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RESOURCE MANAGEMENT A CORRELATE OF STUDENTS' ACHIEVEMENT IN SECONDARY SCHOOL PHYSICS IN OYO STATE

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Abstract

This paper focused on resources management as a predictor of students' achievement in secondary school physics. Resource management is measured using some six variables as related to physics. These include planning of physics class; replacement of damaged physics facilities; maintenance of physics facilities; frequency of repairs of physics facilities; organization of the use of physics facilities; and marking exercise of students' assignments by the physics teacher. A total of 1,029 SS1 physics students from 40 schools with their principals participated in the study. Descriptive statistics and multiple regression analysis were used to answer the two research questions. Two research instruments – Physics Achievement Test (PAT) and the School Questionnaire (SQ) were used in this study. The results of the study show that the level of resource management can be average. Again, four out of six independent variables contribute significantly to the prediction of students' achievement in physics. It is therefore recommended that teachers should organize their classes as scheduled and that repairs should be done regularly on malfunctioning physics facilities.

Introduction

Physics which is the study of matter, energy and their interactions is an international enterprise, which plays a key role in the future progress of humankind. The importance of physics education and research in all countries of the world manifests in the following ways: development of alternating current (ac), hydroelectric power, electric motors, radio, microwave ovens, satellites, radar, modern rocketry, the solution of the DNA structure, nuclear magnetic resonance, magnetic resonance imaging, X-rays, lasers, transistors, light-emitting diodes, oscilloscopes, television, holography, and the World Wide Web (originally developed for high-energy physicists), and so on. Science, with physics as its foundation, can solve many of the impending crises facing the society, such as global warming, overpopulation, poisoning of our planet, waning energy and other natural resources.

Unfortunately, irrespective of the importance of physics in the national development, physics as a subject is undesirable to most students (Adewale, 2002) as evident in the low enrolment – it should be noted that over the years the enrolment pattern in the subject does not assume any particular pattern (Farombi, 1998). Apart from the low enrolment, students' performance in physics is another source of concern (Adewale, 2002). The students' achievement which is one of the measures of school effectiveness is low. A basic definition of school effectiveness is the production of a desired result or outcome in the school. It is clear from research literature that the quality of teaching is at the heart of effective schooling. However, high quality teachers do not always perform to their full professional and teaching styles (Sammons, Hillman & Mortimore, 1997).

The question remains, according to Owens (2004), what is it that some schools do in order to fulfill the responsibility of quality teaching? Smith (in Owens, 2004) developed a penetrating analysis of the effective school research literature by stating "the most persuasive research suggests that students' academic performance is strongly affected by school culture". Successful schools are found to have cultures that produce a climate conducive to teaching and learning. The goal is to change the school culture, which requires staff members to assume responsibility for school improvement, which in turn is predicted on their having the authority and support • necessary to create instructional programs that meet the educational needs of their students.

Beare, Caldwell and Millikan (1989) drew from research on school and teacher effectiveness to suggest that instructional leadership should involve two broad interrelated areas of activity: the fostering of excellence in teaching and the capacity to deal successfully with certain 'key situations'. They concluded that to achieve excellence in teaching involves six types of activity:

- **Clinical assistance:** This means the capacity of the teacher to diagnose student needs and provide learning experiences to meet the needs of each student.
- **Planning:** The selection of appropriate objectives, learning experiences and assessment procedures by the teacher.
- **Instruction:** The successful communication and achievement of experience for all students.
- **Classroom management:** Maintaining an orderly environment for learning.
- **Monitoring of progress:** This is a continuous process of assigning and reporting for all students, providing information for the ongoing process of clinical assistance, planning and instruction.
- **Care for Student:** This is an action on the part of the teacher which reflects values such as respect, acceptance, support and recognition.

They identified the key situations in instructional leadership as:

- Teacher supervision and development
- Teacher evaluation
- Instructional management and support
- Resource management
- Coordination
- Trouble shooting

Scheerens and Creemers (2001) acknowledged that more refined models of school effectiveness have been developed by educational researchers (e.g, Duckworth, 1983; Glasman & Biniaminov, 1981; Blom, Brandsma & Stoel, 1985; etc). they took into consideration the student's socio-economic background variables and learning theory at the student level. Although students' socio-economic background cannot easily be influenced by education, it is used as a control factor which has to be taken into account in order to facilitate interpretation of other factors.

Scholars are in agreement that resources (human and non- human) are very important to the success of any worthwhile educational endeavor (Vaitzey, 1968; Taiwo 1969; Bowles, 1974; Fields, 1974; and Adaralegbe, 1983). These scholars point out that the availability of funds, teachers, students and materials (like school buildings, number of chairs, desks and other facilities) are necessary for the attainment of any educational objectives. Unfortunately, these resources are not properly managed in schools; this may happen if the school heads are not aware of the practices of resource management. The following arguments pointing to the fact that resources should be properly managed were put up by Farombi (1998):

1. If the resources are inadequate or poor in terms of quality, the process of teaching and learning will be defective and the learning outcomes will also be defective.
2. If the resources are adequate and of good quality, but the processor poor, that is, if the tools and other facilities (inputs) available for the educational system are not properly managed, the learning outcomes will be adversely affected.
3. If on the other hand, however, the resources are available, relevant and reasonably adequate and in addition, prudently used and managed, there is the likelihood that the learning outcomes will be of high quality.

   It is hoped that this paper will point out ways in which the school heads and their sub-ordinates will be informed on resource management.

Statement of the Problem

This study sought to identify the pattern of resource management and to find the relations between resource management and students' performance in secondary school physics in Oyo State.

Research Questions

The following research questions were used to guide the study:

1. What is the pattern of resource management in Oyo State?

2 What are the composite and relative contributions of resource management in Oyo State?

Methodology

Population, Sampling and Sample

This is a survey which used a target population of all physics students in senior secondary schools 3 (SS 3) and teachers of physics in Oyo State. The study adopted a multistage stratified random sampling technique. The sampling was at four levels: the senatorial districts level; the local government areas (LGAs); school and subject levels. Stratified random sampling technique was extensively used in selecting samples for the study. This sampling technique was used because stratification increases the reliability of survey estimates; improves efficiency of the sampling technique; allows the use of different sampling techniques for a single study; and ensures adequate representation of specific groups in a target population.

As at the time of this study, there were 33 LGAs in Oyo State, stratified into three senatorial districts. From each district, three LGAs were randomly selected. In all, a total of nine LGAs participated in the study. Sampling at school level was done by collecting a list of all secondary schools by ownership status (private or public) and location (urban or rural) from the Oyo State Ministry of Education. Schools in each LGA were stratified by location and ownership status. Three schools in the ratio of one private to two public were randomly selected from each of urban and rural locations, making a total of six schools in each LGA. Sampling at participant level (students) was done using simple random sampling technique to select 20 students at SS 3 level. In addition, physics teachers who were directly responsible for teaching the selected students were involved in the study. In all, 54 physics teachers and 1,080 SS 3 students in 54 schools participated in the study.

Research Instruments

Two research instruments were used for this study: these are the Physics Achievement Test (PAT) and School Questionnaire (SQ).

Physics Achievement Test

This is a forty-item test with a four-option format A, B, C and D. The items used in the test were developed from the SS 3 physics syllabus (curriculum-referenced) to ensure good content coverage. Students were expected to select the option that best expressed their knowledge. Distribution of items by content and cognitive behaviours is presented in Table 1. The first three levels of cognitive operation (knowledge, comprehension and application) were used in this study. Since the students were in SS 3 and were getting ready for their school certificate examination, it was expected that they would have covered the syllabus and that was why the test items examined all the branches of physics.

Table 1: Table of Specification

Content	Level of Cognitive Operation			Total
	Knowledge	Comprehension	Application	
Light	7	2	3	12
Mechanics	6	1	3	10
Heat	3	1	2	6
Light	2	1	1	4
Electricity	2	1	2	5
Modern Physics	1	1	1	3
Total	**21**	**7**	**12**	**40**

An initial pool of 100 items was trial tested on a similar group of studentc in a LGA not selected for field work. Comment from the trial testing exercise was used to enrich the test. The items in the test with facility indices ranging from 0.2 to 0.6 as suggested by Thorndike (1997) were retained, and those outside this criterion were discarded. Fifty items fell into the criterion set but some of them had structural problems and the 50 items were pruned to 40 as shown in Table 1. The 40 items discriminated between strong and weak students. A K-R 20 (a measure of internal consistency and construct validity, Thorndike (1997)) of 0.87 was obtained. The value is high and could be used for the study.

School Questionnaire (SQ)

SQ is divided into 2 sections A and B. Section A dealt with the background information of the schools and the principals name, local government area, location (urban, less urban and rural), age of school, the total number of students and staff (teaching and non-teaching). Section B dealt with the pattern of supervision in the school setting which addressed the issues of maintenance of Physics facility, planning of Physics class, of repair and organizing the use 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 attracted a score of zero. Student's total scores therefore represented their achievement in Physics. Descriptive statistics and multiple regression analysis were used to answer the research questions 1 and 2 respectively.

Results and Discussion

Research Question One

What is the pattern of resource management in Oyo State?

The research question was answered by considering the six variables which constitute the resource management in this study. The variables are: planning of physics class; replacement of damaged physics facilities; maintenance of physics facilities; frequency of repairs of physics facilities; organizing the use of physics facilities and marking physics assignment.

Table 1 Resource Management

Variable	Level	Freq	%
Planning of Physics class	Never	19	47.5
	Rarely	8	20.0
	Often	2	5.0
	Very often	1	2.5
	No response	10	25.0
Replacement of damage Physics facilities	No damage	10	25.0
	Caution fees	13	32.5
	Never replaced	7	17.5
	Replaced by defaulters	10	25.0
Maintenance of Physics facilities	By company	1	2.5
	By principal's instruction	2	5.0
	By lab attendant	24	60.0
	By science teacher	13	32.5
Frequency of repairs of Physics facilities	Never	-	-
	Occasionally	32	80
	Regularly	8	20
Organizing the use of Physics facilities	Never	6	15.0
	Rarely	10	25.0
	Often	10	25.0
	Very often	4	10.0
	No response	10	25.0
Marking Physics assignment	Never	11	27.5
	Rarely	9	22.5
	Often	6	15.0
	Very often	3	7.5
	No response	11	27.5

Above, 47% of the schools indicated that they never planned for physics class. This implies that although teachers may go to classes, their level of preparedness to teach the prescribed content is low. Very few teachers prepared for physics lesson. Above 60% of the schools were able to adequately organize the use of physics facilities while only 15% were unable to.

Some teachers did not assign marks to their students' home work or class exercise, it is only 7.5% of the teachers who reported that they marked students' home work or class exercise on a continual basis, the rest did it when they are able or willing to do so. There were some schools 25% where none of the material resources was damaged. Few schools reported that most of the damaged material resources were never replaced.

When an item is damaged by the students, only 25% of the schools indicated that the material resources were replaced by the defaulters. Most of the schools maintain (i.e. oil the metallic instruments, dust the wooden facilities and so on) their material resources through the help of the science teachers and laboratory attendants, repairs of materials and facilities were often carried out in most schools occasionally, which means that there are times when these materials are not repaired.

Research Question 2

What are the composite and relative contributions of resources management to students' achievements in physics in Oyo State?

The combined and relative contributions of resource management in explaining the students' achievement in physics were used to answer the research question stated above. Students' achievement in physics was therefore regressed on the independent variables as shown in Table 2(a-c).

Table 2(a) Regression Summary of Resources Management Explaining Students' Achievements in Physics

Multiply R	0.76605
R square	0.58683
Adusted R square	0.56823
Standard Error	0.55917

Table 2(b) Analysis of Variance

Source of variation	Df	Sum of square	Mean square	F-ratio
Regression	6	108.88830	18.147	3.72951*
Residual	33	160.58425	4.86619	

* = Significant at P < 0.05

Table 2(c) Parameter Estimate

Variable	B	SE B	Beta
Planning a Physics class	0.69399	0.48858	0.48485*
Replacement of damaged Physics facilities	0.27999	0.17891	0.29011
Maintenance of Physics facilities	0.19306	1.18267	0.52964*
Frequency of repairs of Physics facilities	0.41263	1.09037	0.01162
Organize the use of Physics facilities	0.20199	0.77374	0.32433*
Marks assigned by Physics teacher	1.26642	1.12299	0.62427*
Constant	0.69852	1.06463	

* = Significant at P < 0.05

Results in Tables 2(a-c) show that the combination of all the variables in resource management has a multiple correlation of 0.76605 with the students' achievement in physics. However, the combination of these variables explained 58.68% of the variance in students' achievement in Physics as shown by the coefficient of determination (R2 = 0.58683). The analysis of variance further shows that there is a clear trend of students' achievement in Physics increasing with resource management with an F-ratio of 3.72951 significant at 0.05. Results as shown under parameter estimate indicate that partial correlation coefficients of all the variables in resource management have positive relationship with students' achievement in Physics.

The standardized regression coefficients were used to determine the relative contributions of each of the variables in resource management to the explanation of students' achievement in Physics. The significance of each variable's contribution was tested, and it was observed that planning a Physics class; maintenance of physics facilities; organizing the use of physics facilities and marks assigned by the physics teacher contributed significantly to the explanation of students' achievement in Physics.

Discussion

Very few teachers prepared for physics lesson. Such preparations include, lesson note preparation, arrangement of physics apparatus and equipment, getting students ready for the day's activities. There are other levels of preparations by teachers such as physical and psychological preparations. When teachers are prepared physically and psychologically, they tend to teach better than when they are not prepared. Unstructured observations made during data collection shows that majority of the schools in the rural areas were not able to organize the use of physics facilities probably because not many teachers in those schools were experienced in the use of newly supplied physics facilities. Another factor is that in-service training for the newly recruited physics teachers was not available. In both rural and urban schools, a quick estimate of time spent by teachers in a typical physics classroom in a week is 2 hours (3 periods of 40 minutes). Attempt was made to find out the actual time (time on task only for one week) Physics teachers go to teach; it was found out that a mean of 1.6 hours was actually utilized by teachers in physics classrooms.

Physics being one of the basic sciences involves practical classes. Thus, from experience, students perform better in practical Physics than in theory. That explains why 60 per cent of the students responded that they were able to use facilities (which include apparatus and equipment). One will expect that all the students should be able to use Physics facilities without difficulty, but it should be borne in mind that the students are in year one.

Some teachers did not assign marks to their students' home work or class exercise. Students' home work has been a consistent predictor of achievement (Farombi, 1998), if the feedback on students' achievement is not provided (Anjorin, 2008, Kumuyi, 2007), it is unlikely that students' achievement will be high.

Every school that has some of the facilities damaged had a means of replacing or repairing the facilities. For example, in some school, no damage was recorded. However, in some other schools where some facilities were damaged, different methods were in place to restore such damaged facilities. For example, the facilities could be replaced from the caution fees or the damaged facilities replaced by defaulters. However, some schools (seven of them) found it difficult to use any of the approaches as there were never replacements of the damaged facilities.

The multiple regression analysis showed that planning a physics class; maintenance of physics facilities; organizing the use of physics facilities and marks assigned by the physics teacher had significant contribution to the explanation of students' achievement in Physics. It should be pointed out that, the use of Physics facilities explained student's achievement in Physics because physics is a practical oriented subject, hence as students manipulate the facilities which include apparatus and other equipment, they are likely to perform better. In a case where these facilities are absent, there is the likelihood that students will not perform well. Frequency of repairs of Physics facilities does not predict students' achievement in Physics probably because most of the schools repaired theirs occasionally. It is assumed that if the repairs are carried out regularly, there is the likelihood that frequency of repairs may raise students' achievement in Physics.

Conclusion and Recommendations

Resource management in Oyo State secondary school physics class cannot be said to be absolutely bad. This is because Physics facilities are maintained either by companies; the laboratory attendant or Physics teacher. Moreover, the repairs on the physics facilities were carried out occasionally (although it should be done regularly). Again it cannot be said to be absolutely good since more than half of the teachers did not plan for their lessons as they ought to while less organized the use of Physics facilities. It can also be seen that four (the planning a physics class; maintenance of physics facilities; organizing the use of physics facilities and marks assigned by the physics teacher) out of six variables in resource management predict students' achievement in Physics. This implies that as teachers plan their lesson, there is the likelihood that students will perform well. Again, maintenance has a direct relationship with students' achievement in physics; therefore, physics facilities should be maintained. Since students' home work is a consistent predictor of students' achievement in physics, it is recommended that physics teachers should provide feedback on students' home work and assignments in physics.

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