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Learning Environment as Correlates of Chemistry Students' Achievement in Secondary Schools in Akwa Ibom State of Nigeria   *(Pp. 208-217)*

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Abstract

The study aimed at assessing how 13 learning environment variables taken together predict students' achievement in chemistry as well as their relative contribution to the prediction. Two research questions were raised and stratified random sampling technique was used to select 94 chemistry teachers and 600 of their chemistry students for the study. Learning Environment Questionnaire I and II (LEQ) and Chemistry Achievement Test (CAT) were used for data collection and analysed using multiple regression. The results showed that the 13 variables taken together had significant contribution to students' achievement in chemistry and accounted for 77.34% of the variation in students' achievement in chemistry. It was recommended that stakeholders in provision of chemistry education at the secondary school level must consider the eight variables that contributed significantly to achievement seriously during planning and executing chemistry education programmes for optimum achievement of students in chemistry.

Background to the study

The contribution of chemistry and chemists to social, industrial and economics life of the world in general and Nigeria in particular, has been felt

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in all facets of human life.

Umoinyang and Okpala (2001) stated three societal needs which could be accomplished through the knowledge of chemistry. These are the needs for physical survival, living a satisfactory economics life and raising the level of our socio- cultural life. The knowledge of chemistry has enable us to produce good water, food and health care resources, varying materials for construction of industries, roads, automobile and home in addition to solving problems resulting from human interaction with environment.

Even though the knowledge of chemistry to the society is very important, students' achievement in chemistry as measured by their scores in senior secondary certificate examination is very poor. Senior secondary certificate examinations are taken at the end of senior secondary school education. Asim, Bassey and Essien (2005) reported that the percentages of students that passed chemistry at credit level and above in the senior secondary school certificate in 1999, 2000, 20001, and 2002 were 31.08%, 31.38%, 36.25% and 25.38% respectively. These values are considered very low because these are the percentages of applicant who were qualified for university admission in science related programmes other things be equal.

Factors that influence students' achievement at the senior secondary school are multivariate and it is a matter of great concern to Nigerian government. These factors include – teachers' qualification, quantity of instruction and attitude (Caleb, 2001: Buker & Ibi, 2003): social environment factor (Udoh, 1998); socio-psychological factors (Umoinyang & Okpala, 2001), teaching-learning resources, teachers' characteristics, pupils' school-community, school and teacher characteristics, student, community, school and teacher characteristics, classroom context, teacher perceptions, quantity of instruction, teacher -student relationship, assessing and evaluating students, managing students, student perceptions and students participation in learning (Anderson, 1987). The review showed that most studies done in Nigeria in this area concentrated on the relationship existing between two or three variables. Additionally, they failed to show the strength of the relationship and those that did show the strength of relationship between the variables only studied two or three variables. But Udoh (2005) maintained that educational, phenomenon have educational, psychological and sociological connotation. It's therefore clear from this background that student achievement cannot be accounted for by one, two or three variables but a number of them. Furthermore, no study in Nigeria has sought the

contribution of up to 13 variables to achievement in chemistry at the secondary school level.

This study therefore sought to explain students' achievement in chemistry using 13 learning environment variables namely:-use of teaching/learning materials, orienting students, quantity of instruction, classroom context, teachers', perception, home characteristics, school location, school characteristics, teachers characteristics, examining students, teachers' autonomy, managing students and students' perception.

Two Research questions were raised. They are:-

1. How do the thirteen variables earlier listed taken together predict students' achievement in chemistry?

2. What is the relative contribution of the variables to the prediction?

Method

This is an expost-facto study, using correlational research design.

The study was carried out in Akwa Ibom State of Nigeria. Two categories of target population were involved in the study; - (i) chemistry students and (ii) chemistry teachers. The students' population comprised all 24,102 senior secondary III chemistry students who registered for May/June senior secondary certificate examinations in 2010/2011 school year, and their 241 chemistry teachers. Stratified random sampling technique was used in selecting 94 schools, 40 urban, 24 sub-urban and 30 rural schools, for the study. One teacher, who taught senior secondary III chemistry from each of the 94 schools, participated in the study. The same sampling method was used in selecting 40% of chemistry students taught by these teachers a total of 600 out of 612 students had complete data and participated in the study.

Three instrument were used in the study

i. Learning Environment Questionnaire I (LEQI) responded to by teachers

ii. Learning Environment Questionnaire II (LEQII) responded to by students.

iii. Chemistry Achievement Test (CAT).

All the instruments were developed by the researcher. LEQI had 11 sections-chemistry teachers' characteristics, school characteristics, use of

teaching/learning materials, teachers, autonomy, quantity of instruction, orienting students, classroom contents, examining students, managing students and chemistry teachers' perception of their students. LEQII had two sections, student's perception and their home background. The reliability of variables in LEQI and II are shown in Table 1.

Table 1 showed that the reliability of quantity of instruction and managing students were highest (.85 Cronbach alpha) and lowest (.68 of Cronbach alpha) respectively.

The reliability of Chemistry Achievement Test (CAT) was .81 and .97 as concurrent validity.

Result
Data were analysed using multiple regression analysis using SPSS package. Each research question was separately treated.

Research Question One
How do the 13 variables taken together predict students' achievement in chemistry?

Summary of regression analysis on sample data are shown in Table 2.

The value of regression coefficient square (R^2) of 0.7734 indicate that 77.34% of variation in students achievement in chemistry was accounted for (predicted) by the 13 variable since the F-ratio of 20.60 is significant at df of 13, 20 and .05 level of significant ($F_{crital} = 2.28$).

Research Question Two
What is the relative contribution of the variables to the prediction?

The relative contribution of the 13 variable to achievement in chemistry is shown in Table 3.

Use of teaching/learning materials, chemistry teachers perception, students home characteristics, school location, chemistry teachers characteristics, examining students managing students and students perception contributed significantly (P<.05) to chemistry students achievement while orientating students, quantity of instruction, classroom context, school characteristics and teachers autonomy did not.

Discussion
The result of regressing achievement on the 13 variables reaffirmed the existing assertion that: Learning environment could have potential influence

on achievement. The results were support by Balogun (1993), Toit (1996), Umoinyang & Okpala (2001), Caleb (2001), UNSECO (2002) and Ojerinde (2005).

The highest contribution of students' perception (B = 0.306) to achievement in chemistry is consistent with findings of Bakare (1986), Anderson (1987), Busari (1991) and Caleb (2001) who maintained that students' perception of science correlate positively with achievement. They added that; the way students perceive themselves influence their goals and attitude toward the process and in fact relative effort put-in in order to accomplish their aims. If a student perceives himself as a high achiever, he is likely to work harder to ensure such accomplishment. Teachers' perception (B = 0.208) also contribution significantly to Chemistry students' achievement. This finding supports' that of Anderson (1987). The way teachers perceive their students' academic ability influence their teaching and interaction with the students. Teachers should ensure that their perception is right.

School location (B = 0.094) significantly contributed to chemistry students' achievement. This finding was consistent with the result of many studies, such as Willeny (1981), Ezeife (1990), and Umoinyang & Okpala (2001). The finding was however, at variance with those of Jegde (1984) and Odumusi (1984), use of teaching/learning materials (B = 0.085) also contributed significantly to chemistry students' achievement. This finding was supported by that of Obioma (1991) who found that students in completely materials-based environment scored significantly higher than their counterparts in a traditional classroom that had the chalkboard.

Home characteristics (B = 0.080) also contributed significantly to chemistry students' achievement. The finding was supported by many studies like Baker (1986), AJaia (1986) and Alonge (1989). Managing students (B = 0.068) significantly contributes to chemistry students' achievement. The finding was supported by Ojerinde (2005). Teachers' characteristics (B = 0.051) also contributed significantly to chemistry students' achievement. This finding was in consonant with the results of many studies including those of Anderson (1987), Balgun (1993). However, other studies showed no significant relationship between teachers' characteristic and achievement. Such studies include those of Jedge (1984), and Igwe (1990).

In this study, teachers' characteristics contributed significantly to achievement. This finding is supported by Bukari and Ibi (2003). Examining students (B = 0.050) also contributed significantly to chemistry students'

achievement. This finding was supported by Johnston (1991) who maintained that throughout the world, assessment and examination systems have enormous influence on what is learned and examined.

It was observed that orientating students (B = 0.004) made no significant contribution to chemistry students' achievement. It appears chemistry teachers do not adequately get their students' prepared and ready for a new lesson. Udoh (1998) opined that in any class, students differ in physical appearance, intelligent, sociability, temperament, social personal background hence orienting strategies which succeed with bright students may not be useful to average or less bright ones. Since chemistry students were not grouped according to their academic ability, the chemistry teachers have to bring a class of varying academic ability into a stage of readiness before the commencement of lessons.

Quantity of Instruction (B = 0.004) also did not contribute significantly to achievement. This finding was not surprisingly when considering the result of previous findings. For instance, Fredrick and Walbery (1980) found that the actual time spent on actual learning, homework and assignment did not contribute to students' achievement. School characteristics (B = 0.03) did not contribute significantly to chemistry student's achievement. Studies on school characteristics showed that what is currently happening in school could result in no significant relationship on students' achievement (Obimas, 1991).

Teachers' autonomy (B = 0.008) did not make significant contribution to students' achievement in chemistry. Even though chemistry teachers have autonomy, they do not seem to exercise the power of their autonomy to the advantage of students hence could not contribute to chemistry students' achievement.

Classroom context (B = 0.035) did not also contribute to chemistry students' achievement. Ordinarily, one would expect variables of the classroom context to contribute significantly to students' achievement, which this study has shown to be contrary. Anderson (1987) supported this result by observing that teachers' classroom activities tended to exert no influence on achievement.

Conclusion

Stakeholders (like Federal and State Ministry of Education and their agencies) in the provision of education must consider the eight variables that

contribute significantly to achievement during planning and execution of chemistry education programmes if they have to bolster students' performance in chemistry.

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Table 1: Reliability of each section of the LEQ I and II

S/N	Sub-section of LEQ I & II	Cronbach Alpha
1.	Chemistry teachers' characteristics	.84
2.	School Location	.77
3.	School characteristics	.75
4.	Use of teaching/learning materials	.74
5.	Teachers' autonomy	.69
6.	Quantity of instruction	.85
7.	Orienting students	.78
8.	Classroom context	.75
9.	Examining students	.78
10.	Managing students	.68
11.	Chemistry teachers' perception	.81
12.	Students' perception	.76
13.	Students home characteristics	.81

Table 2

Summary of regression analysis on sample data
Multiple R = 0.8746
R square (R^2) = 0.7734

Table 2: Analysis of variance

Source	df	SS	MS	F_{cal}
Regression	13	756.0314	58.3916	
				20.60
	20	226.4023	2.8331	
Total	33	982.4337	982.437	

Table 3: Reliability of each section of the LEQ I and II

S/N	Sub-section of LEQ I & II	Regression coefficient B	Remarks
1	Use of teaching/learning materials	0.085	X
2	Orientating students	0.004	NS
3	Quantity of instruction	0.004	NS
4	Classroom context	0.035	NS
5	Chemistry teachers' perception	0.208	X
6	Students home characteristics	0.080	X
7	School location	0.090	X
8	School characteristics	0.003	NS
9	Chemistry teachers' characteristics	0.051	X
10	Examining students	0.50	X
11	Teachers' autonomy	0.008	NS
12	Managing students	0.068	X
13	Students' perception	0.306	X

X = Significant at $p < .05$

NS = Not significant at $p > .05$