ISSN 2250-3153

Students' Variables as Predictor of Secondary School Students' Academic Achievement in Science Subjects

Agbaje, Rashidat O, & Alake, Ese M

Department of Integrated Science, College of Education, Ikere- Ekiti, Ekiti State, Nigeria

Abstract- The Students' Variables as Predictor of Secondary School Students' Performance in Science in Ikere 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 125 senior secondary school II science students drawn from the five secondary schools in Ikere Local Government Area of Ekiti state. The instruments used for the study was questionnaire and past academic performance in three science subjects (Biology, Chemistry and 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 Science subjects) are better predictors of students' performance in science subjects, while student gender has no influence on students academic performance . The results also revealed the individual contribution of students' variables to students performance in term of beta weight 0.231 (23.1%), 0.202 (20.26%), 0.181 (0.18.1%) and 0.101 10.1%) for students attitude to Science, study habit, students interest and gender of the students respectively. Conclusion and recommendations were also made in this paper.

Index Terms- Science, students, variables and academic performance

I. INTRODUCTION

Development of any nation is a measure of her development in the area of Science and Technology. Technological growth of a nation leads to its social and economic development. In the world today, science and technology has become a dominant power development indicator. America, Russia, Japan and China are typical examples of nations which are now referred to as developed, as a result of their development in the area of Science and Technology.

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.

The role of science in this modern era of technology is wide and profound. In line with this reasoning, [6] emphasized the importance of scientific knowledge in boosting national prestige, military might, national income and international rating of the country. According to them, science gives birth to the production of micro computers and their innovative applications which earned the developed countries such as the United States of America and Japan unparalleled national wealth, military potential and enviable national prestige.

In Nigeria, in spite of the enormous role that science plays in national development and the efforts of government and other stakeholders in improving science education, science (Biology, Chemistry and Physics) results in most certified examination bodies like the West African Examinations Council (WAEC) and National Examinations Council (NECO) have not been satisfactory especially in Ekiti state, Nigeria [10]. Many factors have been attributed to this ugly and unwholesome situation. These factors, include: students' negative attitude towards Science subjects, students' lack of interest in science subject, 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 science 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 science subjects better and, moreover, choose sciences as courses 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 science subjects by students due to preconceived idea that sciences are difficult subjects, and this has affected the enrolment and performance of students in sciences.

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 science 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 science subjects asserts that sex is a very good predictor of performance in science subjects 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 science subjects.

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

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) science students in all the public secondary schools in Ikere Local Government Area of Ekiti State, Nigeria. Stratified random sampling technique was used to select twenty (25) students each from each of the five (5) selected secondary schools from Ikere Local Government Area of Ekiti State. A total of one hundred and twenty five (125) students were used as samples for the study, these comprise of seventy two (72) male and fifty three (53) female. The instruments used for this study was questionnaire and past records of academic performance of students in Biology, Chemistry and Physics obtained from the schools involved in the study. The questionnaire is designed to elicit information about students' attitude towards Biology, Chemistry and Physics; Interest in Biology, Chemistry and Physics; Students' study habits; and Students' gender. With the permission of the authorities of the schools used for the study, the questionnaires were administered on the affected senior secondary class 2 Science 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 Science.

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

	Gender	Physics Attitudinal Scale	Physics Interest Scale	Study Habit	Student Academic Performance
Gender	1.000				
Physics Attitudinal Scale	.031	1.000			
Physics Interest Scale	-.042	.209*	1.000		
Study Habit	.014	.055	.410*	1.000	
Student Academic Performance	.057	.371*	.300*	.512*	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 science is significant (i.e. r-cal = .512 > r-table =0.195). Also, student attitude towards science and their academic performance in science is also significant (i.e. r-cal = .371 > r-table = 0.193). Similarly, It also shows that r-cal between student interest in science and Students performance in science subjects is significant (i.e. r-cal = .300 > r-table = 0.193). Moreover, student study habit and their interest in science subjects are significant (i.e. r-cal = .410 > r-table = 0.193). It also shows that r-cal between student interest in Science and Students attitude towards science subjects is significant (i.e. r-cal = .209 > r-table = 0.193). The result further revealed that r-cal between student gender and Students performance in science is not significant (i.e. r-cal = .057 < r-table = 0.193).

In summary, student study habit shows the highest relationship with student academic performance in science with r-cal = 0.512, followed and interest in science with r-cal = .410, followed by students' attitude and their academic performance in science with r-cal = .371, followed by student interest and their

performance in science subjects with r-cal = .300 while the correlation between students' interest in science and attitude towards science subjects has the least value of r-cal = .209. The result shows no correlation between students' gender and Students performance in science subjects.

Hypothesis 2

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

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 = science interest Scale

X_3 = science 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 science subjects.

Model	B	Std Error	Beta	T	Sig T	Remark
Constant	198.846	22.322	-	8.746	.000	Sig
Gender	7.113	2.047	.101	.314	.442	Not Sig
Student Attitude Scale	.120	.174	.231	.690	.490	Sig
Science Interest Scale	.041	.058	.181	.459	.076	Sig
Study Habit	.101	.054	.202	1.918	.056	Sig

Dependent Variable: student academic performance.

Multiple R = 0.871

Multiple R^2 = .759

Adjusted R^2 = .759

F = 86.647

Sig. F = .000

The result from table 3 shows that the students' attitude is the single best predictor of student academic performance in science subjects with beta weight 0.231 (23.1%). Student study habit is the second best predictor of student academic performance in science subjects with beta weight 0.202 (20.2%). This is followed by students' interest in science subjects and students' gender with beta weight 0.181 (18.1%) and 0.101 (10.1%) respectively.

The composite relationship between predictors (students' variables) and academic performance is very high, positive and statistically significant at 0.05 level (R=0.871, P<0.05). The coefficient of determinant (R^2) is 0.759. This implies that about 75.9% variation in the students' academic performance is jointly explained by variation in the predictor variables. The remaining 24.1% 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 Science (t= .459) were statistically significant at 95% confidence level in each case. However, the impact of Student gender (t= .314, 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 = 86.647, 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 science subjects and their academic performance in science subjects significant (i.e. r-cal = .371 > r-table = 0.193). This shows that positive attitude towards science subjects is a good predictor academic performance in science subjects. This results agrees with the findings of [13] and [4] that students' positive attitudes to science subjects correlate highly with their science achievement and that improved students' attitude to science subjects enhance students' performance in the subject.

Similarly, It also shows that r-cal between student interest in Science subjects and Students performance in science subjects is significant (i.e. r-cal = .300 > 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 science subjects is not significant (i.e. r-cal = .057 < 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 science subjects.

The result from table 3 shows that the students' attitude is the single best predictor of student academic performance in science subjects with beta weight 0.231 (23.1%). This results agrees with the findings of [13] and [4] that students' positive attitudes to science subjects correlate highly with their science achievement and that improved students' attitude to science subjects will enhance students' performance in the subject. This is followed by students' interest in science subjects and students' gender with beta weight 0.181(18.1%) and 0.101 (10.1%) respectively.

The composite relationship between predictors (students' variables) and academic performance is very high, positive and statistically significant at 0.05 level (R=0.871, P<0.05). The

coefficient of determinant (R^2) is 0.759. This implies that about 75.9% variation in the students' academic performance is jointly explained by variation in the predictor variables. The remaining 24.1% 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.

VI. Conclusion

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

VII. Recommendations

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

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

It is also recommended that science students 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 science subjects at night and make consultation to other text to widen their knowledge on the topic.

References

[1] I. Ajzen, and M. Fishbein,. Attitudes and the attitude-behaviour relation reasoned and automatic processes. European Review of Social Psychology, 2000, 11, 1-33.

[2] A.O. Akanbi, Trend in physics education in secondary school in Kwara State. Lafiagi Journal of Science Education, 2003, 5(1&2), 69-75.

[3] B.M. Akinola, Causes of mass failure in senior secondary school Chemistry in Ijebu East Local Government Area of Ogun State.Oro Science Education Journal, 2006, 4(5&6), 19.

[4] O.A. Akinyemi, Enhancing students' attitude towards Nigerian Senior Secondary School Physics through the use of cooperative, competitive and individualistic learning strategies. Australian Journal of Teacher Education, 2009, .34(1).

[5] E.A. Alao, A scale for measuring secondary school students' attitude towards Physics. Journal of Science Teachers Association of Nigeria, 1990, 26(2), 75-79.

[6] A.O Oredein and A.O. Awodun, Impact of Teachers' Motivational Indices on science Students' academic performance in Nigerian Senior Secondary Schools. International Educational Studies, Vol 6, No. 2 2013.

[7] O.A. Asikhia, Students' and teachers' perception of the causes of poor academic performance in Ogun State Secondary Schools (Nigeria): Implications for Counseling for National Development. European Journal of Social Sciences, 2010, 13(2), 229.

[8] L. Bamidele, Students' poor performance in Physics. A bane to our Nation's Technological Development. Nigerian Journal of Science Education and Practice, 2004, 2(1),174

[9] R. Coley, Differences in the gender gap comparisons across racial//ethnic groups in Education and work. Policy Information Report, Educational Testing Service, Princeton, NJ. Retrieved from http://www.ets.org/media/Research/pdf/PICGENDER.pdf. 2010.

[10] Ekiti State Ministry of Education, Science and Technology (2013). Summary of WAEC results in Physics in Ekiti State between 2005- 2012.

[11] D. Elster, Students interests- The German and Austrian ROSE Survey. Journal of Biological Education, 42(1), 5-11. Retrieved from http://dx.doi.org/10./080/00219266.2007.9656100. 2007.

[12] Encarta Dictionary. A Bloomsbury Reference Book created from Bloomsbury of World English. 2004.

[13] C. Festus and O.A. Ekpete Improving students' performance and attitude toward chemistry through Problem-Based-Solving Techniques (PBST). International Journal of Academic Research in Progressive Education and Development, 2012, 1(1).

[14] S. Gonen and B. Basaran, The new method of Problem-Solving in Physics Education by using Scorn-Compliant content package. Turkish online Journal of Distance Education- TOJDE, 2008, .9(3), 112-120.

[15] S. Hidi, A. Renninger and A. Krapp, Interest, a motivational variable that combines affective and cognitive functioning. In D.Y. Dai and R.J. Sternberg (Eds.), Motivation, Emotion, and Cognition. Malawah, NJ: Lawrence Erlbaum. 2004.

[16] G. Igboke, Comparative Analysis of SSCE and NECO Results in Ohaukwu Local Government Area of Ebonyin State. Unpublished Ph D thesis, Enugu State University of Science and Technology (ESUT). 2004.

[17] Jari Lavonen, Reijo Byman, Kalle Juuti, Veijo Meisalo and Anna Auito. Pupil Interest in Physics: A survey in Finland. Online. Retrieved on 15/2/2013. 2012.

[18] A. Krapp, Structural and dynamic aspects of interest development: theoretical considerations from an autogenetic perspective. Learning and Instruction. 2002, 12, 383-409.

[19] Ogunleye B.O. and Babajide V.F.T. (2011). Commitment to Science and Gender as Determinants of Students Achievement and Practical Skills in Physics. JSTAN Journal. Online . Retrieved 11/07/2012.

[20] M. Logan and K. Skamp, Engaging Children in Science across the Primary-secondary interface: Listening to the students' voice. Research in Science Education, 2008, 38, 501-527. Retrieved from http:// dx.doi.org/10.1007/sIII 65-007-9063-8.

[21] X Ma, Gender differences in learning outcomes background. Paper prepared for the Education for All Global Monitoring Report Retrieved from 2008/ED/EFA/MRT/PI/80,http://unesdoc.org/images/0015/001555/155593e .pdf. 2007.

[22] Macmillan, Mafulul Josiah. School location versus academic Achievement in Physics: Does Computer-Assisted Instruction (CAI) Has Any Effect? Journal of Educational and Social Research, 2012, 2(8).

[23] W. Ogunleye, Strategies for teaching Physics for learning gain in the Senior Secondary School: A guide to teachers. Journal of Science Teachers Association of Nigeria, 1993, 28(1&2), 151-156.

[24] B.O Ogunleye and O. Adepoju Fasakin, Everyday phenomenon in Physics Education: Impact on male and female students' Achievement, Attitude and practical skills in urban and peri-urban settings in Nigeria. Pakistan Journal of Social sciences. 2011, 8(6), 316-324.

[25] B.O Ogunleye and V.F.T. Babajide, Commitment to Science and Gender as Determinants of Students Achievement and Practical Skills in Physics. JSTAN Journal. Online . 2011. Retrieved 11/07/2012.

[26] M.A. Okooboh, M.A. Afolabi and O.A. Asikhia, Science and Technical Education in a Democratic Government for sustainable National Development. The conference: Journal of Contemporary Educational Thoughts, 2004, 1(1),44-45.

[27] R.D. Olarinmoye, Strategies for effective teaching of modern Physics. A keynote Address presented at the STAN Physics Panel Workshop held at Government College, Katsina State. From 24th -29th ,April,2000. 2000.

[28] D.U Onah and E.I. Ugwu, Factors which Predict Performance in Secondary School Physics in Ebonyin North Educational Zone of Eboyin State, Nigeria. Unpublished masters' Degree Dissertation, ESUT. 2010.

[29] A.A. Popoola, Effects of Heuristic Problem- Solving and programmed Instructional Strategies on Senior Secondary Students' LearningOutcomes in Mathematics in Ekiti State,Nigeria. Unpublished Ph. D Thesis. University of Ibadan. 2002.

[30] R. Trumper, Factors affecting Junior High School Students' interest in Physics. Journal of Science Education and Technology, 2006, 15(1), 47-59. Retrieved from http://dx.doi.org/10.1007/s/0956-006-0355-6.

[31] V.J. Udousoro, The Relative Effects of Computer and Text-Assisted programmed instruction on students' learning outcomes in Mathematics. Unpublished Ph. D Thesis. University of Ibadan, Nigeria. 2000.

[32] M. Weinburgh, Gender, Ethnicity, and Grade level as predictors of middle school students' Attitudes toward science. Georgia State University. 1998. Retrieved from www.ed.psu.edu/CI/Journals/.on 17/12/2012.

[33] V. I. Wilson, C. Ackerman and C. Malave, Cross-time attitudes concert formation and achievement in College freshman Physics. Journal of Research in Science Teaching, . 2000, 37(10), 1112-1120.

[34] J. Bennett, Teaching and learning science: A Guide to Recent Research and its Applications. London: Contium. 2003.

AUTHORS

First Author – Agbaje, Rashidat O, Department of Integrated Science, College of Education, Ikere- Ekiti, Ekiti State, Nigeria
Second Author – Alake, Ese M, Department of Integrated Science, College of Education, Ikere- Ekiti, Ekiti State, Nigeria

Correspondence Author – Awodun, Adebisi Omotade, Department of Physics, College of Education, Ikere-Ekiti, Ekiti State, Nigeria., E-mail: bisawoideas@yahoo.com