School Environmental Indices as Predictors of Academic Achievement in Mathematics among Junior Secondary Schools in Oyo State, Nigeria.

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Abstract

The present study was designed to investigate school environmental indices as predictor of academic achievement in mathematics among junior secondary schools in Oyo state. The study employed descriptive survey research design. The sample size consisted of 549 teachers and 601 students were selected using simple random sampling technique. Two instruments were used for data collection namely School Environmental Indices Questionnaire (SE1Q) (0.811) and Mathematics Achievement Test (SMAT) (K_{20} = 0.913). The two instruments were validated before they were used for this study. Data collected were analyzed using simple percentages, mean, standard deviation and Multiple Regression. It was revealed that the availability level of school library facilities, mathematics laboratory facilities and school convenience facilities showed moderate level with the mean value ranged between 2.5 and 3.49. Finding revealed that there was a significant joint influence of school environment indices on academic achievement in mathematics (R = .213, R^2 = 0.103; F = 3.319 $P < 0.05$). Also, there was a significant relative influence of school environmental indices and on academic achievement in mathematics, school library (β = 2.012, t = 5.753, $P < 0.05$), school convenience facilities (β = 1.021, t = 4.443, p<0.05, mathematics laboratory (β = 1.018, t = 3.393 $P < 0.05$). The study concluded that the three indices were at moderate level and are predictors of academic achievement in mathematics. It was recommended that schools should ensure that all the indices mentioned in this study are available and sufficient for the students use so as improved the academic level.

Keywords: School Environment, Students, Academic Achievement, Mathematics, Oyo State.

Introduction

Academic achievement could be described as a performance outcome that indicate the extent to which a person has accomplished specific goals that were the focus of activities in an instructional environment, specifically in schools, colleges and university. Academic achievement could be the stages of schooling you have successfully attained in your studies. It is the extent to which a student, teacher or institution has achieved their short- or long-term educational goals (Bernath & Paul, 2016). In other words, an achievement test is essentially a tool or device of measurement that helps in ascertaining the quantity and quality of learning attained in a subject of study or group of subjects after a period of instruction by measuring the present ability of the individual concerned. (Callaman & Itaas, 2020)

Academic achievement plays a very important role in the attainment of the idea of harmonious development of the child. In this rapidly changing world and with the growing of advancement in science and technology in which the place of education has become so vital that every parent and guidance set high goals for his/her ward. Student academic achievement has been an interesting area in which many scholars have expressed concern in the education sector. It has shown that related factors are hindering a better academic achievement in secondary school (Aerniji, Indria and Odeh, 2019). Many recent studies were carried out to investigate series of factors hindering the academic achievement of secondary school students (Paulpandi & Govindharaj, 2017; Alrashidi, 2016)

Mathematics is the foundation of science and technology and the functional role of mathematics to science and technology is multifaceted and multifarious. Mathematics as a subject is indispensable in the development of any nation with respect to science and technology since mathematics itself is the language of science. Mathematics as one of the core subjects in secondary school curriculum in Nigeria represents one of the modern curricular arrangements which focuses on enhancing students' reasoning and problem-solving skills (Pandey, 2017). It could be showcased that the future of a country depends on the quality of education given to the citizens because education in all aspect assure the future of the society. For this reason, mathematics is very important in secondary schools in Oyo state because it is essential in the physical science, technology, business, financial services and many areas of ICT and this help the students in choosing their course toward their higher institution. It is posited that mathematics is very essential to man because it helps in his personal development and enhanced his mental abilities. The issue of academic achievement in mathematics has become a focus of educator (Yadav, 2017). The alarming issue in mathematics could be discussed from the social aspect and each individual point of view. The teaching and learning of mathematics in the secondary schools in Oyo state are hindered by some factors such as: mathematics laboratories, school libraries facilities and school conveniences facilities. Non-

availability of these facilities are hindrances of good achievement in mathematics among junior secondary schools in Oyo state, Nigeria.

The poor performance of secondary school students in their internal and external examinations in mathematics has been a concern among teachers, educators and parents (Gegbe, Sundo and Shariff, 2015). Nevertheless, this performance has been an object of worry to the parents of these students and most of the students themselves. It was stated that the actual cause of failure was a result of the environmental factors which leads to poor planning mechanism (Eimuhi and Ogedengbe, 2016). It was asserted that the failure of some students from meeting up to the demands of getting good grades in mathematics in the school has a negative influence on students towards the availability of environmental factors such as school library facilities, mathematics laboratory facilities etc. (Takwate, 2018).

According to Daniel Asamoah, Sundeme, Qualano, Adom-Fynn, Clarke-Eboe, Afranie (2020), school environment has been emphasized as an essential requirement for smooth teaching and learning process to take place. A good school learning environment presents learning as a lifelong enterprise and enables students to discover appropriate value system that can be their compass for self-awareness and self-discovery. Learning environment plays a significant role in the students' success. It is obvious that when students learn in a positive environment could do better academically and a conducive environment booster the potential ability of the students and this improve the academic performance. A secondary school student taking a test in a quite peaceful room will almost certainly do better than a student taking the same test in a loud, chaotic room. It was shown that positive learning environment can lower teacher turnover by 22 percent (Amoo & Disu, 2012).

Secondary school students with well-equipped mathematics laboratory facilities would perform very well than those students in a school without mathematics laboratories facilities. This simply imply that, the role of laboratory practical help teachers to work together with students so as to build the connection between theory and practice in real life situation and therefore increase academic achievement. Most of the

junior secondary schools have no mathematics laboratory and this hinder a good academic achievement (Uhumuarbi & Okodugha, 2014)

However, it was opined by Olukanmi & Okori, (2015) that majority of the secondary schools in Oyo state have no adequate convenience facilities such as safe drinking water, sanitation and hygiene (WASH) which are fundamental to improving standards of secondary school students. Water supply is essential for growth as well as for social wellbeing of the students. Ensuring access to water, toilet system and sanitation as human rights constitute an important step towards making it a reality for every individual. Inadequate access to safe water, poor toilet system and sanitation services coupled with poor hygiene practice continues to kill and sicken an individual. This implies that, for a good academic achievement for students, it entails a good planned and well-structured school conveniences facilities. A student that contacts infection as a result of poor toilet system would be absent from school and this led to a poor schooling system (Jasper, Thanh-Tam and Bartram, 2010

According to Indria and Odeh (2019), in every educational institution, there is expected to be a well-equipped library with current and modern books, journals, multimedia projectors, reading tables and chairs, lightening, ventilation, internet/email services etc. in a situation whereby secondary schools in Oyo state do not have well-equipped library facilities, definitely the academic achievement of the students would be poor. It was posited that the library should be a knowledge driven organization to which ensure its effectiveness in this globalized world. It is to function on the aspect of provision of secondary school materials, materials for supplementary reading and provision of materials in support of the school (Ajegbomogun & Diyaolu, 2019)

The consequences of poor academic achievement in compulsory subject like mathematics can be a problem not only on the students but several stakeholders in education. This can lead to social withdrawal from friends and having the feeling of failing the subject. Academic achievement of students in mathematics as a subject has witnessed a deplorable trend in the past decade. Empirical works reviewed showed that inappropriate teaching methods, lack of instructional materials/resources are reasons for poor academic performance of students in mathematics (Pandey, 2017). For instance, the state ministry of education initiated in-service training for the mathematics teachers just to improve the teachers 'teaching techniques in mathematics but all efforts dropped into failure. This shows that there are other factors that can be responsible for poor academic achievement in mathematics. Against this background therefore this study was to investigate the significance of school environmental indices on academic achievement in mathematics in mathematics among junior secondary school students in Oyo State.

Objectives of the Study

The main purpose of this study was to investigate the school environmental indices as predictor of academic achievement in mathematics among junior secondary school students in Oyo state, Nigeria. The specific objectives are to:

1. assess the level of academic achievement of the students in mathematics in Oyo state;
2. ascertain the availability level of school environmental indices in junior secondary schools in Oyo State;
3. investigate the combined influence of school environmental indices (mathematics laboratory facilities, school library facilities and school conveniences facilities) on students' academic achievement in mathematics in junior secondary schools in Oyo State; and
4. examine the relative influence of school environmental indices (mathematics laboratory facilities, school library facilities and school conveniences facilities) on students' academic achievement in mathematics among junior secondary school students in Oyo State.

Hypotheses

1. There is no significant joint influence of school environmental indices (mathematics laboratory facilities, school library facilities and school convenience facilities) on students 'academic achievement in Mathematics in Oyo state, Nigeria.

2. There will be no significant relative influence of school environmental indices (mathematics laboratory facilities, school library facilities and school convenience facilities) on students 'academic achievement in Mathematics in Oyo state, Nigeria.

Methods

The descriptive survey research design was adopted for the study and it covered all the secondary school teachers and junior secondary school students 2 in Oyo State, Nigeria. Five hundred and forty-nine teachers and six hundred and one JSS 2 students formed the sample for the study. The multi-stage sampling procedure was employed for the study. Simple random sampling technique was used to select seventeen local government area (LGAs) from the existing thirty–three LGA in Oyo State. Purposive sampling technique was used to select 549 classroom teachers and 601 junior secondary school students 2 in Oyo State. Altogether, 1150 respondents were used for the study. This instrument was used for the data collection. These include: School Environmental Indices Questionnaire (SEIQ) and Mathematics Achievement Test (MAT). SEIQ was administered to teachers and divided into two sections. Section A contain four items which involved the Bio-data of the respondents such as the age of the respondents, educational qualification, and teaching experience of the teachers and marital status of the respondents. Section B contain information such as the school library facilities, school convenience facilities and mathematics laboratory facilities. The section was made of 4-Liket points scale for the determination of the extent to which the respondents (teachers) examine the school environmental indices on students' academic achievement in mathematics in Oyo State. The items were scaled as follows: Very High Extent (VHE) =4, High Extent (HE) = 3, Moderate Extent (ME) =2 and Low Extent (LE) = 1. The questionnaire was both content and face validated. The reliability of the research instrument was established using Cronbach Alpha which yielded the reliability coefficient of 0. 842. MAT was divided into two sections, section A was on bio-data of students while section B was made of twenty-five (25) structured questions in mathematics set from junior secondary school mathematics curriculum and past questions from junior NECO examination. The adopted instrument was subjected to content and face validity and the reliability coefficient was established with 0.82 using Kuder Richardson formula 20. Data collected were analyzed using simple Percentages, Mean, Standard Deviation and Multiple Regression Analysis.

Results and Discussion

Table 1: Descriptive Statistics on academic achievement of the students in Mathematics in junior secondary schools n = 601

	Measure	Frequency	Percentage (%)	Mean	Std. dev.
Academic achievement in Mathematics	**Fail** (scores of 1-8)	222	37.0	1.70	0.69
	Average (scores of 9-13)	238	39.6		
	Pass (scores of 14-25)	141	23.4		
Total		**601**	**100**		

Table 1 shows the level of academic achievement of junior secondary school students in Mathematics. A Mathematics Achievement Test (MAT) consisting of twenty-five (25) multiple choice questions (MCQ) were used to assess or test the students' academic achievement in Mathematics. The retrieved mathematics achievement test from the students were marked and scored. Scores within the range of 1-8 represented fail, scores within 9-13 represented average achievement while scores from 14-25 represented pass. The table however shows that 222 (37.0%) of the students failed the Mathematics Academic Achievement Test (MAAT), 238 (39.6%) of the students had average performance while 141 (23.4%) of the students passed the test. The mean (standard deviation) for academic achievement in mathematics is 1.70 (0.69). The table, therefore, shows that the level of academic achievement of the junior secondary school students in Mathematics is averagely poor as only a few of the students (141) passed the achievement test. This shows that the level of academic achievement of the students in Mathematics is averagely poor. This shows that majority of the students are below average in their academic achievement in Mathematics. This result corroborates with a study of Batman and Yigit, (2016) who were of the view that organized extracurricular activities have yielded a positive relationship with high academic performance including increasing attendance rates, school engagement as well as a decrease in drop- out rates and depression. Also, the findings of the study are related to the submission of a study Akessa, (2015) who submitted that positive developmental outcomes have been found in students that both home and school environment have a big influence on the performance of children especially in elementary and secondary education.

Table 2: Availability level of library facilities in junior secondary school in Oyo State

S/N	Items	HA	MA	LA	VLA	$\bar{x}$	SD	Remarks
1.	Enough reading tables and chairs are available in the library	121 (22.0)	100 (18.2)	131 (238)	197 (35.9%)	3.26	1.773 0.833	Moderately Available `
2.	E-library facilities/E-mail services are available in the school library	63 (11.4%)	72 (13.0)	136 (24.8%)	268 (48.8%)	2.74	1.734	Moderately available
3.	Computer hardware /software in mathematics are properly kept in the library	73 (13.3%)	69 (12.6%)	197 (35.9)	283 (512)	2.89	1.713	Moderately available
4.	Electricity supply available in the library	131 (23.8%)	110 (20.0%)	209 (38.1%)	99 (18.1)	2.69	1.812	Moderately available
5.	Multi-media projectors are well available for the use of the students	81 (14.8%)	101 (18.4%)	210 (38.3%)	157 (28.6%)	2.81	0.833	Moderate available
6.	Current textbooks in mathematics are well display in the library.	94 (17.1%)	121 (22.0)	185 (33.7%)	149 (26.2%)	2.79	0.791	Moderately available
	Weighted mean value = 3.03							

Source: Field work 2021

Threshold: Highly Available = 3.5 and above, Moderate available 2.5 – 3.49, Low available = 1.5 – 2.49 and Very Low available = 0- 1.49

Table 2 shows the availability level of the school library facilities in junior secondary school in Oyo state. The result indicated that the means score of all the items under availability of school library facilities ranges from (2.69 – 3.26). With the above result, the weighted mean value (3.03) which indicated that the school library facilities are moderately available in the junior secondary school in Oyo state in overall, the library facilities in the junior secondary school, Oyo State was moderately available (M = 3.03). From the above finding, it shows that the availability of school library facilities is of the moderate level. This is in line with the opinion that the availability and adequate library facilities would enhance the teaching and learning in mathematics and this promote better performance in mathematics by the students (Ajegbomogun & Diyaolu, 2019).

Table 3: Availability level of School Convenience facilities in Junior Secondary School in Oyo state

S/N	Items	HA(4)	MA(3)	LA(2)	VLA(1)	□	SD	Remarks
1.	Wash hand basin are not available in the school	136 (24.8%)	192 (34.9%)	121 (22.0%)	100 (18.2%)	2.84	0.712	Highly Available
2.	Electricity supply is always regular	86 (15.7%)	121 (22.0%)	193 (35.2%)	149 (27.1%)	2.67	1.332	Moderately Available
3.	Good sanitation system and hygiene facilities are properly kept in the school	121 (22.0%)	100 (18.2%)	163 (29.7%)	165 (30.1%)	2.74	1.521	High Available
4.	Safe drinking water supply motivate high academic achievement of the students	82 (14.9%)	110 (20.0%)	183 (33.3%)	174 (31.7%)	2.81	1.70	High Available
5.	The water toilet system on the school is functioning well	53 (9.7%)	69 (12.6%)	196 (35.7%)	231 (42.1%)	2.54	1.643	Moderately Available
6.	Pit toilet facilities is well built in the school	193 (35.2%)	184 (33.5%)	100 (18.2%)	72 (13.1%)	2.63	1.712	Moderately Available
7.	Hand sanitizer and soap are always available in the school	163 (29.7%)	200 (36.4%)	89 (16.2%)	97 (17.7%)	2.47	1.751	Lowly Available

Weighted mean value = 2.671

Source: Field work (2021)

Threshold: Highly available = 3.5 and above, moderately available = 2.5 – 3.49, lowly availability = 1.5 – 2.49 and very low available = 0 – 1.49

Table 3 indicates the level of availability of school convenience facilities in junior secondary school in Oyo state. With the above result, it was observed that the weighted mean score of all the items under availability level of school convenience facilities ranged from (2.47- 2.84) and with the above result, the weighted mean value (2.671) which indicated that the school convenience facilities are moderately available in the junior secondary school in Oyo state. In this

study, school convenience facility is a predictor of students' academic achievement in mathematics (Jasper, Thanh-Tam and Bartram, 2012). Also, the findings of the study are related to the submission of a study who stated that toilet and water facilities have been adjudged to have contributed immensely to the academic performance of students. (Olukanni, Ajetombi, Tebowei, Ologun and Kayode, 2014)

Table 4: Level of Availability of Mathematics Laboratory Facilities in Junior Secondary School in Oyo state

S/N	Items	HA(4)	MA(3)	LA(2)	VLA(1)	$\square$	SD	Remarks
1.	Mathematics tools were arranged properly in the cabinets/shelves laboratory	101 (18.4%)	131 (23.9%)	257 (46.8%)	67 (12.2%)	2.67	1.743	Moderately available
2.	Unit cube (wooden or any material) are very much sufficient	59 (10.7%)	200 (36.5%)	191 (34.8%)	99 (18.0%)	2.54	1.810	Moderately available
3.	Different shapes of graduate cylinder are properly installed	51 (9.3%)	118 (21.5%)	266 (48.5%)	114 (20.8%)	2.75	1.754	Highly available
4.	Constant electricity supply in the mathematics laboratory	121 (22.0%)	69 (12.6%)	159 (28.9%)	200 (36.4%)	2.42	1.413	Low availability
5.	Equipment for construction	130 (23.7%)	121 (22.0%)	163 (29.7%)	135 (24.6%)	2.52	0.963	Moderate available
6.	Overhead projectors well installed in the laboratory	132 (24.0%)	101 (18.4%)	171 (31.1%)	145 (26.4%)	3.12	1.763	Highly availably

Weighted mean value = 2.673

Threshold: Highly Available = 3.5 and above, Moderately Available 2.5 – 3.49, Low Availability = 1.5 – 2.49 and very Low Available = 0- 1.49

Table 4 indicates the level of availability of mathematics laboratory facilities in junior secondary school in Oyo state. It was revealed that the weight mean score of all the items under availability level of mathematics laboratory facilities ranged from (2.42 – 3.12) and with 2.673 as the weighted mean which indicated according to the threshold, the mathematics laboratory facilities are moderately available in the junior secondary school in Oyo State. The result is in line with the findings of a study that said that availability of mathematics laboratory facilities in the school influences the academic achievement of the students in mathematics (Ado and Nwosu, 2019). In addition, the result of the study is in line with the submission of a study that the students who lack mathematics laboratory facilities, lack of relevant textbooks, pamphlets and posters were factors central to the poor of education and would not perform very well in mathematics (Neji, Ukwetang and Nja, 2017)

Table 5: Multiple Regression Analysis showing the Joint Influence of School Environmental Indices (school convenience facilities, mathematics laboratory facilities and school library facilities) on Students' Academic Achievement in Mathematics

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2145.453	3	531.151	3.319	.005
	Residual	32250.247	546	121.473		
	Total	34396.700	549			

a. Dependent Variable: Academic achievement of students in Mathematics

b. Predictors: (Constant), Mathematics laboratory facilities, School convenience facilities, School library facilities.

R = .213
R square = 0.103
Adjusted R Square = 0.65
Standard Error of the Estimate = 10.68748

Table 5 shows that the joint influence of school environmental indices (library facilities, conveniences facilities and mathematics laboratory facilities) on academic achievement in mathematics among junior secondary school students in Oyo state, Nigeria was significant (R = .213, R^2 = 0.103 $F_{(3,546= 3.319; P <0.05)}$ This shows that all the independent variables accounted for 10.3% of the variance on academic achievement in mathematics among junior secondary school students in Oyo state, Nigeria. The result shows significant joint influence of school environmental indices and students support services on academic achievement in mathematics among junior secondary school in Oyo state, Nigeria. The result of this study is in line with a study carried out by Yakubu, (2017) on the 'Assessment of water sanitation and hygiene practice in a semi-urban setting, a socio-economic and cultural mirror where it was acknowledged that the academic performance of schools with availability of conveniences facilities was been improving steadily over the years while the academic performance in secondary schools without availability of conveniences facilities deceases the system. In addition, the finding aligns with the study that mathematics laboratory facilities should be available in the secondary schools in other to increase the academic achievement in mathematics by the students (Kaushik, 2019)

Table 6: Multiple Regression analysis for the Relative Contribution of school environmental indices (school library facilities, school conveniences facilities and mathematics laboratory facilities) on academic achievement in mathematics.

Model	Unstandarized coefficients β	Std.Error	Standardized Coefficients Beta	t	Sig
Constant	12.132	4.460			
School conveniences facilities	.161	.048	1.021 2nd	4.443	002
School library facilities	.068	.016	2.012 1st	5.753	0.05
Mathematics laboratory facilities	.061	.018	1.018 3rd	3.393	000

a   Dependent variable: Academic Achievement in Mathematics

The result revealed all the three independent variables are significant. The greatest contribution ($\beta = 2.012$, t =.573 p < .0.05) was the school library facilities, followed by the school conveniences ($\beta = 1.021$, t = 4.443, P<0.05), mathematics laboratory facilities ($\beta = 1.018$, t = 3.393 P < 0.05. With the above result, the three independent variables can be used to predict academic achievement in mathematics in Oyo state. The results of this study is in line with the findings of the study by Eze and Uzoigwe (2013) who stated that **a** well- equipped library is a major facility which enhances good learning and achievement of high educational standards. School libraries may not be effective if the books therein are not available, adequate and up-to-date.

Conclusion
The study finding shows that the level of availability of school environmental indices (school library facilities school convenience and mathematic laboratory facilities) in junior secondary school in Oyo state, Nigeria is moderate in that, the weighted mean value was within the moderate range value (2.5 – 3.49). In addition, all the three independent variables have joint significant influence on students' academic achievement by mathematics among junior secondary school students in Oyo state, Nigeria. Moreover, all the independent variables have significant relative influence on students' academic achievement in mathematics among junior secondary school students in Oyo state, Nigeria.

Recommendations

1. Schools should ensure that school environmental indices such as school convenience facilities (toilets, cafeteria and so on), school library facilities are available and enough for the students' use so as to boost their academic achievement.
2. The government should provide all the mathematics laboratory facilities to the school which will enhance the teaching and learning of mathematics by the teachers and this would promote the performance of the students' performance in Mathematics.

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