Influence of Learning Environment on Students' Academic Achievement in Mathematics: A Case Study of Some Selected Secondary Schools in Yobe State – Nigeria

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Abstract
The purpose of the study was to determine the influence of learning environment on students' academic achievement in mathematics at senior secondary school level. Thus the study investigated some components of learning environment and their possible influence on students' academic achievement in mathematics. A sample of 337 randomly selected SS II students was taken from a population of 1682 students in Potiskum LGA, Yobe state. Data analysis was done using descriptive statistics as well as the t-test. The result shown that, there is significance difference between the mean performance of students taught in an ideal learning environment and that of students taught in a dull learning environment al 0.05 level of significance. The findings were discussed with a view to improving both the quality of learning environment and academic achievement in mathematics. In view of that therefore, recommendations were made for the improvement of the learning environment.
Keywords: Influence/Learning Environment/Academic Achievement/Mathematics.

INTRODUCTION

Intelligence is not the only determinant of academic achievement of a student. Lizzio, Wilson & Simons (2002) noted that academic achievement of a student is most often associated with a lot of components of learning environment. According to Bosque and Dore (1998), teaching and learning environment ought to implement six (6) functions: inform, communicate, collaborate, produce, scaffold and manage. They further added that "*conceptually speaking, the learning environment refers to the whole range of components and activities within which learning happens*". Hence, learning environment takes into account several variables that have direct and indirect effect on students.

Evidence from past and present research in mathematics education has long-established that academic achievements of all categories of students have been a point of concern to many mathematics educators (Ashby, Sadera, and McNary, 2011). For instance, the UNESCO (1984) report of papers presented in the theme *'Mathematics for All: Problems of Cultural Selectivity & Unequal Distribution of Mathematical Education and Future Perspectives on Mathematics Teaching for the Majority'*, at the Fifth International Congress on Mathematical Education, Adelaide – Australia, introductory assert:

New and urgent questions have been raised. Probably the most important ones are:
- o What kind of mathematics curriculum is adequate to the needs of the majority?
- o What modifications to the curriculum or alternative curricula are needed for special groups of learners?
- o How should these curricula be structured?
- o How could they be implemented?

A lot of work has already been done all over the world in attempts to answer these questions or to contribute to special aspects of the problem.

…last, but not least, there are many detailed studies, projects and proposals from different countries dealing with special aspects such as: - teaching the disadvantaged; - teaching the talented; - teaching mathematics to non-mathematicians; - teaching mathematics in the context of real life situations; - teaching mathematics under atypical conditions, etc.

In another perspective, the issue of academic achievement in mathematics has become a focus of many educators. The alarming issue in mathematics could be discussed from the social aspect and each individual point of view (Murugan & Rajoo, 2013). The social aspect includes learning environment which seems to affirm the consistency of relationship between learning environment and students' cognitive as well as effective outcomes (Ashby, et al, 2011).. Thus, learning environment could be an essential key determinant to the students' achievement in mathematics. According to Bosque and Dore (1998), higher-achieving students are likely to have been exposed to curriculum content under an ideal learning environment. In fact, Frenzel, Pekrun & Goetz, (2007) attributed underachievement in academic as a result of poor learning condition. This also affirmed that most scholars are of the opinion that educational attainment/achievement is likely to be determined by the idealness of the learning environment.

Indeed, learning environment plays a major role in shaping the quality of academic achievement in

mathematics (Tella, 2008). It seems there is perceptional consistency among mathematics scholars about learning environment and the student's cognitive and effective outcome (Lizzio, et al, 2002). It was observed that the learning is optimal when body, soul and spirit are in accord; otherwise learning will be ineffective (Frenzel, et al, 2007)). Hence, clean, quiet and comfortable environment are important components of learning environment. Furthermore, creating of an ideal learning environment must be a top priority of every concern educator. Being comfortable should be a combination of several factors which include; temperature, lighting, and noise control (Murugan & Rajoo, 2013).

And for a learning environment to be ideal, learning components such as furniture, ventilation, and thermal comfort must be provided (Bosque & Dore, 1998), In addition, Fraser and Fisher, (1982) examined the normal learning climate. They proposed 68^0F to 74^0F as the required learning temperature. Although Lizzio et al, (2002) noted that optimal learning climate varies from region of a country and with seasons of the year. So, the usage of actual learning environment varies according to different type of schools and society. Nevertheless, it is indeed a well known fact that academic achievement in mathematics among science students is greatly influenced by several components of learning environment as revealed by various research works (Akinsola., Tella & Tella, 2007).

Statement of the Problem
In Nigeria, many secondary schools are been established at various places by government, private organizations or individuals (Tella, 2008). As a result, teaching and learning takes place under different environment. Every school has its location, facilities and also operates under different classroom condition, but all the students are expected to write the same standard examination (i.e. Senior Secondary Certificate Examination) at a completion of secondary education. It may be reasonable to expect a uniform performance from all the candidates since they were taught using the same curriculum and syllabus but in most cases some schools seem outperform others in all respect. Frankly speaking, there must be a definite determinant that is really responsible for the constant failure or success of various schools. To find out this, it has become necessary to investigate the nature and pattern for our secondary schools so as to evaluate the academic achievement in mathematics of students with respect to the learning environment.

Purpose of the Study
The broad purpose of this study is to investigate the influence of learning environment on students' academic achievement in mathematics in senior secondary schools; in particular, the research is aimed at accomplishing the following:
1) To determine the extent at which learning environment can affect performance in senior secondary school mathematics.
2) To determine the difference in learning environment and its influence(s) on students' academic achievement in mathematics.
3) To identify factors within the learning environment that affect students' academic achievement in mathematics.

Research Questions
The researcher is of the opinion that an ideal learning environment should have moderate light and painting, good quality of natural air, comfortable seats and sequential sitting arrangement as well as relative cold climate. So the study seeks to answer the following research questions
1) To what extent is the classroom painting and lighting being capable of affecting students' performance?
2) Under what classroom climate and air quality (ventilation) students prefer to learn mathematics?
3) To what extent is comfortable seat and sitting arrangement capable of affecting students' academic achievement in mathematics?
4) To what extent is the number of students per class and the classroom chalkboard having influence on students' academic achievement?

Hypothesis
In this study, the following null hypothesis was formulated and tested at (α) 0.05 level of significance:
H_0: There is no significant difference between the mean performance of students taught in an ideal learning environment and students taught in dull learning environment.

Scope of the Study
The study was designed to cover the following components of learning environment: classroom painting and lighting, climate and ventilation, seats and sitting arrangement, chalkboard and number of students per class. Also the research work was delimited only on some SS II students being selected from five secondary schools in

Potiskum, Yobe state. These schools are: Federal Government Girls' College Potiskum (FGGC), Fika Governemnt Secondary School Potiskum (Fika GSS), Government Day Secondary School Potiskum (GDSS), Government Science & Technical College Potiskum (GSTC) and Government Girls' Science & Technical College Potiskum (GGSTC).

METHODOLOGY
This research employed the use of descriptive survey design as well as experimental design to investigate the influence of learning environment on students' academic achievement in mathematics. It aimed at collecting data about the components of learning environment from relatively large number of students so as to determine the opinion, attitude preference and perception of interest, by basically means of a structured questionnaire (Tella, 2008). It equally uses experiment so as to clearly express the influence of learning environment on science students achievement in physics using the experimental group (ideal learning environment) and control group (dull learning environment).

Sample and Sampling Techniques
The sample size of 320 representing 20% of the entire population was chosen. According to Ashby et al, (2011) a sample is worthless unless it reflect the entire population upon which generation is made. For that reason, the researcher samples the students regardless of their sex or age to allow easy analysis. The researcher used a random selection technique which was aimed at getting a good representation of the population.

Method of Data Collection
The instruments for data collection that guided the study were structural questionnaire as well as an achievement test. The questionnaire consisted of 16 items, four for each components of the learning environment under investigation. The Likert scale 5 point scale was used; it contains a list of statements which the students were asked to respond. On the other hand, the sampled students of FGGC and GSTC were (Experimental group) while Fika GSS and GGSTC were the (control group) taught by the research for the period of two weeks. The researcher ensured the experimental groups were taught in an ideal environment whereas the control groups were taught in a dull learning environment.

Method of Data Analysis
According to Murugan & Rajoo (2013) data analysis is the statistical technique or tool(s) employed in analyzing the research data. Thus the data collected were subjected to descriptive statistical analysis by computing the Mean (Average) and Standard Deviation (SD) of each item. The decision rule was to reject an item whose mean fall below 3.00 since it used 5 point scale. Moreover, for the purpose of testing the hypothesis, the data were analyzed using inferential statistics of t-test.

DATA ANALYSIS AND INTERPRETATION
Research Question 1:   *To what extent is the classroom painting and lighting being capable of affecting students' performance?*

Table I: Effect of Painting and Lighting on Students' Academic Achievement

S/N	Statement Strategy	Mean	S.D	Remark
1	The classrooms are bright enough for reading	2.83	1.40	Reject
2	You can perform better if your classroom is renovated.	3.82	1.16	Accept
3	Dull classroom painting affect teaching and learning of mathematics.	3.77	1.08	Accept
4	The classrooms have adequate electricity light supply.	2.03	1.00	Reject

Source: Field Work
The table above shows that the respondents disbelieved that classroom is bright enough for reading with the mean score of (2.83); in effect, the classrooms are not bright enough for reading. The result also indicated that dull classroom painting affect the learning of mathematics with a mean score of (3.77). Therefore, based on the findings, painting and lighting have influence of students' academic achievement in mathematics.
Research Question 2:   *Under what classroom climate and air quality (ventilation) students prefer to learn mathematics?*

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Table 2: Ideal Climate and Air Quality (Ventilation) for Learning Mathematics

S/N	Statement Strategy	Mean	S.D	Remark
5	Poor ventilation makes mathematics lesson boring	3.66	1.21	Accepts
6	You can perform better in a moderate classroom temperature.	3.70	1.14	Accept
7	Adequate air ventilation during mathematics lesson might improve your performance.	3.48	1.31	Reject
8	At times, you like staying outside because classroom is very hot.	3.44	1.24	Reject

Source: Field Work

By admiring the table 2, it clearly discloses that poor ventilation makes mathematics lesson boring at (3.66) mean score. Furthermore, the table shows that students may perform better in a temperate classroom at (3.70) mean; but discredit that adequate air ventilation might improve academic achievement in mathematics.

Research Question 3:   *To what extent is comfortable seat and sitting arrangement capable of affecting students' academic achievements in mathematics?*

Table 3: Effect of Seat and Sitting Arrangement in Mathematics Class

S/N	Statement Strategy	Mean	S.D	Remark
9	The classroom has enough seats and desk for every student.	3.29	1.34	Reject
10	Good sitting arrangement makes mathematics learning interesting.	3.54	1.33	Accept
11	The classrooms have enough space for each and every student.	3.38	1.31	Reject
12	No student obstructs another's view due to seats' construct.	3.37	1.35	Reject

Source: Field Work

The table above shows that the respondents (students) lack seats and desk in their various schools since item 9 has (3.29) means score. In addition, it suggested that good sitting arrangement will make mathematics so interesting at (3.54) mean. Therefore, under-achieving students were more likely to have been affected by the seat and sitting arrangement.

Research Question 4:   *To what extent is the number of students per class and the classroom chalkboard having influence on students' academic achievement?*

Table 4: Effect of Chalkboard and Number Students per Class

S/N	Statement Strategy	Mean	S.D	Remark
13	You cannot do well in mathematics because your class is overcrowded.	3.55	1.31	Accept
14	The chalkboard is noiseless while the mathematics teacher is writing.	3.60	1.26	Accept
15	You can clearly see all writing on the board from the back seat.	3.08	1.61	Reject
16	The number of students in your class exceeds forty (40).	3.51	1.35	Accept

Source: Field Work

The table above indicates that the students cannot do well in mathematics in an overcrowded class considering a mean of (3.55) in item 13. The table above also revealed that, class chalkboard does affect the students seating at the back in as much as they can clearly see the writings on it. The finding also shows that the respondents faulted that their number per class exceeds (40.

Now, in an attempt to ascertain the influence of learning environment on students' academic achievement in mathematics, it is thus required to test the hypothesis using t-test of the achievement test.

Table 5: T-Test Analysis on Influence of Learning Environment on Students' Academic Achievement in Mathematics

Group	N	$\bar{x}$	σ^2	t-calculated	t-critical	Decision
Control group	34	5.03	2.50			
Experimental group	47	7.56	1.65	7.67	2.01	Reject H_o

Source: Field Work

The calculated t-test value gives 7.67 while the critical t-value is 1.98 at 5% level of significance and 79 degree of freedom. Since the calculated t-value is greater than the critical t-value, the decision is to reject the null hypothesis (H_o) and uphold the alternative hypothesis. This implies that there is significance difference between the mean score of students taught in an ideal learning environment and the students taught in a dull learning environment.

DISCUSSION OF THE RESULT

To have effective teaching and learning, it lead to the combination of many factors which among others include: the classroom painting and lighting, seats and sitting arrangement, the classroom climate, air quality or ventilation, facilities. Thus, students' academic achievements are tried to these components of learning environment. In the course of this research, the results make clear that students can perform better if classrooms have enough lighting. This further implies that the quality of lighting and painting influence students' academic performance in mathematics. The research also reveals that poor ventilation must be catered for and equally be

discouraged so that the classroom temperature should be kept moderate in order not to hinder quality academic activities. Overcrowd does harm to learning mathematics as indicated by the research.

CONCLUSION

Indeed, intelligence is not the only determinant of academic achievement of students. This ascertains the belief that academic achievement of students is always associated with so many components of the learning environment (Lizzio et al, 2002). It agrees with Frenzel, et al, (2007) by acknowledging that learning environment has great influence on students' academic achievement in mathematics. So in conclusion, learning environment is an essential key factor in determining academic achievement of students.

RECOMMENDATIONS

Based on the result obtained and the analysis of the findings, the researcher would like to forward the following recommendations.

1) Parents and the stakeholders through P.T.A. should work to see that the learning environment conform to UNESCO standard.
2) Government should improve the condition of classroom by providing electric fittings besides renovations of schools.
3) Both the mathematics teachers and the schools heads should look for natural remedy by placing mathematics at favorable time;
4) As a matter of urgency, government should make sure that the number of students per class did exceed (40) forty. In case of new building, the classroom should be constructed in a way to provide enough ventilation.

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