Howell, D. C. (2002). Stattistical methods for psychology (5th edition). Wadsworth: Thomson Higher Education.

Jegede, S. A. & Seweje, R. O. (2005). Science education and science methods. Ado-Ekiti: Green Line Publishers.

Kellerman, W. (2004). Research into Biology teaching. *Journal of Biological Education*; 33(1): 4—9.

Mucherah, W. (2008). Classroom climate and students' goal structure in high school Biology. *Biology in Kenya Learning Environment Research*; 11: 63—81.

Onwuakpa, F. W. & Akpan, B. B. (2000). A study of secondary school students' classroom learning environment in relations to their Mathematics achievement. *Journal of Science Teachers Association of Nigeria*. 35(1&2): 55—62.

Owolabi, O. T. (2004). Improving the teaching-learning process: The art of teaching. Ado-Ekiti: GreenLine Publisher. 115—122.

Seweje, R. O. (2000). The challenges of science teaching in Nigeria today. *Journal of Educational Management*; 1: 216—217.

Spady, W. (1994). Outcome-based education: Critical issues and answers. Arlington, VA: American Association of School Administrators.

Tsavga, J. C. (2011). The effect of environment on the academic performance of students in Tarka Local Government Area of Benue State. An unpublished PGDE project, Makurdi, Benue State University.

Umar, A. A. (2011). Effects of Biology practical activities on students' process skills acquisition in Minna, Niger State. *JOSTMED*; 7(2): 118—126.

Uwadiea, I. (2010). WASSCE results. *The Punch*; August 31: 39.

Uwadiea, I. (2011). WASSCE results. *The nation*; August 11: 4.

Uwadiea, I. (2012). WASSCE results. *The Punch*; August 11: 8.

West African Examinations Council (2011). Biology Chief Examiners' report. Lagos: Megallons (WA) Ltd. May/June.

Wilson, B. (1996). Constructivist learning environment. Englewood, Cliffs: MJ Educational Technology Publishers.