

OPPORTUNITY TO LEARN AND STUDENT ACADEMIC ENGAGEMENT AS CORRELATES OF STUDENTS' ACHIEVEMENT IN CHEMISTRY IN RIVERS STATE

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ABSTRACT

The persistent poor performance of students in chemistry especially in external examinations such as WASSCE and NECO has been a great concern to parents, government and other stakeholders in education, and this is an indicator of students' poor acquisition of the necessary knowledge in chemistry. This could also be attributed to lack of opportunities to learn and poor student engagement in the school which tends to have affected the students' academic performance as well as their chances of gaining admission into Science, Technology and Mathematics (STM) related courses in the higher institutions. Hence, this study investigated the effect of opportunity to learn and student academic engagement on students' achievement in chemistry in Rivers State. The study adopted the correlational design of survey type. The population consisted of all the senior secondary school three (SSS 3) chemistry students in Rivers State. A sample size of 1000 respondents was selected using the simple random sampling technique. Three instruments were used for data collection which include, Chemistry Achievement Test (CAT) with 0.80 reliability coefficient using KR-20, Students' Opportunity To Learn Questionnaire (SOTLQ) and Student Academic Engagement Questionnaire (SAEQ) with 0.94 and 0.89 reliability coefficients respectively using Cronbach Alpha. Four research questions guided the study. Pearson Product Moment Correlation and Multiple Regression Analysis were employed for the data analysis. Result showed that opportunity to learn ($r = 0.044$) and student academic engagement ($r = 0.034$) have positive but weak correlation with students' achievement in chemistry. Results also showed that opportunity to learn ($r = 0.044$, $P > 0.05$) and student academic achievement ($r = 0.034$, $P > 0.05$) do not significantly correlate with students' achievement in Chemistry. Two predictor variables jointly accounted for 0.4% of the total variance in students' achievement in Chemistry.

KEYWORDS: Achievement, Chemistry, Correlates and Opportunity to learn

INTRODUCTION

Chemistry is one of the major branches of science. Chemistry is the science, that seeks to understand the properties and behaviour of matter by studying the properties and behaviour of atoms and molecules (Upahi, 2015), There are various applications of Chemistry in the home or industry. There is an increasing impact of growing knowledge in the subject of chemistry on our social and economic life. A poor chemistry foundation at the secondary school will jeopardize any future effort

to enhance achievement in the subject The study of chemistry at the secondary school level helps students in developing basic skills, knowledge and-competence required for problem solving in their environment, and these are supposed to be acquired in the course of formal education.

Scientists and science educationists are today more recognized "as playing crucial roles in National development. At the classroom level, the chemistry teacher's role in fostering students' active involvement in "doing and learning" of chemistry is seen as crucial for students achievement in sciences, and the overall sustainable advancement in science (Adesojii, and Ogiruii, 2003). As teachers are key players in fostering student engagement for academic success (Akey, 2006)

The role of chemistry in the development of the scientific base of a country cannot be overemphasized and Nigeria is not an exception. Despite the increasing importance of chemistry to the unfolding world, the performance of Nigerian students in the subject at the secondary school remains a dismal failure. Saage (2009) added that it is disappointing to note that the students 'performance in chemistry at internal and external examination has remained considerably poor despite the relative importance of chemistry. The poor achievement of learners in chemistry has been variously explained. According to Usman and Memeh (2007), the factors that negatively affect chemistry achievement include students" background problems; students' lack of interest and/or negative attitude towards chemistry; teacher related factors like poor teacher preparation; inadequate qualified chemistry teachers inadequate instructional materials and application of poor teaching methods.

The performance of students in chemistry in external examinations has been poor and actuating. This can be observed in the analysis of West African Senior Secondary School Certificate Examination (WASSCE) results in the years 2000 to 2011 as shown in table 1.

Table 1.1: STATISTICS ON NIGERIA AND RESULTS FOR INK MAY/JUNE WASSCE (2000-2014) ON CHEMISTRY.

YEAR	TOTAL ENTRY	TOTAL 'SAT	TOTAL SAT . % ..	TOTAL CREDIT (A 1-C6)	TOTAL C'RED TT % (A1-C6)	TOTAL PASS (7 & 8)	TOTAL PASS% (7 & 8)	TOTAL FAIL (F9)	TOTAL FAIL % (F9)
2000	01369	95810	97.23	62442	1.88	52303	26.71-	81065	11.39
2001	1 1 606	301740	96.83	109397	36.25	8 1 679	27,06	0664	16.51
2002	291372	287424	96.85	98988	34.42	88580	30.82	99856	i4.74
2003	318324	304906	95.78	153839	50.98	79448	26:06	71619.	23.49' ;

2004	145078	340774	98.07	128133	38.97	95404	28.00	117237	34.40
2005	338307	327225	98.20	135544	50.94	84267	25.75	107414	32.83
2006	389315	375285	96.40	140263	44.90	89998	23.98	123204	38.64
2007	432230	422681	97.79	194284	45.96	104680	24.76	1 1 1322	26.33
2008	428513	418423	97.64	185949	44.44	114697	27.41	1 1 04 1 7	26.38
2009	478235	468546	97.97	204725	44.69	114020	24.33	1 1 9260	25.45
2010	489453	487047	99.93	207482	42.60	121810	25.01	157754	32.39
2011	575757	565692	98.25	280250	49.54	151627	26.80	1 29 1 02	22.82
2012	641622	627303	97.77	270570	43.13	192773	30.73	148344	23.65
2013	649524	639131	98.40	460470	72.05	95030	14.87	61340	9.60
2014	652809	644913	98.79	399062	61.88	142927	22.16	85461	13.25

Source: WAEC Research and Statistics Unit, Lagos (2015).

Typically, less than half of the students (ie. 50%) who took examinations in chemistry are unable to attain credit level pass. As shown in the above table, the percentage of students who passed chemistry at credit level for fifteen, years (2000 - 2014) are 31.88%, 26.25%, 34.42%, 50.98%, 38.97%, 50.94%, 44.90%, 45.96%, 44.44%, 44.69%, 42.60%, 49.54%, 43.13%, 72.05% and 61.88% respectively. This gives us an average of about 47% of students who are able to attain credit level pass in chemistry.

Generally, the performance of students in chemistry in WAEC SSCE for the-period under review can therefore be said to be poor and inconsistent. This poor and inconsistency in the students' academic performance over the years could be attributed to a number of factors which includes, poor conceptual knowledge of the subject matter, spelling errors, poor performance in questions, requiring detailed explanation, comprehension and application questions (WAEC Chief Examiner's Report, 2009; 2011)

In Nigeria, efforts are being made by researchers, government and non-governmental organization to improve cognitive, affective and psychomotor outcomes in chemistry and recommendations are being made. For instance, Mckinney (2010) recommends the use of -active review, otherwise known as student-led review session, which allows students to work amongst themselves in spontaneously formed groups. In addition, some researchers have looked beyond the aforementioned factors to other related areas within the teaching-learning grid. These include personality variables of the learners (students) like self-efficacy, self-esteem, self-concept, intelligence quotient, emotional quotient amongst others, which are concerned about different stimulus that drive attainment of high quality educational achievement in chemistry. The principal factors in learning/not learning depend heavily on the learner and the opportunity that he is given to learn. Hence this study examined the effect of opportunity to learn and student engagement on students' achievement in chemistry.

Opportunity to learn was originally defined as the overlaps between the information students were taught and the information on which they were tested. But now opportunity to learn has expanded to include the quality of resources, school conditions, curriculum and teaching that students experience (Lisa, 2010). Hence, Lisa defined opportunity to learn as what the -education system does to enable students, to meet the expectations set by the content and performance standards. Perry, Hawkins and Sealy.(2016) see opportunity to learn as a framework for connecting teacher practice to student achievement in chemistry.

Opportunity to learn is a way of measuring and reporting whether students and teachers have access to the different ingredients that make up quality school. It can also be defined as the conditions within the classroom or school that will promote learning for all students. The more opportunity to learn ingredients that are present in an individual school, the more opportunity students have to benefit from a high quality education. Examples of opportunity to learn are qualified teachers, clean and safe facilities, up-to-date books and quality of learning materials, high quality course work and school conditions.

Student academic engagement is another relevant issue of focus in this study. Student academic engagement is considered important by the researcher because the extent by which a student fully engages in academic activities of the school can go a long way to affect his academic performance. Huit (2005) expressed student academic engagement as a continuum of three factors: allocated time (amount of time allocated for instructional and non-instructional activities in the classroom), engaged-time (the amount of time the student is engaged in learning tasks) and academic learning time (the amount of time student successfully engaged in learning task). Thijs and Verkuyten (2009) suggested that the more .engaged students are, the more successful they will be in their learning. They further submitted that "Engagement is associated with positive student outcomes - including higher grades and less dropping out. This research supports the theory that if we can engage students, we can influence their achievement, resulting in a higher graduation rate.

From the foregoing, there is the likelihood that students who are given the opportunities to learn and are fully engaged academically will display outstanding features and do well in school: This could be because, the students enjoy adequate learning period, teaching-learning materials, educative social gatherings under the guidance of quality teachers in a conducive environment.

This study aimed at determining the extent to which opportunity to learn and student academic engagement can explain students' achievement in chemistry in Rivers State.

RESEARCH QUESTIONS

The study seeks to provide answers to the following research questions:

1. What is the correlation between opportunity to learn and students' achievement in chemistry?
2. What is the correlation between student academic engagement and students' achievement in chemistry?
3. What is the composite and relative effect of opportunity to learn and student academic engagement on students' achievement in Chemistry?

Scope of the Study

The study focused on opportunity to learn and student academic engagement as correlates of students' achievement in senior secondary school chemistry in Rivers State.

The study made use of Senior Secondary School (SSS 3) chemistry students from five Local Government Areas of Rivers State. However, the sample was limited to only 1000 SSS 3 students.

METHODOLOGY

Research Design

A correlational design of survey type was used in this study. This is because the researcher was interested in investigating possible relationships among the variables without manipulating them.

Population

The population of the study included all senior secondary school three (SSS 3) chemistry students in all the secondary schools in Rivers State.

Sample and Sampling Technique

The researcher used a sample size of 1000 students (40 students x 25 schools) which was selected from five (5) local government areas of Rivers State.

In selecting the sample for the study, stratified random sampling technique was used to select twenty-five (25) senior secondary schools from five (5) local government area in Rivers State based on school ownership strata (federal, state and private schools). After which, simple random sampling

technique was used to select forty (40) SS3 students from each of the twenty-five (25) selected schools which gave a total number of 1000 respondents.

Instrumentation

Three research instruments were utilized in this study. They are;

1. Chemistry Achievement Test (CAT).
2. Students' Opportunity To Learn Questionnaire (SOTLQ) and
3. Student Academic Engagement Questionnaire (SAEQ)

Validity and Reliability of Instruments

The three instruments; Chemistry Achievement Test (CAT), Students' Opportunity To Learn Questionnaire (SOTLQ) and Student Academic Engagement Questionnaire (SAEQ), were given to some experts in test construction who determined their face and content validities. Their suggestions and comments formed the basis for the authentication of the instruments.

To establish the reliability coefficient of Chemistry Achievement Test (CAT), an initial pool of 100 test items was trial-tested on a sample of 50 students from one school outside of the sample schools for the study. Fifty (50) test items were selected after item analysis. A Kuder Richardson 20 (KR-20) formula was used to obtain a reliability coefficient of 0.80 which was high, hence the instrument was used. However, the reliability alpha analysis was used to obtain the reliability coefficients of 0.4 and 0.8 for Students' Opportunity To Learn Questionnaire (SOTLQ) and Student Academic Engagement Questionnaire (SAEQ) respectively using 100 subjects.

Data Analysis

The data collected was analyzed using Pearson Product Moment Correlation to examine the relationship between the independent variables (opportunity to learn and students' academic engagement) and the dependent variable (students achievement in chemistry) and Multiple Regression Analysis was used to determine which of the independent variables could predict the students' achievements, and to what extent. Data analysis was done at 0.05 significance level with the aid of Statistical Package for Social Science (SPSS) version 20.

RESULTS AND DISCUSSION

This chapter focused on the results and discussion of the research findings.

Research Question One

What is the correlation between opportunity to learn and students' achievement in Chemistry?

Table 1.1: Correlation matrix between opportunity to learn and students' achievement in chemistry

	CHEMISTRY ACHIEVEMENT	OPPORTUNITY TO LEARN
CHEMISTRY ACHIEVEMENT	1	.044
Pearson Correlation		.166
Sig. (2-tailed)		
N	1000	1000
Mean	79.5720	259.6780
SD	11.33425	45.04944

Table 1 shows the results of the correlation between opportunity to learn and students' achievement in chemistry. The result shows that there is a positive but weak correlation between opportunity to learn and students' achievement in chemistry ($r = 0.044$). This implies that students' opportunity to learn relates positively with students' achievement in chemistry.

Research Question Two

What is the correlation between student academic engagement and students' achievement in chemistry?

Table 2: Correlation matrix between student academic engagement and students' achievement in chemistry

	CHEMISTRY ACHIEVEMENT	STUDENT ACADEMIC ENGAGEMENT
CHEMISTRY ACHIEVEMENT	1	.034
Pearson Correlation		.288
Sig. (2-tailed)		
N	1000	1000
Mean	79.5720	77.7850
SD	11.33425	10.56960

Table 2 shows the result of the correlation between student academic engagement and students' achievement in chemistry. From the table, it can be seen that there is a positive but weak correlation between student academic engagement and students' achievement in chemistry ($r = 0.034$). This indicates that student academic engagement relates positively with students' achievement in

chemistry. The more the students engage in academic activities the more their academic achievements improve.

Research Question Three

What is the composite and relative effective of opportunity to learn and student academic engagement on students' achievement in chemistry?

Table 3: Regression Model Summary and ANOVA of composite effect of opportunity to learn and student academic engagement on students' achievement in chemistry

R	.098					
R Square	.010					
Adjusted R Square	.004					
Std. Error of the Estimate	11.31413					
Model	Sum of Squares	df	Mean Square	F	Sig.	Remarks
Regression	.1223.274	6	203.879	1.593	.146	NS
1 Residual	127113.542	993	128.010			
Total	128336.816	999				

NS = Not Significant at 0.05 alpha level

Table 3 reveals the composite effect of opportunity to learn and student academic engagement on students' achievement in chemistry. The results show that the combination of the two predictor variables - opportunity to learn and student academic engagement have a positive multiple correlation ($R = 0.098$) with students' achievement in chemistry. The study revealed that the predictor variables jointly accounted for 0.4% ($\text{Adjusted } R^2 = .004$) of the total variance in students' achievement in chemistry while the remaining 99.6% could be due to the factors and residuals not considered in the study. Furthermore, the results indicates that the aggregate effect of the predictor variables on students' achievement in chemistry is positive but not statistically significant ($F(6.993) = 1.593, P > 0.05$). This implies that the two predictor variables - opportunity to learn and student academic engagement when put together has no significant effect on students' achievement in chemistry.

Table 4: Relative effect of opportunity to learn and student academic engagement on students' achievement in chemistry

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Remarks
	B	Std. Error	Beta			
L (Constant)	74.006	.3.341		22.152	.000	
Opportunity to Learn	.011	.008	.043	1.368	.172	NS
Student Academic Engagement	.035	.034	.033	1.038	.300	NS

NS = Not Significant at 0.05 alpha level

Academic engagement on students' achievement in chemistry. The result reveals that the relative effect of each of the predictor variables: opportunity to learn (= 0.043, $t = 1.368$, > 0.05) and student academic engagement (- 0.033, $t = 1.038$, > 0.05) on students' achievement in chemistry is low and not statistically significant. However, opportunity to learn make the highest contribution (- 0.043) while student academic engagement makes the lowest contribution (= 0.033) makes the lowest contribution.

DISCUSSION OF FINDINGS

The result reveals that there is a positive but weak correlation between opportunity to learn and students' achievement in chemistry. It further shows that opportunity to learn do not significantly correlate with students' achievement in chemistry (Table 1.1 and 1.3). This shows the extent to which factors of opportunity to learn such as conducive environment, learning facilities, curriculum content etc can affect students' achievement in chemistry. The findings of this study corroborates the views of Chien, Harbin, Goldhagen, Lippman and Walker (2012) that the quality of practices both inside the classroom and across the school: play a critical role in providing, learning opportunities and developing environments in which the students can flourish- The findings also agree with the submission of Enueme . (2011) that availability and adequacy of relevant school facilities are a sine qua non to fostering school effectiveness and ultimately child-friendliness. In the same vein, Olusegun and Omojafor (2009) noted that the design and layout of the school environment, which includes the buildings, interior finishing, outdoor space, room management as well as appropriateness of equipment and learning materials, have profound impact on children's all round development.

The result also shows that there is a positive but weak correlation between student academic engagement and students' achievement in chemistry. This indicates that students' academic engagement relate positively with students' achievement in chemistry. It also indicates that the more the students engage in academic activities, the more their academic achievements improve. The findings of this study corroborates the observation of Thijs and Verkuyten (2009) that the more

engaged students are, the more successful they will be in their learning. The result also buttressed Kuh (2009) who observed that student academic engagement and its historical antecedents are supported by decades of research showing positive associations with a range of desired outcomes. Gunuc (2014) examined the relationship between student academic engagement and other academic achievement and found that there were significant relationships between the students' academic engagement and their academic achievement, and especially the dimensions of cognitive engagement, behavioural engagement and sense of belonging. He also found that the students with high student academic engagement scores had higher levels of academic achievement scores and that those with low student academic engagement scores had lower levels of academic achievement scores. Hence, Taylor and Parsons (2011) advised that we need to change how we teach and what we teach in order to encourage student engagement.

The result further reveal that the combination of the two predictor variables (opportunity to learn and student academic engagement) have a positive multiple correlation ($R= 0.098$) with students' achievement in chemistry. The study revealed that the predictor variables jointly accounted for 0.4% (Adjusted $R: = .004$) of the total variance in students' achievement in chemistry while the remaining 99.6% could be due to the factors and residuals not considered in the study. Furthermore, the results indicate that there is a weak joint effect of the predictor variables on students' achievement in chemistry ($F(6.993) = 1.593, P > 0.05$). This implies that the two predictor variables (opportunity to learn and student academic engagement) when: put together have no significant effect on students' achievement in chemistry. This shows that there are so many factors that contribute to students' achievement in chemistry other than the variables considered in this study. The findings of this study is supported by Gunuc (2013) who reported that the campus/school climate is likely to have influence on students' performance, their achievement and on their positive and negative behavior. Adegbesam (2013) opined that the success of any school to achieve its stated goals or objectives depends on the ability of the chief administrator, otherwise known as the principal and his leadership style.

The result also reveals that the relative effect of each of the two predictor variables -opportunity to learn and student academic engagement on students' achievement in chemistry. The result reveals that the relative effect of each of the two predictor variables: opportunity to learn ($= 0.043, t = 1.368, P > 0.05$) and student academic engagement ($= 0.033, t = 1.038, P > 0.05$) on students' achievement in chemistry is low and not statistically significant; hence none of the predictor variables could be regarded as the most influential in the prediction model. This implies that the effects or contributions of the predictor variables; in this study are very minimal and not significant. However, the impact of opportunity to; learn and student academic engagement on students' achievement should not easily be underrated. Parents, teachers and school owners should strive to create an environment that; will provide opportunities that could engage students in meaningful learning in order to enhance their academic achievements.

CONCLUSION

This study showed that the two predictor variables: opportunity to learn and student academic engagement did not make statistically significant contributions to students' achievement in chemistry. However, it was observed that the two predictor variables correlated positively with students' achievement in chemistry. It is therefore, concluded that students could perform well if the school can provide the needed opportunities that can academically engage students in learning as well as enhance their academic achievement.

Limitation of the Study

The following are the limitations of this study:

It was not possible for the researcher to make use of all the secondary schools in Rivers State. The study was therefore, limited to twenty-five schools used in the study. This was due to the security situation in the state.

Also, the study could not cut across all the local government areas in Rivers State. It only makes use of five local government areas of the state. This was due to the time frame and economic constraints.

Suggestion for further Studies

The following are suggestions for further studies:

- The predictor variables of this study does not exhaustively explain the variance observed in students' achievement in chemistry, hence it is suggested that further studies should be done in order to ascertain all the variables linked with students' achievement in chemistry.
- This study should be replicated in other subject areas and in other local government areas in Rivers State using the same variables.
- It is also suggested that this study should be replicated in other parts of the nation for further generalization.
- Further studies can also be conducted on the same subject matter but among the university students in the department of chemistry.

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