43

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Editorial Board

Contents

A Path Analytic Model of School Factors and Students' Achievement in Senior Secondary School Physics in Oyo State, Nigeria.

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Abstract

The study examined school factors (school distance from students' home, class size, government grants, availability of parent teachers association and instructional leadership) as determinants of students' achievement in SS physics in Oyo stale, Nigeria. Fifty-four principals and 1, 080 students in 54 schools were involved in the survey. Physics Achievement Test and School Questionnaire were used to collect data. The five predictor variables were meaningful and significant to the criterion variable (students' achievement in physics). Instructional leadership contributed the most and class size the least. It is recommended that principals should exert their influence in the schools by making teachers do their work, maintain order and discipline, these are likely to increase students' achievement in physics.

Key words: School effectiveness; Instructional leadership, School factors, Students' achievement in physics.

Introduction

A growing body of literature on effective schools has regularly emphasized that the school head should be a key actor in bringing about productivity (Ellett 1996; Block, 1995). Since the beginnings of the principalship in American education, educators have struggled to define a distinctive role for the position. Theoreticians and analysts have repeatedly dissected the job and its place in the larger social and educational

context, transforming principals from "bureaucratic executives" to "humanistic facilitator" and then "instructional leader" (Stoll & Fink, 1996). The multiplicity of demands for school head as an instructional leader creates role conflict. Surveys persistently find that school head feel torn between the instructional leadership that almost everyone agrees should be the top priority and the daily management chores that are almost impossible to ignore; often time, the managerial responsibilities of the principals seem to take precedence (Chan & Harbison, 2002).

Although, an effective, school head is not all that is required for an effective school, it is, however, very difficult to have a good school without a good school head. Ajayi (1985) believes that a leader is a member of a group who has the ability to influence the behaviour of the other group members and consequently making them to do what else they would not have done. Scheerens (1992) observes that effective school head are differentiated from average ones by the fact that they do not simply "mind the shop" but are also geared towards achieving high teaching result and in order to realize this, are prepared to become actually involves with teaching. This assertion is shared by Adewale (2004) when he states that effective leaders yield good results because, they structure work in a way that members are motivated toward high effort. They also positively influences their abilities and role perception so that these factors combine with high efforts lead to high performance. The school head is the pivot of school activities. The quality of learning that goes on in the school depends to a large extent on the head teacher's effectiveness.

Apart from the school head being an instructional leader in the school, he/she also mediates between the school and the home through the Parent Teacher Association (PTA). The view of Redding (1991) that a "positive home - school relationship increases student achievement" is very apt here, and should be complementary. The effective head teacher uses his personality, personal and professional characteristics as well as his leadership style to determine the 'ethos' of the school that will positively bring about enhanced students learning. These school qualities are supported by the studies of Anyanwu, (2000), Postlethwaite

and Ross (1992). In NAEP2007, PTA source contributed most to the prediction to students' achievement in Mathematics and English language. The plausible explanation to this finding is that the PTAof any school is usually the closest out of the bodies listed. As such, the PTA is most likely to appreciate the requirements of the school and the funds needed to execute any identified school projects, which are needed to facilitate learning. Similarly, the PTA is in a better position to monitor the execution of such projects and to ensure accountability.

Another school factor that influence students' achievement is class size. The National Policy on Education stipulates that there will be a maximum of 35 students in a class (FRN, 2004). The relationship between the maximum number of students in a class and students" achievement in Mathematics shows that the higher the number of students in a class, the lower the students' achievement in Mathematics (NAEP, 2007). The reason could be that if there are few students in the class, the teacher will be able to have personal interaction with them and it is likely that this interaction will improve the students' achievement in Physics. The NAEP findings are consistent with those of Glass and Smith (1978) who concluded that achievement decreased as you add students to very small classes. They also noted that decreasing class size from 40 to 20 students creates a 6 percentile increase on an average achievement test. Achilles, Jayne, Fulton, Nye, and Wallenhorst, (1992), Housden, (1992) Mitchell and Beach (1992) also found that there was a positive statistically significant impact of lower class size on students' achievement. However, in their meta-analysis, Robinson (1990) found that out of 22 studies of K-3, eleven found reducing class size had a positive effect on achievement in reading. Two found in favour larger classes and nine found that there was no significant difference between performance in large and small classes.

Distance of schools from students' homes is another school variable that can affect students' achievement. There have been debates during the school mapping exercise in Nigeria that students should be in school less than 2kilometres away their homes. This has not been fully adhere

to because the policy is new. Establishments of schools in the past did not follow a scientific approach of school map. Schools were established to fulfilled political promises not minding the distance of the school to the homes of the populace, it is therefore, noticed that there are many schools that are far away from the students' homes. Nowadays, schools are established after determining the concentration of schools in a location and the number of populace the school is likely to serve through school mapping technique. NAEP study in Nigeria in 2007 showed that the shorter the distance covered by students to get to their schools, the higher their performance in Mathematics and English language and the farther away the schools are to the students' home, the lower the students' performance in Mathematics and English language.

Government grant is another school variable considered in this study. The national policy on Education stipulates that education in Nigeria will always be the responsibility of the government through payment of teacher salaries, grants and capital expenditure (FRN, 2004). The significant contribution of government grants to the prediction of students' achievement is such that the higher the grants schools received from government, the higher the students' achievement. This is so because the grants received by schools could be used to purchase those items which are likely to promote learning experiences. Examples of such items are teaching aids, library, library furniture and fittings and textual materials (Adu, 2002; Farombi, 1998).These materials are recognized as predictors of students' achievement (Farombi, 1998).Unfortunately, the trend has been to reduce governments' overall spending both nationally and internationally and in many cases, those reductions have resulted in declines in funding for public schools (Haycock, 2005). Hence, it is possible for schools not to have all that is needed to increase students' learning outcomes.

Many studies have considered each of these school factors either singly or in combination of two or three, but this study examines the causal relationship between the five identified school factors (class size, instructional leadership, government grants; school distance from students' home and

availability of parent teachers association) and students' achievement in senior secondary school physics. The following research questions were developed to guide the conduct of the study:

1. What is the most meaningful causal model for students' achievement in secondary school physics?
2. What is the most significant direction as well as estimates of the strength of causation(path coefficients) of the variable in the model?
3. Which of the significant paths are direct and which ones are indirect?
4. What proportions (%) of the total effects are (i) direct and (ii) indirect?

Methodology

Population, Sampling and Sample

This is a survey which had a target population of all Senior Secondary (SS) III physics students and principals in the -- senior secondary schools in Oyo State, Nigeria. 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 (using the existing structure). From each district, three LGAs (equal allocation method) 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 LGAs 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 LGAs, Sampling at subject level (students and principal) was done using simple random sampling technique to select twenty (20) students at SS 3 level. In all, 54 principals and 1,080 SS 3 students in 54 schools participated in the study.

Instrumentation

The instruments used in this study are: Physics Achievement Test (PAT) and School Questionnaire (SQ).

Physics Achievement Test

This is a fifty-item test with five-option format A. B. C and D. The items used in the test were also developed from the SS 3 physics syllabus (with the items 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	15	9	7	24
Mechanics	12	2	6	20
Heat	7	1	4	12
Light	5	1	2	8
Electricity	6	1	3	10
Modern Physics	3	1	2	6
Total	24	14	12	40

An initial pool of 100 items was trial tested on a similar group of students 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 have 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

The school questionnaire administered in the selected schools was designed to gather relevant information from the principals relating to their schools. The questionnaire is divided into two sections A and B. Section A focused on background information on the school. Such information included distance of school from students' home; number of classrooms for physics students, number of physics students, sources of income in the school, availability of the charitable organizations, Parent Teacher Association (PTA), etc. Section B dealt with instructional leadership activities. It has eight items. Examples were: head-teachers' monitoring and evaluation of teaching-learning activities, head-teacher's visits to classes to know what is going on there, students' performance dependence on the effective monitoring of students' progress by the head-teacher. Principals provided information on a modified4-point Liken Scale. The response format used was: Strongly Agree=4, Agree=3, Disagree=2 and Strongly Disagree=1.The instrument was content validated, then it was administered on Principals in fifteen schools not used in the main study. A Cronbach-alpha (a measure of internal consistency and construct validity) of 0.86 was established. The instrument was considered valid and was used as one of the instruments in this study to collect data.

Administration, Collection of Data and Data Analysis

Guidelines for the conduct of the exercise were produced and distributed to all the field officers to ensure uniformity of administration. Data were collected on school basis for editing and analysis. The SPSS software was used to analyze the data. Since students and school variables were used in the study, school was used as the unit of analysis.

Data analysis procedure for this stud) is the confirmatory causal modelling that involves two techniques: multiple regression analysis (backward solution) and path analysis. Blalock (1964) defined causal modelling as a technique for selecting those variables that are perceived to be determinants (causes) of the effects and then attempting to isolate the separate contributions to the overall effects made by each causation through the application of path analytic technique. In order to establish the causal linkage between the school factors and students' achievement in physics, the researcher:

i. built a hypothesized causal model involving school factors as determinant of students' achievement in physics on the basis of temporal order, research findings (from availableliterature) and theoretical ground as suggested by Duncan (1966) and Kerlinger andPedhazur(1973).
ii. identified the path in the model through structural equations.
iii. determined the paths in the model based on statistical significance and meaningfulness.
iv. validated the new model by reproducing the zero-order correlational matrix of the variablesfrom a set of normal equations using the path coefficients in the model.

Building a Hypothesized Causal Model

Path analysis is an extension of the regression model, used to test the fitness of the correlation matrix against two or more causal models which are being compared by the researcher. Consider the variables X_i (i =1,2,3,4,5). It is logical to think that distance of school from students' home (X_1) can affect the

number of students in a school which can also affects the number of students in the class (X_2) (Makoju, Falayajo, Ayodele. Obaitan, Akinsola, Falaye, Adewale, Nwangwu, Shuaibu, and Nwana, 2004). It is logical to think that schools with majority of the students coming from far distance (X_1) will receive government support through the government grant (X_3) and schools with large classes will receive more grants from the government (NAEP, 2007). Presence of Parent Teacher Association (PTA) is a function of the distance of the parents' home o the school. A school where majority of the students" homes are so far away may find it to have a functional PTA. It is also logical to think that class size is dependent on the presence of a functional PTA, this is because PTA can reduce large classes through self-help projects in building more classrooms for the schools. Amount of government's grants going to a school is dependent on the availability of parent teachers association because where there is a strong PTA, government's involvements in terms giving grants may be limited. It is logical to think that where schools are far from students' home, it is likely to make the instruction leaders (principals) ineffective because as he is dealing with truancy, he will also be dealing with late coming which may affect his leadership ability. The same goes for the class size; large class size is a sub-set of overpopulated school. If the school is overpopulated, it may affect the principals in the running of the schools. The function of a school leader is likely to be less cumbersome when the government grant is available. The government grant refers to the subvention each school receives from the government on termly basis. Availability of parent teachers association can also affect the productivity of the instructional leaders because some of the PTAs assist in recruiting PTA teachers and they pay the salaries of such teachers, this venture goes a long way to help stabilise the teaching process especially schools where there are insufficient teachers.

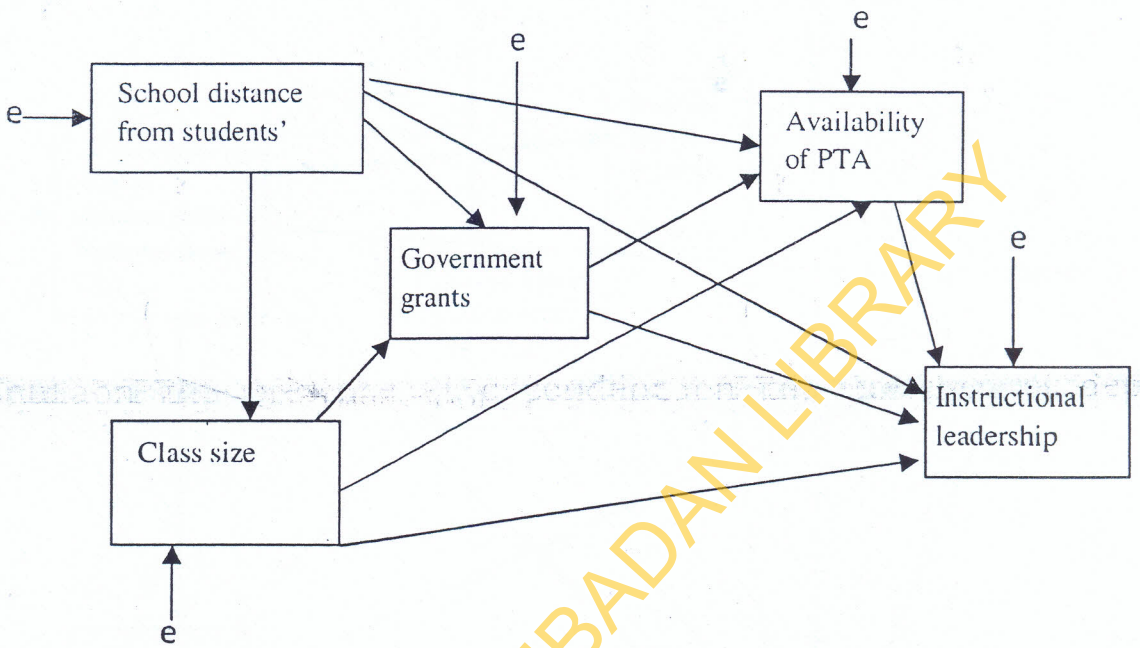

Fig. 1: Causal Paths Among Variables x, (i=l, 2, 3.4 and 5)

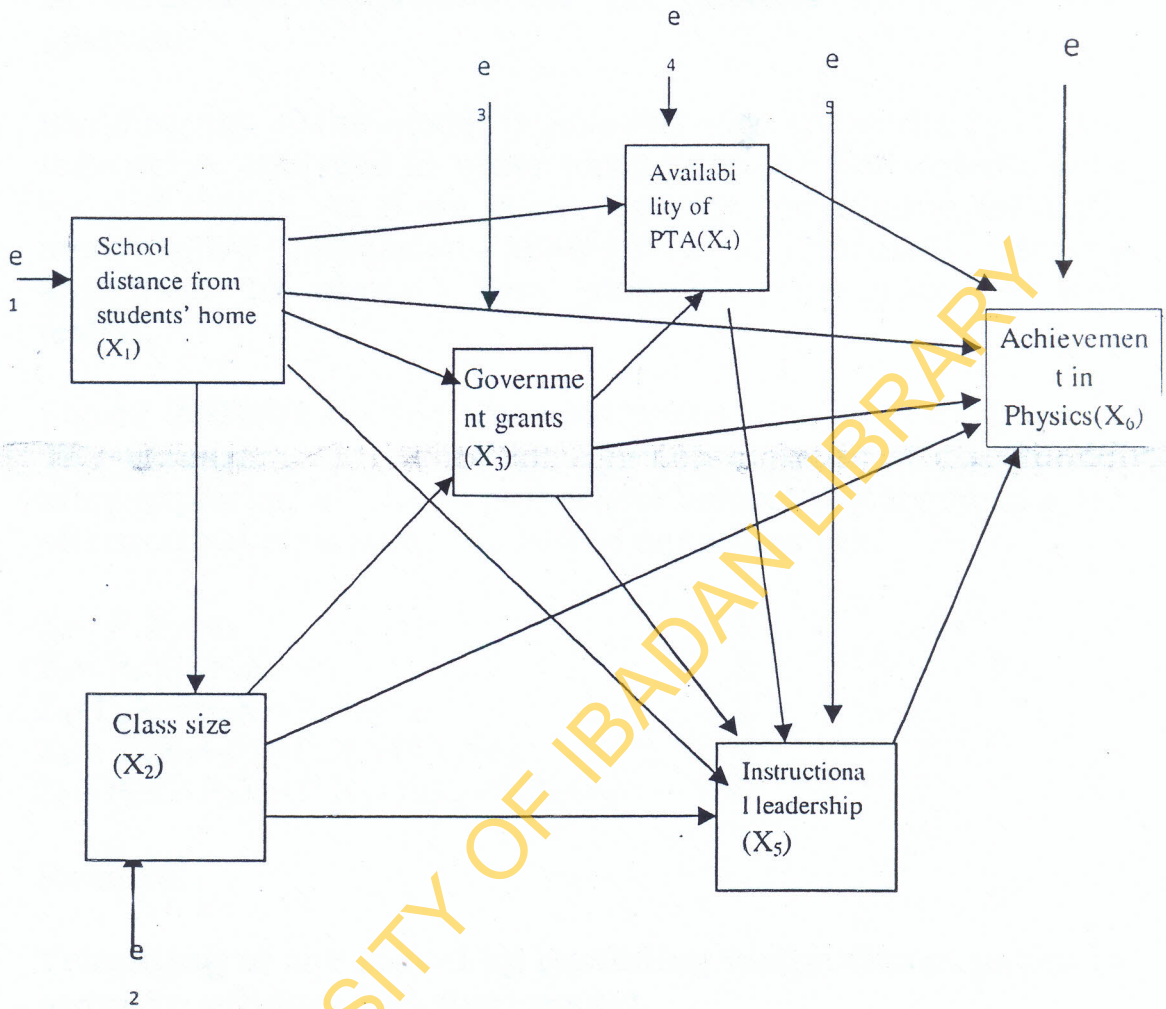

Fig 2 The hypothesized causal paths among the variable xi (i=1 ,2.3,4,5 and 6).

Identifying the paths in the model through the setting up of structural equations for the models by a selected system:

Building up of the model is followed with the running of five regression analyses in order tocompute the path coefficients for the model. As there is no separate programme for path analysis,five regression analyses of standardized scores are used to obtain beta weights whosesignificance was tested.

Figure 2 shows the hypothesized model with its causal paths. The researcher identified thesignificant paths of the model after exploring all the hypothesized linkages by forming a set ofstructural equations 1 to 5. The equations are:

$Z_2 = P_1X_1 + e_2$ 1
$Z_3 = P_1X_1 + P_2X_2 + e_3$ 2
$Z_4 = P_2X_2 + P_2X_2 + P_3X_3 + e_4$ 3
$Z_5 = P_1X_1 + {}_2X_2 + P_3X_3 + P_4X_4 + e_5$ 4
$Z_6 = P_1X_1 + P_2X_2 + P_3X_3 + P_4X_4 + P_5X_5 + e_6$ 5

Results

Trimming of the model by excluding insignificant paths in order to produce the final model

Some researchers recommend that path coefficient of 0.05 and above are retained at specified levels. The trimming helped the researcher to ascertain the possibility of producing a more parsimonious model without much loss of information.

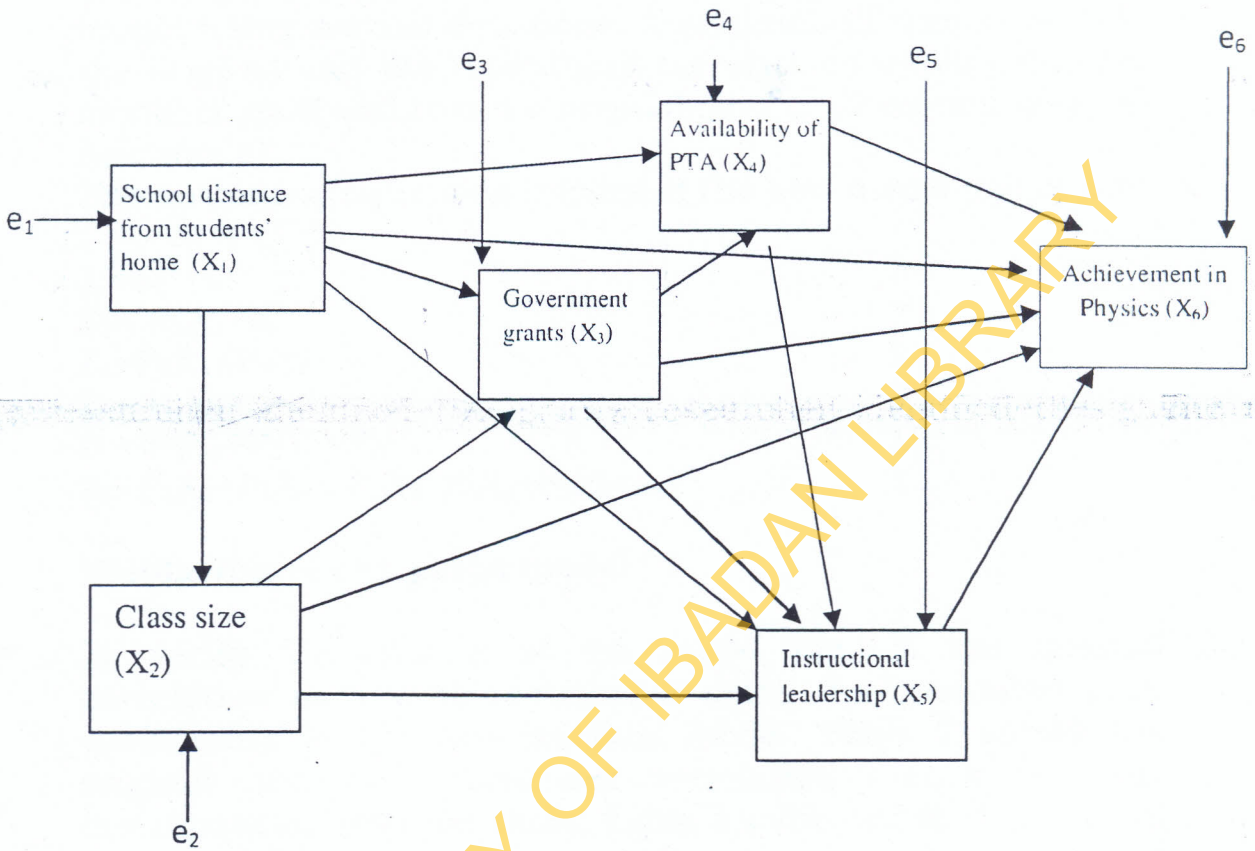

Fig. 3. A More Parsimonious Model

Validation and verification of the usefulness of the model.

The original path coefficients were reproduced in the new model using normal equations. A minimal difference between the original and the reproduced correlations implies that the model is good and that the original data is consistent with the new model.
The structural equations implies in the new model (fig. 3) are:

$Zi=e_1$ 6
$Z_2= P_1X_1+e_2$ 7
$Z_3=P_1X_1+P_2X_2+e_3$ 8
$Z_4= P_1X_1= P_2X_2+P_3X_3+e_4$ 9
$Z_5= P_2X_2+P_3X_3+P_4X_4+e_4$ 10
$Z_6=P_1X_1+P_2X_2+ P_3X_3+P_4X_4+P_5X_5+e_4$ 11

Validation of the paths model

To verify the efficacy of the model (fig. 3) the original correlation data were reproduced using the computed path coefficients in the parsimonious model. Table 2 shows the original and the reproduced correlation matrix and the discrepancies between them. Table 3 indicates that 13 out of the 15 paths are significant and meaningful at 0.05 level and that the mean of the discrepancies (difference) between the original and reproduced correlations (0.021??) is considered minimal (diff<0.05). This is an indication that the pattern of correlation in the observed data is consistent with the more parsimonious model. The new model is therefore considered tenable in explaining the causal relationship between the predictor variables (variables 1-5) and the criterion variables (variable 6). Fig.3 shows the most meaningful causal model involving 132 paths in explaining students' achievement in physics in terms of identified school variables.

Table 2 Correlation Matrix showing the Original and the Reproduced Correlation Coefficients

	School distance (X_1)	Class size (X_2)	Government grants (X_3)	Availability of PTA (X_4)	Instructional leadership (X_5)	Students' achievement in physics (X_6)
School distance (X_1)		.23	-.13	.41	-.18	-.24
Class size (X_2)	.22		.14	-.17	.21	-.23
Government grants (X_3)	-.10	.16		.04	.25	.32
Availability of PTA (X_4)	.43	.19	.04		.31	.26
Instructional leadership (X_5)	-.20	.23	.24	.33		.38
Students' achievement in physics (X_6)	.25	-.21	.29	.26	.37	

Note: 1. Entries above the diagonal are original correlation coefficients

2. Entries below the diagonal are the reproduced correlation coefficients.

Table 3: Discrepancies between the Original and Reproduced Correlation coefficient

Correlation	Original	Reproduced	Difference
r_{12}	.23*	.22	.01
r_{13}	-.13*	-.10	.03
r_{14}	.41*	.43	-.02
r_{15}	-.18*	-.20	.02
r_{16}	-.24*	-.25	.01
r23	.14*	.16	-.02
r24	.17*	.19	-.02
r25	.21*	.23	-.02
r26	-.23*	-.21	-.02
r34	.04*	.04	.00
r35	.25*	.24	.01
r36	.32*	.29	.03
r_{45}	.31*	.33	-.02
r_{46}	.26*		.00
r56	.38*	.37	.01
Total	2.00	2.00	.00

* Significant and meaningful

Discrepancies between the Original and Reproduced Correlation coefficient. The discrepancies between the original and the reproduced correlation coefficients in the model are presented table 3. The total value of the discrepancies is 0.00 and the mean value is 0.00 which is less than 0.05, hence the hypothesized model is tenable and can be used in the model.

The directions and the estimates of the strength of causation (path coefficients) of the variables in the models.

The directions and the estimates of the variables in the model are shown in the path ways which are (i) significant (ii) meaningful and (iii) have a link with the criterion variable. The paths are shown in Tables 4. The table shows 116 paths for the model. The beta weights of the paths (path coefficients), which give estimates of the strengths of the

causations were shown in Fig. 3 as the path coefficients for the new model however, the actual values of the indirect paths wereobtained simply by multiplying the beta weights of the component single path and the r_{12}, r_{13}, r_{23}, r_{14}, r_{24} as applicable.

Table 4 Pathways through which x_i (1-5) caused variations in the dependent variable X_6 at $p<0.05$

Normal Equation	Direct Path	Indirect Paths
r_{12}		1, P_{21}
r_{13}	-	2, P_{31}, r_{12},P_{32}
r_{14}	-	4: P_{41}, $P_{42}r_{12}$, $P_{43}P_{31}r_{12}$,P_{32}
r_{15}	-	7: P_{51}, $P_{53}P_{31}$,$P_{54}P_{41}$, $P_{54}r_{12}$, $P_{54}P_{43}P_{31}$,etc
r_{16}	P_{61}	15: e.g. $P_{62}r_{12}$, $P_{63}P_{31}$, $P_{64}P_{41}$, P_{42}, etc
r23	-	2: $P_{31}r_{12}$, P_{32}
r24	-	4: $P_{41}r_{12}$, P_{42}, $P_{43}P_{31}r_{12}$, etc
r25	-	7:$P_{51}r_{12}$, $P_{53}P_{31}r_{12}$, $P_{54}P_{41}r_{12}$, $P_{54}P_{42}$, $P_{54}P_{43}$ $P_{31}r_{12}$ etc
r26	P_{62}	15: eg $P_{61}r_{12}$, P_{62}, $P_{63}P_{31}r_{12}$, P_{64} $P_{41}r_{12}$, $P_{64}P_{42}$, etc
r34	-	5: $P_{41}P_{31}r_{12}$, $P_{32}P_{41}$, $P_{42}P_{31}r_{12}$, $P_{42}P_{32}$, P_{43}
r35	-	5: $P_{51}P_{31}$, P_{53}, $P_{54}P_{41}P_{31}$, $P_{54}P_{43}P_{31}r_{12}$, $P_{54}P_{43}$
r36	P_{63}	15: e.g. $P_{61}P_{31}$, $P_{63}P_{31}r_{12}$, $P_{64}P_{21}r_{12}$, $P_{64}P_{42}$, $P_{64}P_{42}P_{31}r_{12}$, etc
r_{45}	-	7: e.g. $P_{51}P_{41}$, $P_{53}P_{42}r_{12}$, $P_{51}P_{43}P_{31}$, $P_{53}P_{41}P_{31}$, etc
r_{46}	P_{64}	16: e.g. $P_{61}P_{41}$, $P_{61}P_{42}r_{12}$, $P_{61}P_{54}P_{31}$, $P_{62}P_{42}r_{12}$, etc
r56	P_{65}	22: e.g. $P_{61}P_{51}$, $P_{61}P_{53}P_{31}$, $P_{61}P_{54}P_{41}$, $P_{61}P_{54}P_{42}r_{12}$, etc.
Total	5	127

Pathways through which x, (1-5) caused variations in the dependent variable X_6 at $p<0.05$ Table shows 132 significant and meaningful pathways through which all (5) the predictor variables caused variations in the criterion variable (students' achievement in physics) out of the 132 pathways, 5 were direct while 127 were indirect.

Table 5 Decomposition of the total effects of the independent variables on Students' Achievement in physics into direct and indirect effects

Criterion Variable	Predictor Variable	Total Effects (T.E)	% of T.E. Direct relative to Overall T. E	Effects	% of D.E. relative to	Indirect Effects (I.E)	% OF I.E. relative to
Var. 6	School's Distance from Students'Hom e	-0.25	18.12	-0.17	14.30	-0.08	3.74
	Class size	-0.21	15.22	-0.11	9.25	-0.10	4.67
	Government Grants	0.26	21.01	0.20	16.82	0.09	4.21
	Availability of parent Teachers Association	0.26	18.84	0.19	15.98	0.07	3.27
	Instructional Leadership	0.37	26.81	0.28	23.55	0.09	4.21
Total		1.38	100.00	0.95	79.90	0.43	20.10

Note: 1.Total Effects= Original correlation coefficient
2. Direct Effects= Path coefficients
3. Indirect Effects= Total Effects - Direct Effects.

Decomposition of the total effects of the independent variables on Students' Achievement in physics into direct and indirect effects.

Table 5 shows decomposition of the total effects into direct and indirect effects of the five predictor variables on students' achievement in physics. The table further reveals that the five predictor variables (school distance from students' home (X_1), class size (X_2), government grants (X_3), availability of parent teachers association (X_4) and instructional leadership (X_5) have both direct and indirect effects on the criterion variable. In terms of direct effect, instructional leadership (X_5) contributed the most (β=.28). This was followed by government grants (X_3) (β=.20), availability of parent teachers association (X_4) (β=.19); school distance from students' home (X_1) (β=-.17); and class size (X_2) (β=-.1 1) in that order. The respective contributions of the five predictor variables were meaningful and significant to the criterion variable (students 'achievement in physics (X_6).

Discussion

Instructional leadership (X_5) has the highest direct effect (23.55%) on the criterion variable (students' achievement in physics (X_6). The significant contribution of instructional leadership to the prediction of students' achievement is such that the higher the influence of the school principal in providing leadership, the higher the students' achievement in physics. The result indicates that school head has a lot to do in promoting students' learning outcomes probably because he/she the one that dictate the pace of learning in the school. Imagine there is no principal or someone acting in the capacity of a principal in a school, there is likely to be chaos in such a school because everyone (teachers and students alike) will be in their natural habitat (untamed). The school head is the pivot of all the schools' activities, he/she coordinates the day to day running of the school and provides leadership to both the teachers, supporting staff (typists, gardeners, messengers, etc) and students. The quality of learning that goes on in the school depends to a large extent on the head teacher's effectiveness. Principals also make sure that the teaching materials are available and are used to promote learning. Farombi (1998) found that when school head makes sure that teachers make use of instructional materials students' achievement is raised. Another reason why school heads (principals) is important in raising students' learning outcomes is because they tend to know the right motivational strategies to use teachers to teach effectively. This supports Adewale (2004)'s view when he declares that school heads yield good results because they structure work in a way that members are motivated toward high effort and also positively influence/their abilities and role perception so that these factors combine with high efforts lead to high students' performance.

Government grant (X_3) has the next high direct effect (16.82%) on the criterion variable (students' achievement in physics (X_6). Government grant as used in this study include such money as subvention and imprest received from government to run the school. The significant contribution of government grant to the prediction of students' achievement

is such that the higher the grants schools received from government, the higher the students' achievement in physics. This is so because the grants received by schools could be used to purchase those things which are likely to promote learning experiences. Examples of such items that could be purchase using the government are teaching aids, library, library furniture and fittings and textual materials (Adu, 2002; Farombi, 1998). These materials are recognized as predictors of students' achievement (Farombi, 1998). Unfortunately, the trend has been to reduce governments' overall spending both nationally and internationally and in many cases, those reductions have resulted in declines in funding for public schools (Haycock, 2005). The implication of this is that schools may not be able to purchase all the needed instructional materials which have be considered as consistent predictors of students' learning outcomes.

Availability of Parent Teachers Association (X_4) is the next predictor variable that has direct effect (15.98%) on the criterion variable (students' achievement in physics (X_6). The significant contribution of availability of PTA to the prediction of students' achievement in physics is such that where there is concentration of PTA, the higher the students' achievement in physics. The plausible explanation to this finding is that the PTA of any school is usually the closest out of the bodies listed. As such, the PTA is most likely to appreciate the requirements of the school and the funds needed to execute any identified school projects, which are needed to facilitate learning. Similarly, the PTA is in a better position to monitor the execution of such projects and to ensure accountability. The result of this study corroborates the findings of Redding (1991) that a positive home - school relationship increases student achievement. The effective principal uses his personality, personal and professional characteristics as well as his leadership style to determine the ethos of the school which increase students' learning outcomes The finding of this study confirms the studies of NAEP (2007), Anyanwu, (2000), Postlethwait and Ross (1992) that this school quality (Availability of Parent Teachers Association) raises students learning outcomes.

School's distance from students' home (X_1) is the next predictor variable that has direct effect (14.30%) on the criterion variable (students' achievement in physics (X_6). The significant contribution of school's distance from students' home to the prediction of students' achievement in physics is such that where schools are far from the student's home, the lower the students' achievement in physics. Accessibility of school to students is measured by the distance covered by students before getting to school is determined from principals. Principals were asked to indicate the average distance of the majority of the students' home from school. Distance covered by students before getting to school is found to have negative impact on the students' achievement in Physics. This variable is applicable to those students who are day students. This suggests that the farther a school is to a student the lower is his/achievement in Physics and the closer a school is to a student, the higher is his/her achievement in Physics. NAEP study in Nigeria 2007show that the shorter the distance covered by students to get to their schools, the higher their academic performance and the farther away the schools are to the students' home the lower the students' academic performances.

Class size (X_2) is the least predictor variable that has direct effect (9.25%) on the criterion variable (students' achievement in physics (X_6). The significant contribution of class size to the prediction of students' achievement in physics is such that where there are many students in a class, the lower the students' achievement in physics. Class size is negatively correlated to students' achievement in physics. The result is expected because the larger the size of the class the less or the benefit the learners derive from instructional activities. Smaller classes allow students to develop better literacy and numeracy skills. Teacher morale is higher because they can spend more time with individuals and use different and more effective methods.

Conclusion and Recommendations

The respective contributions of each of the five predictor variables that is, school distance from Students' home (X_1), class size (X_2), government grants (X_3), availability of parent teachers association (X_4) and instructional leadership (X_5) were meaningful and significant to the criterion variable (students' achievement to physics). The five predictor variables have both direct and indirect effects on the criterion variable. In terms of direct effect, Instructional Leadership (X_5) contributed the most; followed by Government Grants (X_1); Availability of Parent Teachers Association (X_4); School's Distance from Students' Home (X_2) and class size (X_1) in that order. That is, $X_5 > X_3 > X_4 > X_2 > X_1$. Instructional leadership is found to be a potent predictor of students' achievement in physics, it is therefore recommended that there should be a policy environment that empowers the principals to exert their influence in the schools and make teachers do their work, maintain order and discipline which is likely to increase students' achievement. Although the government grand increases with students' achievement in physics the trend is to reduce government spending in education. If the major concern of a government in the Nigerian's National Policy on Education is to be achieved in terms of promoting science and technology, there is the need to put education and students' achievement on a priority list. It is recommended that there should be a policy to enforce schools without PTA to have a functional PTA which is likely to help such schools attain high level of effectiveness. Students are encouraged to attend schools close to their homes in order to reduce stress and time wastage as contained in the school mapping policy. Finally, class size should be reduced to 35 students as stipulated in the National Policy on Education so that teachers can cope with the teaching process.

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