

ASSESSMENT OF STUDENTS' CLASSROOM LEARNING OUTCOME: INFLUENCE OF ENVIRONMENTAL FACTORS

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Abstract

Classroom environment is not supposed to be attractive for teaching and learning alone but conducive for the test or assessment of the degree of learning taking place there. Classroom tests and examinations are means of establishing a students' level of accomplishment in a given subject. The classroom is expected to protect the learner from the vagaries of weather, air pollution, noise and when tests are to be conducted, the time of the day, invigilation and seating arrangements has to be conducive and appropriate also. The aim of this work is to determine how these environmental factors influence the performance of students in test and examination. The research was conducted using the survey instrument of questionnaire to obtain the perception of the respondents to the effect of environmental factors on learning outcome assessment. The questionnaire was subjected to mean score analysis to obtain respondents satisfaction value of the ordinal data on Likert scale. It is reasonable to assert from the analysis of the data that a test/examination conducted in a poor physical environment, such as those with poor lighting, under poor weather, noisy environment and polluted air will not be conducive to both the student and teacher hence produce poor performance in results of test /examinations. The findings revealed that due to the poor infrastructural development of Nigeria educational system, it is obvious that there is agreement to the effect that the environment factors affect learning. It is therefore advocated that apart from good teachers being employed in our educational system, location of schools should be considered very critically using these environmental parameters before approval is given for its establishment in the country.

Keywords: Noise, environment, weather condition, Air pollution, Assessment, Time of day.

1 INTRODUCTION

Though it is possible to argue that some kind of learning take place in an inhospitable environment, it is generally the desire of human to have some form of comfort in the environment of teaching and learning. Ngene [1] reported that human nature is to adapt in order to withstand adverse climate which is termed its resistance, while the degree of damage an environment can cause an individual called its vulnerability. It has been observed by [2] in [1] that energy, human health, comfort and even classroom activities are more susceptible to being affected by climate than any other factors in the physical environment. Noteworthy is the fact that the way a house is built, building locations, materials choice, designs, method of air conditioning and type of dress human wear is affected by climate and weather conditions. Research by [3] have unveiled the fact that natural anthropogenic processes will have negative effect on climate in the future which it describe as climate change, this paper will contribute to knowledge on how such prediction will negatively affect students classroom learning environment and hence, students' performance.

Academic achievement as measured by the grade an individual scores in test/examination according to [4] defines the degree of accomplishment in tests. Since it has been observed by [5] that physical classroom environment affect students' performance, such factors in the environment which include poor lighting, poor weather condition, noisy environment and polluted air will not be conducive to both the student and teacher.

Teaching and learning processes are usually conducted in an environment such as proper classrooms though in some extreme cases under tree shades, sheds and other temporary arrangements [6]. Test and assessments are means of ascertaining the level of teaching and learning that has been taken place in a good classroom environment. Figure 1 and 2 are classical examples of both the poor and good physical and social environment that will engender quick recall by a student.



Fig. 1. (Left) and Fig.2. (Right) show two classroom environments for teaching and Learning

This work would therefore, look at how the environmental factors influence or affect students' classroom recall ability during test in a school setting in Nigeria. This challenge arose because of the observable poor facilities and poor funding currently associated with our educational system. The situation is in agreement with [7] observation that educationist in Nigeria are agreed on the need for improvement in resources (funds, manpower, etc.) available for education especially science education.

The general aim of the research is therefore to assess the students learning outcome as affected by the environmental factors. The objectives will include determining the environmental factors that influence test performance, determine the relationship among the influencing factors and suggest minimization tools for mitigating the effect of the negative influence of the factors in the school environment.

2 LITERATURE REVIEW

The classroom as a learning environment is expected to be attractive enough to make the students stay long hours in them. However, the classroom environment is not supposed to be attractive for teaching and learning alone but also conducive for the test or assessment of the degree of learning taking place therein. A classroom test is one of the instruments used in obtaining a good assessment of students' accomplishment in a given subject. An assessment measures the personal attributes and environment of learning of a student according to National Teachers' Institute (NTI) Kaduna, [7]. A good assessment therefore measures how well a student has learnt a good content. Other instruments that can be used in this regard will include aptitude test, inventories, questionnaires and observations. This section reviewed the findings in literature concerning how to solve the problem of environment and its influence on students learning outcome.

2.1 Theoretical Review

In the action perspective sociological theory of ethnomethodology type according to [9] and [10], the classroom life can only be described by the meaning individual actors in it takes from it. This implies that whatever role individual participants in the classroom including the environment play will determine the success or failure of others in the system or world in which it operates. A good example to this will mean that a students' success in his or her classroom work, including tests, will depend on the enabling environment of the classroom and the teacher activities in the environment. Though, the social context in which teaching and learning takes place is very important, this paper emphasised the physical environment of the classroom where the tests are conducted. A teacher's role in the classroom will include but not limited to planning what to teach, how to teach it and the appropriate method of measuring the teaching outcome. The evaluation function of the teacher on a student is important because according to NTI Kaduna PDE module 106 [11], he can use the outcome in two major ways. Indicate to the students the progress he/she has made in the acquisition of knowledge

and the area of the school work that requires further efforts the teacher also uses the evaluation to assess and determine the extent of students' achievement of the educational objective set before him/her and aspects that will require further remedial action

In line with Cognitive-Gestalt's theory, learning is recognised as understanding the whole or total through meaningful relationship with a cognitive learning approach of parts. The Piaget, Brunner, Kohler theories recognises that individuals when confronted with difficult challenges uses previous experiences to interpret the problem and then in the study of the circumstance of the challenge decides on the best line of action towards finding a solution to the problem. This cognitive constructive theory therefore, explains that learning come by insight through the reorganisation of the field of experience seen in gaining new ideas or discovering a solution to a problem. It also means that a truncation of the line of flow of the ideas can occur if the environment is not right. The theory recognises that learning is a process that takes place in three non-exclusive stages of acquisition, retention and recall. A classroom test as it is known is carried out to check a students' recall ability after he/she must have acquired and retained the material learnt/received. Therefore, the environment has the ability to affect the retention capacity that is tested in a recall/test. Also, the class environment during Test/assessments could be impactful on their achievement.

2.2 Empirical Review

Tests are means of evaluating students' academic performance in terms of programme or students' level. Programme level performance indicates whether a programme was successfully delivered as envisaged while student level evaluation looks at how well the students understood the programme. Each of these two levels is evaluated by formative or summative means. Test contingencies refer to factors that affect students' classroom test which include the teacher, environment and learning materials. On the basis of the test contingencies this research looked at how environmental factors affect the outcome of classroom test. The environmental factors outlined in figure 3 below will include: time of day, weather conditions, arrangement of seats, invigilation, noise and air pollution.

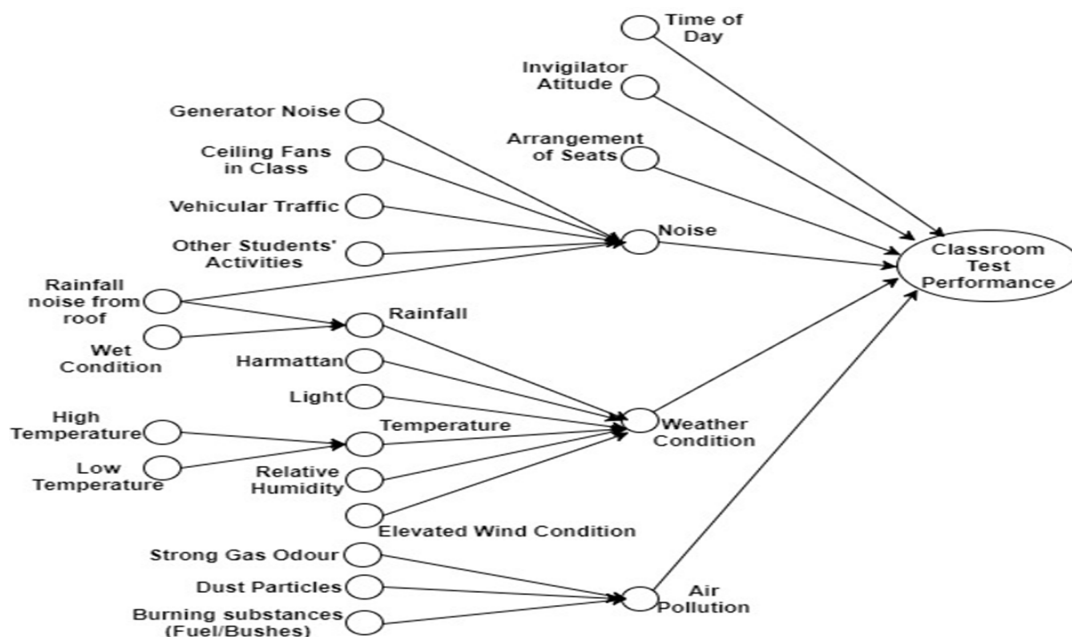


Figure 3. Show the environmental factors that influence students' classroom test performance

Researches by ([12], [13], [14]) have identified some factors that influence students' academic performance to include: social, psychological, economic, environmental and personal factors. The effects of these factors vary from student to student and also from country to country. The various researches which are helpful to both the parents and teachers in understanding and guiding the students emphasises the role of communication skills, learning facilities, proper guidance and family stress on academic performance of students. For emphasis, this paper dwell only on the environmental factors as shown in Figure 3 above, around the classroom, that influence students' test performance.

3 METHODOLOGY

The research was conducted using survey instrument of questionnaire to obtain the perception of the respondents to the effect of environmental factors on learning outcome assessment. The research instrument of questionnaire was adopted because, in education as well as other social sciences, it is often not possible to exercise control over factors which affect the population characteristics of interest. The research questions which centred on the factors shown in Figure 3 necessitated the research strategy to enable a viable solution to be found. The questionnaires were self-administered on students of a foremost government approved Open and Distance Learning (ODL) Institution in Nigeria at the Ota study centre and collected after filling. From several research strategies available, such as experimental, survey, case study, action research etc., the survey approach was adopted for the case study.

The need to capture all the subjects that consists the population, National Certificate in Education (NCE) and the Postgraduate Diploma in Education (PGDE) of the ODL necessitated the adoption of the population frame as the sample size of the study. However, since all the students are not usually available all the time, the technique of available sample was adopted hence the 92 students captured in the study and the 25 students used for the pre-test sample-study. The primary data required for this study was obtained through the administration of the structured questionnaire to the respondents covered by the study after explanation of the procedure and the confidentiality clause involved.

The SPSS version 20 statistical tool of principal component analysis according to [14] was used to reduce the number of variables that establishes the empirical relationship among the variables of interest. To assess the suitability of the data for factor analysis, the Kaiser-Meyer-Oikin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were conducted on the sample. The crumbach alpha test of reliability to check the ability of research instrument to produce the same results when subjected to the same influence or circumstance several times was carried out and the lecturers of the study centre assessed the validity of the questionnaire.

4 RESULTS, ANALYSIS AND DISCUSSION

The research has revealed as explained by one of the respondents in his remark that "full concentration is the key factor in achieving the best performance in any test/examination. Hence, any factor which could cause distraction can destabilize even the best candidate in any test/examination". This research therefore, note that test performance is a function of such factors as time of day, invigilators behaviour, noise pollution depending on the source, weather conditions, air pollutions and arrangements of seats to varying degree.

From the work, the following points are established for this study centre of with regard to the factors affecting students' classroom test performance. The age range among students at the centre indicates a mean of 31 years, median of 30 years, multiple modes of 21 years and a minimum and maximum age of students to be between 18 and 55 years respectively. The gender distribution among the respondents showed 38.5% male to 59% female with a 2.6% missing data which could come from especially the female respondents who did not disclose their ages.

The level of education among the students in the centre indicates that secondary school leavers and HND/BSc students constitute the highest percentage of 40% while OND, MSc and Ph.D are the rest, with 1.7% missing data. Also the survey showed that greater than 46% of the students at the centre had taken test/examination more than 5 times which indicate their fair idea of what the centre environmental conditions look like in both rainy and dry seasons of the year. Cumulative Grade Point Average (CGPA) is a measure of a students' test/examination performance, this is, therefore, used to measure how well a student has done in his test/examination bearing in mind the prevailing environmental circumstances. Analysis of the results as obtained from the survey data indicates that 3.4% of students are in the pass/fail grade 5.1% in the third class grade, 56.4% in the second class division and 15.4% in the first class grade. The results however represents a student judgment of his achievement and not evidence-based on actual results of performance.

Principal component analysis as noted by [15] is used to reduce the number of variables that establishes an empirical relationship among the variables. In this regard, large number of observed variables is reduced to small number of principal components which account for the variance of the observed variables. To group the 25 essential factors, factor analysis was used. Principal factor extractions analysis with varimax rotation was performed using SPSS version 20. To assess the suitability of the data for factor analysis, the Kaiser-Meyer-Oikin (KMO) measure of sampling

adequacy and Bartlett's test of sphericity were conducted on the data set, Table 1. The result indicates that the KMO measure for sampling adequacy was 0.729 which is greater than 0.7 allowable, an approximate chi-square of 919.519 and associated level of significance with P-value < 0.001, indicating that the population correlation matrix was not an identity matrix. Both of the tests showed that obtained data supported the use of factor analysis.

Table 1. The Kaiser-Meyer-Oikin (KMO) Sampling adequacy test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.729
	Approx. Chi-Square	919.519
Bartlett's Test of Sphericity	df	300
	Sig.	.000

The principal components analysis revealed as shown in Table 2, the presence of seven (7) components with eigenvalues exceeding 1, however if reduced to five(5) components a better results of the factors relationship was established based on the researcher judgement. The five components explained 51.78% of the variance made up of 16.54% for component 1, 12.66% for component 2, 8.92% for components 3, 7.22% for component 4 and 6.65% for component 5 respectively. It is important to also note that the Crumbach's alpha test of reliability was low at 0.132 < 0.5 which may be explained by the low number of respondents used for the survey.

Table 2. The five principal component that show the grouping of the factors influencing learning outcomes

	Rotated Component Matrix ^a				
	Component				
	1	2	3	4	5
Gaseous Odour in Classroom	.751		.367		
Classroom Pollution	.662		.345		
Pollution by Noize	.657				
Burning Substances around Classroom	.648				
Dust Particles in Classroom	.603		.315		
Effect of Generator	.589				
Within Classroom Noise	.585				
High Classroom Temperature	.489				
Number of Invigilators	-.418			.304	
Rainfall Noise		.774			
Condition of Climate		.722			
Without Classroom Noise		.695		.324	
Rainfall with Wet Condition		.619	.366	-.302	
High Wind in the Classroom		.597	.327		
Road Traffic Noise	.505	.560			
Relative Humidity1			.704		
Oyi Uguru Harmattan			.585		
Low Classroom Temperature			.510		
Time of Day of Test			.359	.623	
Invigilator Behaviour				.618	
Specific Time of Day Effect				.515	
Hand used in Writing				-.309	
Type of Seat Arrangement					.727
Seat Arrangement					.661
Dark Cloud with Poor Lighting	.445				.568

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 19 iterations.

The grouping of the variable according to the principal component analysis result indicates that the environmental pollution factors consist of component 1, made up of indoor pollution from (i) gaseous odour in the classroom, (ii) level of pollution of the classroom (iii) noise pollution (iv) burning of substance (fuel/bushes around the classroom); component 2 has external factors from the environment such as (i) rainfall noise on roof (ii) general weather/climate condition outside (iii) noise outside the classroom (iv) rainfall causing wet condition and (v) high wind effect in sometime open classrooms; component 3 consists of (i) relative humidity in an area (ii) the effect of harmattan season (iii) and low classroom temperature witnessed during harmattan and rainy seasons; component 4 is also made up of (i) time of the day of test (ii) specific time of the day of test and (iii) invigilators behaviour during test; and last is component 5, consisting of (i) type of seat arrangement and (ii) general seat arrangement of gap between students during examination to check cheating.

The finding of this research is that students' academic performance in test/examinations is affected by the factors in component 1-5 above. It is also important to point out that (i) poor lighting due to cloud (ii) hand used in writing (iii) road traffic noise (iv) number of invigilators in a class (v) high classroom temperature was not considered as critical factors and hence do not, from the analysis of results affect students' academic performance.

5 CONCLUSIONS

It is affirmed that for effective teaching to take place, the environment must be conducive to both the teacher and the students. Test and assessment as means of ascertaining the level of teaching and learning that is taking place also need a favourable environment to be conducted. On this basis, the research investigated the environmental factors that influence students' classroom test/examination performance with particular interest on ODL study centre, in Ota. Principal component analysis was used to establish, as required in the objectives, both the relevant factors in the environment that affect classroom test performance and the relationship among the factors as seen in the five components.

The following points are suggestions on mitigating the negative influence of the factors identified to minimize their influence on learning activities in our schools system as the third objective.

- (i) establishment of green zones or planting of flowers and trees to absolve some of the harmful gases around our schools as it used to be in the old times
- (ii) continuous education of teachers and other stakeholders on the importance of good environment and sanitation
- (iii) all schools, both public and private owned should have well-funded/equipped maintenance department to take care of their infrastructural needs
- (iv) Teacher-made test/examination is meant for evaluation of students' progress. Invigilation procedures should not be such that will create anxiety, fear and tension on students as these could lead to loss of recall from memory
- (v) Teachers/school management should consider the issue of time of the day when conducting test/examinations
- (vi) approval processing for all new schools (primary, secondary and tertiary) should also involve professionals with knowledge of factors influencing environment of learning such as Engineers, Architects in the designs of school plants
- (vii) use of appropriate planning laws and legislation in ensuring that school classrooms are located far away from busy highways and other sources of chronic noise pollution. This will also take care of gaseous emissions, traffic noise and traffic accidents involving students around the school premises.

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