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CONTENTS

Material Resource Utilization, a Correlate of Students' Performance in Secondary School Physics in Oyo State

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Abstract

The aim of this paper is to examine the relationship between the material resource utilization and students' performance in secondary school physics in Oyo State. Material resources vary from students' own items like students chairs and lockers to such materials owned by schools like school bus. In other words, material resources are those things used in schools to facilitate teaching and learning processes. A total of 1029 SS1 Physics students from 40 schools with their principals participated in the study. Descriptive statistics and multiple regression analysis were used to answer the research questions 1 and 2 respectively. Two research instruments were used in this study, these include Physics Achievement Test (PAT) and the School Questionnaire (SQ) The results of the study shows that the level of material resources in Oyo State secondary schools is low. Material resources such as textbooks, library size, fan, students' stools in the laboratory are found to significantly predict students' performance in secondary school Physics in Oyo State. It is therefore, recommended that more of these material resources should be provided in the schools.

Introduction

It is imperative to say that school teaching should not be devoid of good instructional materials in order to achieve good results in the school academics. Fuller (1986) identified 14 positive effects and 8 negative effects out of the 22 analyses he did on the effect of text books and reading materials on students' achievement. The confirmation rate of the contribution of text books and reading materials on students' achievement was 64%. He also had 3 positive effects out of 3 analyses for desks and the use of instructional media (radio) respectively on students' achievement.

Another strong indicator of students' achievement is the laboratory. A laboratory is a room or a separate building specially built for teaching by demonstration of theoretical phenomenon into practical terms. The saying that "seeing is believing" suggests the effect of using laboratories in the teaching and learning of science will increase students' performance

The early I.E.A. survey asked schools about the presence and utilization of classroom laboratories. These measures were rather consistently related to higher achievement especially in developing countries. They identified two measures of laboratory use:- number of students in laboratory classes and time spent in laboratory classrooms. These were also found to be positively related to achievement (I.E.A., 1973).

School library is another material resource which could raise students' achievement. The works of Carnoy (1971) and Hussen et al (1978) stated that the simple presence of school library is related to the school's average achievement especially in the third world and developing countries. The efficacy of library size and its utilization rates were found to be significant and much less strong than the social class control variables and the availability of text books. Ryan (1973). Importance of school library is attested to in the National Policy on Education (NPE) as follows:

Libraries are one of the most important educational services. Each State Ministry needs to provide funds for the establishment of libraries in all our educational institutions and to train librarians and library assistants for this service.

In a study conducted by Popoola (1981) on the relationship between institutional resources and academic performance, the investigator discovers that the library correlates with academic performance showing that schools with well-equipped library normally maintain high academic performance.

School building is another material resource which has relationship with academic performance. Olutola (1981 and 1982) notes that the availability of the school building and other plant facilities which of course are very vital physical resource items in the educational system is an important factor which contributes to good academic performance. According to him, they enhance effective teaching-learning activity. He explains further that well-sited school buildings with aesthetic conditions, playground, lavatory usually contribute to the achievement of higher educational attainments by the students. Although, school buildings are very important inputs into the educational system, expensive ones may not necessarily improve academic performance. Williams (1973) states that:

> There is very little evidence about the relationship between differences in the quality of buildings which involve substantial resources on one hand and the differences in the quantity and quality of student output on the other hand.

Statement of the problem

This study sought to identify the pattern of material resources and to find the relationship between material resources and students' performance in secondary school Physics in Oyo State.

Research questions

The following research questions were used to guide the study:

- Q1 What is the pattern of material resources in Oyo State secondary schools?
- Q2 What are the composite and relative contributions of material resources to students' performance in secondary school Physics in Oyo State?

Procedure

Population, sample and sampling technique

The principals and SSI physics students in all the senior secondary schools in Oyo State constituted the population of this study. Oyo State was purposefully chosen because of the investigator's knowledge of the location of the schools in the State. SSI physics students were used because SSI students' result obtained can be used to improve their quality in subsequent classes. Multistage sampling techniques were used in this study, these include at: local government level, school level, and subject level:

1. **Sampling at local government level:** Out of the 33 Local Government Areas (LGAs) in Oyo State, 6 were randomly selected.
2. **Sampling at school level:** There were 106 schools in the 6 Local Government Areas selected, forty (40) schools were chosen using probability proportional to size. Schools selected had at least:
   a) 30 physics students in SSI.
   b) A full-time physics teacher for SSI.
3. **Sampling at subject level:** The actual number of students randomly selected are between twenty-five (25) and twenty-nine (29) in each of the forty (40) schools, the school principals also partook in the study. So in all, there were one thousand and twenty-nine (1029) Physics students, and forty (40) principals.

Research instruments

Two research instruments were used for this study:

1. **Physics Achievement Test (PAT):** The Physics Achievement test (PAT) consists of two sections A and B. Items were drawn from mechanics and properties of matter (this formed section A) and Heat (this formed section B) of Ordinary Level Physics teaching syllabus.
   PAT is made up of 30 items with options A, B, C and D. Originally, 200 PAT items were developed (for SSI physics students) and validated by Farombi (1990). From these 200 items, 30 items with almost equal

distractive indices, high and positive discriminating values and difficulty indices between 0.40 and 0.60 were selected. An investigation of the scheme and record of works of all the schools used in the study showed that the topics from which PAT items were picked had been covered. The Kuder-Richardson formula 20 was used to establish a reliability estimate of 0.778 for the test. It should be noted that the Kuder-Richardson 20 according to Thorndike (1973), is appropriate for reflecting the internal consistency of dichotomously scored items.

2. **School Questionnaire (SQ):** SQ is divided into 2 sections, these include: the background information and the pattern of supervision in the school setting. The background information (GBI) addresses the issue of name, Local Government Area, location (urban, less urban and rural) and age of school, the total number of students and staff (teaching and non-teaching). The second section addressed the issues of maintenance of Physics facilities. This instrument was validated by two experts at the Institute of Education, University of Ibadan.

Method of data analysis

PAT was dichotomously scored using scrorbatt programme for right or wrong. Every student who shaded the correct option was scored 1 while shading the wrong option earned zero. Students' total scores therefore represented their achievement in physics. Descriptive statistics and multiple regression analysis were used to answer the research questions 1 & 2 respectively.

Results and discussion

Research Question 1

What is the pattern of material resources in Oyo State secondary schools?

Descriptive statistics were used in answering this research question. These include mean (a measure of the central tendency), standard deviation (a positive square root of variance which is a measure that reflects the degree of variability in a group of scores). Others are: the minimum and maximum of the scores (to identify the range of the spread of the scores) and finally, the frequency of the mean and its percentage are calculated and reported as seen in the following table. However, in order to determine the level of material resources, it is necessary to see the pattern of human resources under investigation. This is revealed in Table 1.

Table 1: Level of Human Resources

Human Resources	Mean	Std. Dev.
Students population	1803.80	1241.39
Full-time teachers	40.36	6.58
PTA teachers	7.33	7.08
Non-teaching staff	15.85	13.79

Table II reveals the descriptive characteristics of the variables in the research question above.

Table II Level of Material Resources

Variables	Min	Max	Mean	S.D
Students' chairs	250	2087	1242.95	721.86
Student. lockers	302	2103	1273.55	767.07
Students' stools in the laboratory	0	57	39.67	23.05
Students' benches in the laboratory	0	18	10.25	9.85
Students' tables in the laboratory	0	27	16.30	11.91
Teachers' chairs	19	60	35.30	18.86
Teachers' tables	19	58	34.67	19.50
Typewriters	0	8	2.07	2.26
Duplicating Machine	0	6	1.20	0.76
Radio Sets	0	4	1.17	0.87
Projectors	0	2	0.40	0.06
Wood/Steel cabinets	0	9	4.13	3.67
Fans	0	8	3.15	2.75
Refrigerators	0	5	0.80	0.38
Easy chairs	0	8	3.60	2.18
School bus	0	3	0.10	0.09
Lawn mower	0	2	0.03	0.01

Bicycles	-	-	-	-
Motor cycles	-	-	-	-
Book shelves	0	12	5.00	4.43
Chairs and tables in the Library	0	34	20.20	18.53
Library size (m^2)	0	87	65.92	34.32
Playing grounds	9	12	2.45	1.81
Generator/Plants	0	3	0.20	0.46
Air conditioners	0	3	0.18	0.45
Sports materials	10	101	54.63	48.19
Number of Classrooms	16	47	30.29	14.86
Classroom size (m^2)	284	33.34	27.99	11.46
Volume of Textbooks	100	1000+	589.98	104.9

Table II reveals the mean, standard deviation and percentage of the level of material resources. Since students took the largest percentage of the school population, one expects that the number of chairs and lockers should be very high. This was seen to be so as the combination of chairs and lockers are found to be about 91% of the total material resources considered. Items like school bus, lawn mower, generator/plant, air conditioners, etc. were few in number when compared with others.

Research question 2

What are the composite and relative contributions of material resources to students' performance in secondary school Physics in Oyo State?

The combined and relative contributions of the independent variables in explaining the dependent variable are used to answer the research question. Students' achievement in Physics was, therefore, regressed on all the variables relating to material resources. Table 3 presents a summary of the multiple regression analysis for material resources.

Table III(a): Regression Summary or Material Resources Explaining Students'

Multiple R	0.82400
R Square	0.67897
Adjusted R Square	0.65234
Standard Error	2.32524

Table III(b): Analysis of Variance

Source of variance	DF	Sum of Squares	Mean Square	F-ratio
Regression	23	182.96453	7.95498	3.47130*
Residual	16	36.66624	2.29164	

** = significant at p<0.05.*

Table III(c): Parameter Estimate

Variable	B	SE B	Beta
Laboratory equipment	0.278171	1.001357	0.080201^{ns}
Students' stools in the laboratory	6.192247	7.651705	0.824286*
Students' benches in the laboratory	3.263200	1.500872	0.612700*
Students' tables in the laboratory	-2.613774	3.922351	-0.347934^{ns}
Typewriters	11.907059	7.726608	0.7432450*
Duplicating Machine	0.582557	5.765080	0.109955^{ns}
Radio Sets	-0.301459	1.653832	-0.060838^{ns}
Projectors	-1.183400	2.176129	-0.192089^{ns}
Wood/Steel Cabinets	2.951926	4.599078	2.567943*
Fans	-2.017718	3.034495	-0.396388*
Refrigerators	-0.533662	1.188226	-0.126327^{ns}
Easy chairs	3.135917	2.855099	0.655523*

School bus	2.082680	2.133849	0 320336^{ns}
Lawn mower	0.893047	3.106056	0.121343^{ns}
Book shelves	1.423527	1.960848	0.300086^{ns}
Chairs and tables in the Library	4.560273	4.028577	0.785739*
Library size	0.014976	0.017592	0.624122*
Textbooks	3.366187	0.977027	0.516096*
Playing grounds	1.185931	2.333489	0.209383^{ns}
Generator/Plants	3.213303	2.463138	0.760647*
Air conditioners	2.827728	2.466485	0.448368*
Sports materials	-1.092229	1.496749	0.255753^{ns}
(Constant)	0.1000001	2.325242	

** = significant at $p<0.05$*
ns = not significant at $p<0.05$.

Results in Table III (a-c) show that the combination of all the variables in material resources have a multiple correlation of 0.9268 with the students' achievement in Physics. However, the combination of these variables explained 67.91 percent the variance in students' achievement in Physics as shown by the coefficient of determination (R^2 = 0.6791). The analysis of variance further shows that there exists a clear trend of increase in students' achievement in Physics with material resources available in schools as an F-ratio of 3.4713 (significant at $p<0.05$) is observed.

Results as shown under parameter estimate indicate that partial correlation coefficients of laboratory equipment, students' stools in the laboratory, book shelves, air conditioners, playing ground, library tables, library size, school bus, mower, typewriter, cabinet and duplicating machine have positive partial correlation with students' achievement in Physics. One the other hand, the remaining variables have negative partial correlation coefficients, with students' achievement in Physics.

The standardized regression coefficients were used to determine the relative contributions of each of the variables in material resources to the explanation of students' achievement in Physics. The significance of each variable's contribution when tested shows that benches, stools, textbooks, library size, typewriters, cabinets, fans, easy chairs, plant/generator, projector and air conditioners contributed significantly ($p<0.05$) to the explanation of students' achievement in Physics.

Discussion

School materials used in this study can be categorized into three, these include those materials owned or used by the students almost everyday; notebooks, textbooks, students' chairs and lockers, and so on. The second one is the material used by the teachers; textbooks, chairs and tables, and so on, and the last is the one owned by the school (i.e. school assets); buildings, air conditioner, fan, easy chairs and so on. Other material resources not considered in this study are farm, (crop and animal) implements like hoes, cutlass, pens, drinkers, feeders and so on.

The level of the material inputs in the school system is low, from the result of this study, it was evident that there are some students who did not have chairs to sit even though some of them have lockers, while others did not have any of the two as seen in Tables III(a) and III(b) For example, the maximum students population is 3214 students while maximum number of chairs and lockers are 2087 and 2103 respectively.

Generally, the combination of all the variables in material resources can be said to have explained 68 percent of the variance in students' achievement in Physics and the remaining 32 percent was being accounted for by extraneous variables. There are quite a number of variables in material resources which contributed significantly to the prediction of students' achievement in Physics. These include laboratory equipment like stools and benches. In the early IEA study, questions which centre on the presence and utilization of classroom laboratories was asked.

A school library is another material resource which significantly influences students' achievement in Physics. This study did not include the activities in the school library like the frequency of visitation to the library (which can be measured by a register) or how often a student consulted textbooks in the library. There are five measures considered in library, these are: presence of a school library, how adequate the school library is equipped, adequacy of library furniture (like chairs, tables and bookshelves) school librarian and library size. Fuller (1986) in a study found significant influence of school library on school achievement. He also discovered that library size had significant effects on academic achievement.

Some material resources that can be described as luxury (fans, air conditioner, generators, easy chairs) were found to have significant effects on students' achievement in Physics. This points out that students learn better under a conducive atmosphere, where there is no problem of heat and low intensity of light. It can be argued that students who read in a hot room are likely to be distracted consequently, lowering their achievement level.

Textbooks are also found to contribute significantly to the prediction of students' achievement in Physics. In this study, focus was not on the frequent

use of textbooks but on the volume of textbooks a student possesses. Fuller (1986) is of the view that there was a positive impart of instructional materials especially those directly related to reading and writing (measured in terms of the number of textbooks available per student).

Findings in this study agree with earlier research study findings to the effect that higher availability of textbooks and other instructional materials boost the quality of learning activities which increases students' learning outcomes (Heyneman and Loxley, 1983). Similarly, the provision of desks opportunity to read and write, thus raising students' achievement (Arriagada, 1983). The availability of school material resources provides more motivating condition for learning, thus raising achievement level (Heyneman and Jamison, 1980).

Conclusion and recommendation

It has been established in this study that the level of material resources is low in schools, government should be able to provide these resources so that teaching and learning will be enhanced. The Parents Teachers Association (PTA), philanthropists and other charitable organizations are also encouraged to compliment the effort of government. Moreover, there are some material resources that could be improvised by the teachers and the students in order to facilitate teaching and learning, such materials should be provided by the teachers and the students respectively.

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