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Some Non-Cognitive Factors as Correlates of Senior Secondary School Students' Achievement in Mathematics

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Abstract. This study investigated some non-cognitive factors as correlates of senior secondary (SS) students' achievement in mathematics in Ogun state. It adopted the non-experimental research design with two research questions raised. A sampling proportion to size was employed in selecting 26 SS from 254 schools in the state. An arm of intact class SS 2 students was selected from each school. Purposive sampling technique was used to select all the SSS 2 mathematics teachers. TQ; MAT; SQ; and PCEOS were developed, validated and their reliability coefficient values were 0.89; 0.75; 0.91; and 0.85 respectively. Data analyzed used was Multiple Regression statistical analysis. The findings revealed that the combinations of the independent variables accounted for 3.2% of the total variance observed in the students' achievement in mathematics and significant. Hence, it is recommended that there should be frequent school inspection coupled with the teachers' welfare, students' achievement in mathematics would be improved.

Key words: Students' mobility, Frequency of Inspection, Teachers' job satisfaction, Classroom Environment Observation and achievement

1. Background to the study

A strong foundation on early education makes it clear in its report that the academic success of the students or schools will be assessed through annual students' achievement tests (UNESCO, 2003). Although many educators and advocacy groups raised serious concerns regarding the use of achievement scores as the single measure of success and failure of students, most people believe that schools used to be held to a higher standard of accountability (Rosenshine, 2001). In other words, people believe that cognitive ability alone should not be used in measuring or assessing the students' performance because there are factors that contribute to positive behavioural changes in students. Nevertheless, there are evidences that revealed that some variables are significant to school effectiveness through teachers' perceptions. Such variables include students' mobility, teachers' job satisfaction, physical classroom environment and school inspection (Corcoran, 1985 and Abiodun, 2008).

According to one of the reports of the West African Examinations Council (WAEC) Chief examiners (2012), academic success in the public schools in Nigeria is significantly low and decreases yearly. Despite all the efforts made by the teachers, principals and even the school inspectors to keep up with monitoring of every aspect of the school programmes (WAEC, 2012). People kept on thinking on academic works for assessing students' achievement and that is why the stakeholders measure

performance using cognitive ability alone and this has consistently brought about poor performance of the students in mathematics but if non cognitive factors are taken into consideration during the students' assessment, this might likely enhance better performance. Therefore, cognitive and non-cognitive factors should be put into consideration in assessing students' achievement. The school factors are the existing structures, which indicate the existence of a school in an environment and where learning is taking place. These factors can be cognitive and non-cognitive in nature. The most neglected are the non-cognitive school factors like physical classroom environment, teacher's job satisfaction, school inspections, students' mobility to mention but a few.

Studies have revealed that teachers do not make any deliberate attempt to teach affective outcomes in mathematics and as such, most instructions and consequent evaluation are directed towards the cognitive skills (Obemeata, 1983; Mansaray & Ayanleke, 1995). The study of Kissocks and Iyortsum (1982) gave credence to this submission. They claimed that too many teachers pay more attention to recall learning, which requires students simply to repeat information. They further contended that teachers also avoid the affective aspect of learning, which directs students to make judgments and consider the values, attitudes, feeling, interests, beliefs and emotions they have that influence their actions.

The tendency to neglect affective and psychomotor outcomes in the evaluation of students in mathematics may be attributed to the narrow meaning, which is often given to evaluation and failure on the part of teachers to make a distinction between formative and summative evaluation. Furthermore, Ale (1999) asserted that the general failure of teachers to systematically evaluate affective outcomes of learning in mathematics could be due to difficulties in defining affective objective with a level similar to academic or cognitive objective.

It is desirable that affective and psychomotor outcomes be evaluated in mathematics. Affective outcomes for example have been found to be as important as intelligence in the process of education and in the practical affairs of everyday life; as such they must be emphasized in the teaching of mathematics since one of the major goals of the mathematics curriculum is to effectively form the affective behaviours of the learners. Further, concerns for the school role in emotional and personal development of the children have been rooted in the teaching of mathematics, as such there must be adequate evaluation which will focus on the three domains (affective, cognitive and psychomotor).

Students' mobility as one of the factors mentioned above is the movement of students from one school to another. Another study found that between 30% and 40% of school changes are not associated with residential relocation (Abiodun, 2008). Furthermore, Corcoran (1985) found out that the negative impact on educational achievement for students and school creating an achievement gap between mobile and non-mobile students. Frequent relocation interrupts regular attendance and continuity of it. Further studies have examined the impact of mobility on several aspects of academic achievement test scores, retention and even tone of a school (Abiodun, 2008; Rumberger, 2011).

Another factor being considered in this study is School inspection. School inspection involves the interaction of human beings with each other (inspectors and the inspected) through a variety of formal procedures and convections, with the aim of making sense of some social situations in the classroom. Rutter (1983) and Reynolds (1989) have shown that the kind of social practice which inspection represents can be differently understood according to the theoretical perspective. Inspection is to be contrasted with those forms of internal evaluation where the members of an institution carry out the evaluation.

Apart from school inspection, there are other non-cognitive factors like teacher's job satisfaction. The negative attitude of students towards learning always affects teacher's job satisfaction adversely and lowers teachers' self-esteem. Reynolds (1985) in a study of job

satisfaction that focused on high school business teachers in Ohio identified 27 factors that were significant for a high level of students' learning outcomes. Michael (2006) found out that achievement in the job, the work itself and recognition contribute to satisfaction in teaching. The result of inspections also includes the report on Physical classroom environment and school activities to mention but a few. The physical classroom environment is the suitability of the classroom environment and the physical present of students, which depict the existence of a learning environment. It includes the lighting, colour, relevant teaching materials, classroom spacing and sitting arrangement.

Based on this background, this study was therefore to investigate the correlates of some non-cognitive factors (students' mobility, teachers' job satisfaction, frequency of school inspection and physical classroom environment) on the students' achievement in senior secondary school mathematics.

2. Research questions

With the context of the stated problem, this study is interested in finding answers to the following research questions:

- What are the composite contributions of students' mobility, teachers' job satisfaction, school inspection and physical classroom environment to the students' achievement in senior secondary school mathematics?
- What is the relative contribution of each of students' mobility, teachers' job satisfaction, school inspection and physical classroom environment to the students' achievement in senior secondary school mathematics?

3. Methods

Research type: The non-experimental type of research of survey was used in this study. This was chosen because the manifestations of the variables were assumed to have already occurred.

Population: The target population for this study comprised all senior secondary two students and their teachers in government-owned senior secondary schools in Ogun state.

Sampling technique and sample: Multi-stage sampling technique was used in this study:

1. The local government areas were stratified into four existing administrative divisions in the state (Ijebu, Remo, Egba, and Yewa).
2. a sampling proportion to size was employed in selecting 26 senior secondary schools from available 254 schools in the selected local government areas using ratio 1:10.
3. an arm of intact class SSS 2 students were selected from each school through a simple random sampling procedure. These students were available and not prepared for external examinations
4. Purposive sampling technique was used to select all the mathematics teachers teaching senior secondary school students II in the selected class.

Instrumentation: The following four instruments were used in this study:
Teacher's Questionnaire (TQ);
Mathematics Achievement Test (MAT);
Students' Questionnaire (SQ);
Physical Classroom Environment Observational Scale (PCEOS)

Teacher's Questionnaire (TQ) was constructed and validated by the researcher. It had three sections. Section A elicited information on the teacher's biography while section B comprised of information on the basic needs that can bring job satisfaction if they are adequately supplied. It had a modified four- point likert scale of Strongly Agree (SA); Agree (A); Disagree (D); Strongly Disagree (SD). Section C contained information on school inspection. It also had a modified four- point likert scale of Strongly Agree (SA); Agree (A); Disagree (D); Strongly Disagree (SD). The scoring was done using codes. The coding sheet comprised of the following: the sex was coded with male equals 1 and female equals 2. The age was 21-30 (1); 31-40 (2); 41-above (3) while the educational level was followed suite Med (1); First degree (2); NCE (3). Marital status also was coded Single

(1); Married (2); Widow (3); Widower (4); Separated (5). Sections B and C were scored on a modified four point likert scale of Strongly Agree (4); Agree (3); Disagree (2); Strongly Disagree (1) for positive statement items. Negative statement items were reversed. Reliability coefficient value of TQ was computed to be 0.89 using Cronbach Alpha's formula.

Mathematics Achievement Test (MAT): This instrument was used to measure the students' achievement in mathematics. Forty multiple-choice questions were developed and validated by the researcher from the Senior secondary school 2 mathematics curriculum used in schools in Ogun state. Before the selection of forty items, 100 items were trial tested on 50 students in two selected schools (not the selected schools in the study). The item difficulty of the test varied from 0.4-0.6 and items with high indices of discriminations were selected. Kuder-Richardson (K-R 20) was used to establish the reliability of MAT, which is 0.75.

Students' Questionnaire (SQ): The SQ was developed and validated by the
researcher. The SQ elicited information on the students' biography, and students' mobility. It consisted of two sections. Section A contained both introduction and some demographic information of the respondents. Section B consisted of statements to elicit information on students' mobility where the respondents ticked YES or NO as applicable.
The reliability of SQ was determined to be 0.91 using Split Halve.

Physical Classroom Environment Observational Checklist (PCEOC) The PCEOC used to find out the availability of instructional materials in government-owned Senior secondary schools was developed by the researcher. It comprised of two sections. Section A consisted of information on the standard classroom environment while section B consisted of items for obtaining information about instructional materials available in the classroom. The checklist was used to rate the classroom environment in terms of Present, Inadequately present and Not present. The scoring procedure was done using Present (3), Inadequately present (2) and Not present (1). The Coefficient reliability value of PCEOC was calculated to be 0.85 using Cronbach Alpha's formula.

Data Collection: The researcher and ten research assistants carried out the data collection. The research assistants were the student teachers from Faculty of Education, Olabisi Onabanjo University, Ago-Iwoye posted to different schools within Ogun state for six weeks of Teaching Practice Exercise between 6th may and 19th June, 2009. The research assistants were adequately guided in the procedures for administration of the instruments through instructions and trial testing sessions. In the first day, the researcher and research assistants had an ample rapport with the students, teachers and the school principals. The other days were used for the administration of the Mathematics Achievement Test (MAT) and the PCEOC. The TQ and SQ were the first instruments administered.

Data Analysis Procedure: The Multiple Regression statistical analysis (ANOVA) was used in analyzing the data collected.

4. Results and Interpretation

Research question 1: What are composite contributions of the students' mobility, school inspection, teachers' job satisfaction and physical classroom environment to the students' achievement in senior secondary school mathematics?
This question was answered with multiple regression analysis. To answer this research question, students' achievement in mathematics was regressed on the four predictors (independent variables as the result is presented in tables 1a and b.

Table 1a: Model summary of regression analysis

Model	Value
Multiple R	0.144
R square	0.032
Adj R^2	0.018
Std error	6.307

Table 1b: Analysis of variance (ANOVA)

Model	Sumof Square	df	Mean square	F-ratio	Sign value
Regression	879.139	4	219.785	5.255	0.000
Residual	40141.031	1009	39.783		
Total	41020.171	1013			

The results as shown in Table 1a shows that the combination of students' mobility, teachers satisfaction, frequency of inspection and physical classroom environment have a positive relationship **(R = 0.144)** with the **(R^2 = 0.032)** of the variation in students' achievement as explained by the linear regression. The combination of these variables however explained 3,2% of the variance in the students' achievement in senior secondary schools mathematics as shown by the coefficient of determination.

The Table 1b indicates that combination independent variables to students' achievement in mathematics is statistically significant **($F_{(4,1009)}$ = 5.255; P < 0.05)**. This implies that the multiple correlation of 0.144 observed between students' mobility, teachers satisfaction, frequency of inspection and physical classroom environment is not by chance as the F-ratio of 5.255 (P<0.05) obtained is significant.

Research question 2: What is the relative contribution of each of the four predictors to the students' achievement in Senior secondary school mathematics?

Table 2: Relative contribution of the independent variables to the prediction of students' achievement in mathematics

Model	Unstandardized coeff β	std error	Standardized coeff β	t value	Sign
Constant	32.102	2.296		13.981	.000
Studts M	.346	.319	0.034	1.083	.000
Inspection	-.954	.234	0.134	-4.074	.000
Trs Job S	-.271	.049	- 0.020	-1.662	.000
Class envir	8.872	.102	0.029	0.866	.387

The Table 2 shows the linear regression equation

$Y = 32.102 + .346x_1 - .954 x_2 - .271 x_3 + 8.872 x_4$

Where

x_1 = Students' mobility, x_2 = Frequency of Inspection; x_3 = Teachers' job satisfaction; x_4 = Classroom Environment Observation

As indicated in the Table 2, results shown under parameter estimate indicate that the unstandardised coefficient of frequency of inspection and teachers' job satisfaction have a negative relationship with students' achievement in senior secondary mathematics. The other variables are however positively related to contributions of each of the variables to students' achievement in senior secondary mathematics, it was discovered that students' mobility, frequency of inspection and teachers' job satisfaction had significant (P<0.05) combination to the explanation of students' achievement in mathematics. It had been observed that the students' mobility, teachers' satisfaction, and frequency of inspection are related to their students' achievement in senior secondary mathematics except physical classroom environment. Hence, teachers and educational administrators should understand these variables on students' achievement in mathematics through participation in the seminars/workshops and conferences adequate information would be provided to the teachers and educational administrators regarding their

success at reaching the students with the possible results of improvement.

5. Discussion of the findings

The findings revealed that the combinations of the independent variables (Students' mobility, Frequency of Inspection, Teachers' job satisfaction and Classroom Environment Observation accounted for 3.2% of the total variance observed in the students' achievement in mathematics, though not highly correlated but it is significant. This is line with the findings of Obemeata (1998) and Adeagbo (2001) concluded that if all the factors, which are school indicators, cognitive and non-cognitive are well provided; it will enhance students' achievement.

Furthermore, the findings of this study reveals that the more the school inspection, the better the students' achievement in mathematics, and also the more the students' mobility, the more the students' achievement decreases; this is an indication that students' mobility and school inspection have an overwhelming influence on students' achievement in secondary school mathematics than the other variables. This is an indication that if there is a regular school inspection with good reports on the activities going on in the school, it will enhance students' learning outcomes (Ale, 1999 and Alio & Paters, 2000). It is also in line the studies of Erinosho (2004) and Jegede (2004) concluded that it is not in the best interest of the educational system to neglect the inspection of schools they further stated that inspection, if properly executed can lead to positive improvement in the students' learning outcomes. While Okpala (2004) opined that frequency of school inspection would increase the school standard and students' learning outcomes will be enhanced. Finally, Abiodun (2008) found out that students' mobility leads to a host of problems for teachers and schools, such as the difficulty in matching needed services to students and classroom's disruptions caused by students coming and going through the year.

6. Recommendations and Conclusion

The following recommendations and conclusion are:

- The government and educational planners should be aware that there is teachers' job dissatisfaction, which can easily reduce their performances. However, the teachers are the major instruments at the implementation stage and since there will not be any better output if the implementation stage is faulty. Therefore, the governments or the stakeholders must appreciate that the teachers' job dissatisfaction can cause poor achievement and look into the teachers' welfare.
- The ministry of education should not limit frequent students' mobility and give order or a rule that would stop the principals from taking students from another schools thorough investigation. However, frequent school inspection coupled with the teachers' welfare and students' achievement in mathematics should be improved.

References

Abiodun, S. I. 2008. Non-cognitive school indicators as correlates on senior secondary school students' learning outcomes in CRS. A post field seminar, ICEE University of Ibadan.

Ale, S. O. 1999. Difficulties facing Mathematics Teachers in Developing Countries: A case study of Nigeria. *Educational studies in Mathematics.* 12. 4. 479-489.

Alio, B. C. & Harbor Paters, V. F. 2000. The effect of Polya's problem solving technique on secondary school students achievement in mathematics. *Abacus the Journal of the Mathematical Association of Nigeria.* 25. 1. 5-8.

Corcoran, Th. B. 1985. *Effective secondary schools.* In A. M. Kyle (Ed.), Breaching for excellence: An effective schools source book. Washington, DC. US> Government Printing office.

Erinosho, S. Y. 2004. Teaching science beyond the classroom four walls. Afemikhe, O. A. & Adewale, J. G. (Eds.). Issues in educational measurement and evaluation in Nigeria in honour of Wole Falayajo.

Institute of education, University of Ibadan.

Jegede, O. 2004. African Cultural Perspectives and teaching of science. In Solomon S. & G. Aikenhead (eds.). STS education international Perspectives on reform. New York, teachers college Press.

Kissocks, C. & Iyortsum, P. 1982. *A Guide to Questioning: Classroom procedure for teachers.* London: The Macmillan Press Ltd. 45-67.

Mansaray, A. &Ayanleke, M.O. 1995. What do Mathematics Teachers' Test? *A Journal of Educational Discussion and Research*. 2. 1&22. 23-27.

Obemeata, J.O. 1983. Non-cognitive assessment in educational evaluation. Edted P.A.I Obanya. *Curriculum in theory and practice* 308-326.

Okpala, P. N. 2004. Teacher classroom management of scientifically gifted Junior secondary school students in two socio cultural zones in Nigeria.

Reynolds, D. 1989. Parents and the left: rethinking the relationship. In F. Macleod (Ed.) Parents and schools: The Contemporary challenge, Lewes. Falmer Press.

Rosenshine, B. V. 2001. Teaching functions in instructional programs. *Elementary school Journal.* 3. 335-351.

Rutter, M. 1983. School effects on pupil progress: research findings and policy implications. *Child development*. 54. 1. 1-29.

United Nations Educational, Scientific and Cultural Organization, (UNESCO) 2003. EFA Global monitoring Report 2003/4: Gender and education for all – The leap to equality summary report, UNESCO, Paris, 2003, p. 2.

West African Examinations Councils 2012. *Chief examiners' Reports (Mathematics)*, Statistics Office, West African Examination Council, Lagos, Nigeria