Students' Variables as Predictor of Secondary School Students' Performance in Physics

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Abstract- The Students' Variables as Predictor of Secondary School Students' Performance in Physics in Ekiti West Local Government Area of Ekiti State, Nigeria was investigated in this study. The study adopted a survey research design of the ex-post facto type. The sample comprised 120 senior secondary school II Physics students drawn from the six secondary schools in Ekiti West Local Government Area of Ekiti state. The instruments used for the study was questionnaire and past academic performance in Physics of the students involved in the study. Two research hypotheses were generated and analysed in the study using Pearson's Moment Correlation and Multiple regression statistical analysis. Among others, the study revealed that: students' variables (study habit, attitude to and interest of students in Physics) are better predictors of students' performance in Physics, while student gender has no influence on students academic performance (is a poor predictor). The results also revealed the individual contribution of students' variables to students performance in term of beta weight 0.222 (22.2%), 0.196 (19.6%), 0.142 (0.14.2%) and 0.020 (2%) for students attitude to Physics, study habit, students interest and gender of the students respectively. Conclusion and recommendations were also made in this paper.

Index Terms- Physics, students, variables and academic performance

I. INTRODUCTION

Science has become such an indispensable tool that no nation, developed or developing, wishing to progress in the socio-economic sphere will afford to relegate its learning in schools. The role of science in this modern era of technology is wide and profound. In line with this reasoning, [24] emphasized the importance of scientific knowledge in boosting national prestige, military might, national income and international rating of the country. In the words of [27], "Physics is the most utilized basic science subject in most technology and technology- related profession". This merely indicates that the enormous role that Physics plays in the technological growth of any nation must not be undermined. In spite of the great emphasis on Physics teaching because of its central role in technological advancement, students are observed to perform poorly in academic achievement in the subject (see table 1).

Table 1: Showing summary of trends of performance in Physics in the West Africa Senior Secondary School Certificate Examination, Ekiti State (between 2005-2012)

YEAR	TOTAL No EXAMINED	CREDIT A1- C6	PASSES D7- E8	FAILURE F9
2005	3738	2156 (57.7%)	1104(29.5 %)	478 (12.8%)
2006	4157	2661 (64.0%)	1004 (42.2%)	492 (11.8%)
2007	4435	2524 (56.9%)	1243 (28.0%)	668 (15.1%)
2008	3385	1274 (37.6%)	797 (23.5%)	1314 (38.9%)
2009	4289	2296 (53.5%)	1036 (28.7%)	937 (17.8%)
2010	5459	2569 (49.8%)	1825 (31.6%)	1065 (18.6%)
2011	6859	4020 (58.6%)	1124 (16.4%)	1715 (25.0%)
2012	5081	2514 (49.5%)	1379 (27.1%)	1188 (23.4%)

Source: [10]).

A cursory look at the table revealed that not very many of the candidates had credit pass in the subject over the period of observation. In addition, mostly, over 40% of the candidates that were examined over the period of observation (except, 2006) scored below credit level grade which are considered to be failure grade and as cannot acceptable for admission purpose to read any science based course in the tertiary institutions.

Many factors have been attributed to this ugly and unwholesome situation.

These factors, include: students' negative attitude towards Physics, students' lack of interest in Physics, gender inequality and student study habits according to [2]; [7]; [3] and [22].

Attitude is an opinion or general feeling about something [12]. In the studies of Wilson and [13], students' positive attitudes to science correlate highly with their science achievement. Similar reports were recorded by [31] and [29], that students show more positive attitudes after been exposed to self-learning strategy such as computer and text-assisted programmed instruction, self-learning device, self- instructed and problem- based instruction. Moreover, several studies, such as [5]; [23]; [32]; [1]; [32]; [14] have variously reported that students' positive attitudes towards science highly correlate with their achievement in science and

students' attitude towards Chemistry have significant direct effect on students' achievement. [4] in his study affirms that improved students' attitude in Physics will enhance students' performance in the subject.

Interest is a feeling of curiosity or concern about something that makes attention turn towards it [12]. Research has shown that students will study and learn Physics better and, moreover, choose Physics as a course in upper secondary school if they are interested in it [17].

In the same way, modern research on interest [15] has also shown that interest-based motivation to learn has positive effects both on studying processes and on the quality and quantity of learning outcomes.

[26] in their study on science and technology education in democratic government for sustainable national development, assert that unimpressive response to science and technical education is particularly evident in students' poor performance in science subjects at secondary school level. Similarly, [8] observed lack of interest in Physics by students due to preconceived idea that Physics is a difficult subject, and this has affected the enrolment and performance of students in Physics.
Researchers have identified a number of factors that may have impact on students' interest in specific subjects. For example, in a study on structural and dynamic aspects of interest development, [18] identified a significant decline in interest in Physics, Chemistry and Mathematics as students' progress through secondary school. He also noted that this decline is especially pronounced for girls. Similarly, according to [34], research into students' attitude and interest in Physics originates from the 1960s and 1970s, basic questions are still open: how to make students' attitude towards Physics more favourable and how to increase their interest in the subject. Interest has many implications for studying and learning.

It is particularly noteworthy that a variety of research also found significant gender differences in attitude towards, and interest in science, with girls losing interest faster than boys in secondary school ([14]; [30]; and [11). Also, [20] indicate that these gender differences were most likely to be connected with a number of variables related to classroom experiences, including pedagogical variables. [28] in their study to determine the factors which predict performance in secondary school Physics asserts that sex is a very good predictor of performance in Physics at secondary school level. Similarly, the findings of [6] reveals significant in the aspect of gender difference in favour of boys in Physics achievement. Also, [25] observed that there is gender inequality in science, technology and mathematics.

Conversely, [16], [21] and [9] in their separate studies on comparative analysis of SSCE and NECO results in Ohaukwu local government area of Ebonyin State, gender differences in learning outcomes background and differences in gender gap comparisons across racial/ethnic groups in education and work respectively reported that there is no significant effect of gender on achievement of Physics.

II. Research Hypotheses

The following research hypotheses were formulated and tested at $p< 0.05$:

HO_1. There is no significant relationship between student variables and student academic performance in Physics.

HO_2 : There is no significant relationship between the contributions of student variables to the academic performance of secondary school student in Physics.

III. Methodology

The study was a descriptive survey of *ex-post facto* research design which was questionnaire based. The target population for this study comprised of all senior secondary class II (SS 2) Physics students in all the public secondary schools in Ekiti West Local Government Area of Ekiti State, Nigeria. Stratified random sampling technique was used to select twenty (20) students each from each of the six (6) selected secondary schools from Ekiti West Local Government Area of Ekiti State. A total of one hundred and twenty (120) students were used as samples for the study, these comprise of seventy nine (79) male and forty one (41) female. The instrument used for this study was questionnaire. The questionnaire is designed to elicit information students' attitude towards Physics, Interest in Physics, Students' study habits and Students' gender. The researchers made personal contact with all the selected schools and collected the photocopy copy of the previous results in Physics of the students involved in the study.

With the permission of the authorities of the schools used for the study, the questionnaires were administered on the affected senior secondary class 2 Physics students. The questionnaire copies were then collected and each of them was scored accordingly and the data collected were later analysed using Pearson's Product Moment Correlation and Multiple regression statistical analysis at 0.05 level of significance.

IV. Result and Discussion

Hypothesis 1

There is no significant relationship between student variables and student academic performance in Physics.

Table 2: Correlation matrix of student variables and student academic performance in Physics

	Gender	Physics Attitudinal Scale	Physics Interest Scale	Study Habit	Student Academic Performance
Gender	1.000				
Physics Attitudinal Scale	.029	1.000			
Physics Interest Scale	-.055	.320*	1.000		
Study Habit	.017	.055	.521*	1.000	
Student Academic Performance	.060	.482*	.411*	.623*	1.000

* correlation is significant at the 0.05 level (2 – tailed)

The result from table 2 shows that r-cal between the students study habit and their academic performance in Physics is significant (i.e. r-cal = .623 > r-table =0.195). Also, student attitude towards Physics and their academic performance in Physics is also significant (i.e. r-cal = .482 > r-table = 0.193). Similarly, It also shows that r-cal between student interest in Physics and Students performance in Physics is significant (i.e. r-cal = .411 > r-table = 0.193). Moreover, student study habit and their interest in Physics are significant (i.e. r-cal = .521 > r-table = 0.193). It also shows that r-cal between student interest in Physics and Students attitude towards Physics is significant (i.e. r-cal = .320 > r-table = 0.193). The result further revealed that r-cal between student gender and Students performance in Physics is not significant (i.e. r-cal = .060 < r-table = 0.193).

In summary, student study habit shows the highest relationship with student academic performance in Physics with r-cal = 0.623, followed and interest in Physics with r-cal = .521, followed by students' attitude and their academic performance in Physics with r-cal = .482, followed by student interest and their performance in Physics with r-cal = .411 while the correlation between students' interest in Physics and attitude towards Physics has the least value of r-cal = .320. The result shows no correlation between students' gender and Students performance in Physics.

Hypothesis 2

There is no significant relationship between the contributions of student variables to the academic performance of secondary school student in Physics.

In order to test the hypothesis, scores on all the identified predictors (students' variables) of academic performance constitute the independent variables while students' academic performance represents the dependent variable. These set of scores were subjected to statistical analysis using multiple regression analysis at 0.05 level of significance.

The regression model is specified as follows:

$Y = f(x)$

$Y = b_0+b_1X_1+b_2X_2+b_3X_3+ b_4X_4+U_i$

Where X_1 = student study habit

X_2 = Physics interest Scale

X_3 = Physics Attitude Scale

X_4 = gender

b_i = slope

U_i = stochastic error term.

Regression result is presented in table 3 below

Table 3: Multiple regressions of the student variables and academic performance of secondary school students' in Physics

Model	B	Std Error	Beta	t	Sig T	Remark
Constant	219.846	21.222	-	8.746	.000	Sig
Gender	8.122	2.047	.020	.221	.473	Not Sig
Student Attitude Scale	.120	.174	.222	.690	.490	Sig
Physics Interest Scale	.037	.048	.142	.459	.076	Sig
Study Habit	.103	.054	.196	1.918	.056	Sig

Dependent Variable: student academic performance.
Multiple R = 0.901
Multiple R^2 = .812
Adjusted R^2 = .812
F = 94.723
Sig. F = .000

The result from table 3 shows that the students' attitude is the single best predictor of student academic performance in Physics with beta weight 0.222 (22.2%). Student study habit is the second best predictor of student academic performance in Physics with beta weight 0.196 (19.6%). This is followed by students' interest in Physics and students' gender with beta weight 0.142 (14.6%) and 0.020 (2%) respectively.

The composite relationship between predictors (students' variables) and academic performance is very high, positive and statistically significant at 0.05 level (R=0.901, P<0.05). The coefficient of determinant (R^2) is 0.812. This implies that about 81% variation in the students' academic performance is jointly explained by variation in the predictor variables. The remaining 19% unexplained variation is largely due to variation in other variable which are not in line with the regression model but otherwise constitute the stochastic error term.

Testing the effect of individual predictor variable on students' academic performance, the result shows that students' study habit (t=1.918, P<0.05), students' attitude (t=0.690, P<0.05) and students' interest in Physics (t= .459) were statistically significant at 95% confidence level in each case. However, the impact of Student gender (t= .221, P>0.05) are not statistically significant at 0.05 level.

The regression model is statistically significant in terms of overall goodness of fit (F = 94.723, P < 0.05).

V. Discussion

The results of the study were discussed based on the two research questions:

The result from table 2 shows significant difference in the student attitude towards Physics and their academic performance in Physics significant (i.e. r-cal = .482 > r-table = 0.193). This shows that positive attitude towards Physics is a good predictor academic performance in Physics. This results agrees with the findings of [13] and [4] that students' positive attitudes to science correlate highly with their science achievement and that improved students' attitude in Physics will enhance students' performance in the subject.

Similarly, It also shows that r-cal between student interest in Physics and Students performance in Physics is significant (i.e. r-cal = .411 > r-table = 0.193).That is , the result is significant. This results agrees with the findings of [15] that interest-based motivation to learn has positive effects both on studying processes and on the quality and quantity of learning outcomes. Moreover, the result that r-cal between student gender and Students performance in Physics is not significant (i.e. r-cal =

.060 < r-table = 0.193) agrees with the findings of [16], [21] and [9] in their separate studies reported that there is no significant effect of gender on achievement of Physics.

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VI. Conclusion

As a result of the findings of this study, it is concluded that students' variables (students' attitude towards Physics, Students' interest in Physics and study habit) were significantly important to students' academic performance in Physics. This simply implies that performance of student in Physics strongly depend on students' attitude towards Physics, Students' interest in Physics and study habit.

VII. Recommendations

Based on the findings of this study, it was recommended that:

Students of Physics must cultivate right attitude towards the learning of the subjects. They should have the mind that Physics is fascinating; view it as something around them every day and not as an abstract subject.

It is also recommended that students of Physics must cultivate good study habit and good interest in the subject. They should learn how to go over what they were being taught for that day in Physics at night and make consultation to other text to widen their knowledge on the topic.

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