

Predictive validity of students' achievement on basic science in relation to students' performance in Physics

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Abstract

The study appraised the predictive strength of students' achievement in basic science vis-a-vis the performances of students in Physics in West African Senior School Certificate Examination. The research technique used was correlational design. Purposive and simple random sampling techniques were used to select the sample of the study. The sample size consisted 275 students drawn from six schools located in three states in southeast geopolitical zone of Nigeria. Two research questions and two hypotheses guided the study. The hypotheses were tested at 95% level of confidence. The theoretical framework was anchored on the "achievement goal theory". The instruments for data collection was students' achievement records from the NECO organized JSSCE/BECE and WAEC organized WASSCE. Linear regression analysis was done, enabling the researchers to answer the research questions. The extracted data were paired for the analysis. Based on the outcome of the analysis, it was discovered that students' achievement in basic science is not a predictor of students' achievement in physics in WASSCE for both males and females combined, and when each gender is considered separately. It was recommended that ministry of Education should undertake survey on the issue in order to obtain peoples' opinions on how to address the matter.

Keywords: basic, science, physics, correlational, achievement

Introduction

Science plays central roles in the development of nations. It is indispensable in the search for appropriate solutions to socio-economic problems of a nation. The consciousness on the importance of science in development made the Nigerian Federal Government to state that science and technology should form the basis of the country's development and should influence thinking process (FRN, 1986). To translate this lofty idea to reality, the government further stated that all efforts will be geared towards making it possible for the average child to have early contact with the concept of science and material related to science and technology even before attaining primary school age. Government asserted that special provision shall be made for the study of sciences at all levels of education, starting from the kindergarten to the University (FRN, 2013).

The study of science in secondary schools begins with basic science, previously known as integrated science in Nigerian junior secondary schools. Basic schools include the first six years of the lower basic and three (3) years formal schooling after primary school. It is in the basic schools that the basic science previously known as integrated science is taught, in preparation for entry into senior secondary where West African Senior School Certificate Examination (WASSCE) is taken as the final examination by the students. It is the precursor of other science subjects as it lays the foundation for the study of the separate science subjects at the senior secondary school level. In this light, it forms the basis of achieving government's development agenda through science.

Physics is one of the three subjects that are integrated into basic science, but typically studied as a separate subject in the senior secondary schools. Physics as a separate subject, deals with the study of the fundamental constituents of the universe, the force they exert on one another, and the effect of these forces (Omiwale, 2011). The contributions of Physics in the study of science are enormous. Indeed, the study of science and its contributions to modern inventions would not have come to fore without sound knowledge of Physics and the application of its principles. Ibeh et al. (2013) had referred to physics as "a fulcrum subject among the science that requires special attention". Technological inventions and scientific breakthrough rest heavily on the application of physics principles. Otuka (1983) stated that technological potential of a country is more accurately gauged by its physics education. Without Physics, technological culture cannot really take root, no matter the amount of imported technical expertise. Otuka (1983) further added that priority of physics in the development of scientific and technological programme of nations is so important that backwardness and exploitation by other countries would be the only reward of a nation with poor records in physics.

Based on its usefulness and in order to encourage students to develop interest in the study of Physics at the early contact with science, the curriculum of basic science was

designed to contain rudimentary topics that will guide the study of physics in the senior secondary school section. The topics are sequentially arranged in the basic science curriculum so as to gradually introduce the students to the contents of the physics curriculum. For instance, in the first year junior secondary school (JSSI), students are to study energy, forces, renewable and non-renewable energy. In the second year, junior secondary school students (JSS2) are exposed to topics such as work, energy and power, types of energy and thermal energy. The third year junior secondary school students (JSS3) are meant to study light energy, sound energy, magnetism, electrical energy and radioactivity (NERDC, 2012). Through this arrangement, the contents of the curriculum of the separate subject studied in the senior secondary school physics are introduced to the students while in the junior secondary schools. This means that the background knowledge and foundation in the study of physics are laid for students at the basic level.

Based on this early exposure to the concept of physics, it is expected that students that studied basic science and passed it at credit level in the terminal examination of the basic education programme (JSSCE) should be able to study physics as a separate subject in the senior secondary school and do well in WASSCE. But contrary to this expectation, reports on students' achievement in the West African Senior School Certificate Examination (WASSCE) in physics indicate abysmal performance of male and female students (WAEC, 2015; 2016; 2017). This sharply contrasts with their JSSCE basic science achievement records (SMoE, 2012; 2013; 2014). It could be recalled that part of the provisions in the 9-3-4 system of education is that students must pass at least six subjects including the core subjects at credit levels in order to qualify to study in senior secondary school in Nigeria.

As Basic science is designated as core subject at the junior secondary school (JSS), it therefore showed that those students who performed poorly in the WASSCE physics must have passed basic science at credit level which qualified them to study in the senior secondary school. Further evidences of poor achievement of students in physics at WASSCE in Nigeria were independently reported by Aina (2015), Nwankwo and Madu (2014) and Omiwale (2011). These researchers independently lamented that students' academic achievement in physics in Nigeria have generally and consistently remained poor over the years.

Another source of worry is that further to the reported general poor students' achievement in WASSCE physics, girls were reported to perform far less than their male counterparts in the WASSCE physics examinations (Nwankwo & Madu, 2014; Onah & Ugwu, 2010). The poor achievement of girls in the SSCE in physics is contradictory to the reports on achievement of girls in JSSCE basic science (SMoE, 2012; 2013; 2014). The result records did not contain evidence showing that girls achieved lower than their male counterparts.

The basic science curriculum and that of senior secondary school physics are similar in content although different in scope (NERDC, 2012). Despite these similarities, most students that passed basic science at JSSCE with high grade were unable to replicate the same feat in physics at the senior secondary school certificate examination. This has remained a big source of worry to education science stakeholders in Nigeria. It has cast shadows and doubts on the decision made with the students' basic science in JSSCE achievement records with respect to the students' future achievement in the study of physics as a single subject. In order to clear or establish the doubts and shadows, this study investigated the predictive validity of students' achievement in basic science in JSSCE on their achievement in physics in the senior secondary school certificate examination. The study further investigated the moderating effect of gender on the predictive validity of the JSSCE in basic science.

The achievement goal theory (AGT) was selected as the theory for this study because of its compatibility and relevance with the research questions. Research frameworks are fundamental yardsticks that enable researchers to probe comprehensively, enabling them to extract relevant answers or solution to the problems. It is in this light that Ramnarain and Ramaila (2016) argued that achievement goal theory is an important framework for understanding of students' performances in an academic setting. The research findings of Bardach et al. (2020) maintains that achievement goal was most strongly related to its contextual counterpart based on circumstances that predate goal interest. In a related study, Dull et al. (2015) opine that achievement goal theory is an essential framework that guides evaluation of students' academic performances.

Chazan et al. (2022) reviewed the contributions of AGT in students' performances. Their findings highlight important indices such as: achievement, competence, performance, and goal attainment. Some authors hold the view that AGT relies on cognitive presentation of desired outcomes arising from future-oriented target (Üztemur, 2020). Achievement goals enables researchers and practitioners to comprehend the intent for students to embark on achievement enterprise. Therefore, evaluating students' performance of Physics in WASSCE in the three states of Anambra, Ebonyi and Imo that are selected for the study based on their performance in JSSCE/BECE in Basic schools could be best achieved through AGT framework. The AGT will be used to buttress the research findings and to inform discussion and recommendations accordingly. Therefore, the achievement goal theory is used in this study to ascertain the extent to which achievement of students in basic science can predict their achievement in physics.

Research questions

The two (2) research questions that guided the study are:

1. What is the predictive validity of students' achievement in basic science JSSCE on their achievement in physics in the WASSCE?
2. What is the predictive validity of male and female student's achievement in basic science on their achievement in WASSCE?

Hypotheses

The researchers formulated two null hypotheses that guided the study and the hypotheses were tested at 0.05 level of significance.

Ho1: The achievement scores of students in the JSSCE in basic science do not significantly predict their achievement score in physics at WASSCE.

Ho1: The achievement of students in the JSSCE in basic science does not significantly predict male and female students' achievement scores in the WASSCE in physics.

Methodology

The research design adopted for the study was a correlation design. A total of 275 students, with males 169 and females 106, participated in the study. These students were drawn from six (6) schools in three states (Ebonyi, Anambra and Imo) in Nigeria. Figure 1 gives the map of Nigeria, indicating the respective states. The students were combination of those who wrote state organized JSSCE basic science in 2012, 2013 and 2014 and passed and also wrote the WASSCE in the years 2015, 2016 and 2017 respectively according to their year of graduation. They were students from the six sampled schools with intact results in the two examinations (JSSCE and WASSCE).

The sample was selected using a combination of simple random sampling and purposive sampling techniques. Purposive sampling was combined with simple random sampling technique because there were defined criteria, which schools must meet in order to qualify for participation in the survey. The criteria included presentation of candidate for state organized JSSCE/BECE since 2012 and presentation of candidates for WAEC organized WASSCE from 2015. Furthermore, the school must be offering all the core science subjects and finally, the school must be a co-educational institution. The records were all drawn from the Imo State, Anambra State and Ebonyi State Ministry of Education for 2012 to 2014 JSSCE basic science/integrated science.

Predictive validity of students' achievement on basic science in relation to students' performance
Ogbaga Emmanuel, Ph.D; Nweke C. O., Ph.D; Beth N. Oluka, Ph.D; I. O. Egbe, Ph.D & M. N. Anugwo, Ph.D



Figure 1: Map of Nigeria, indicating the 3 states used for the study

Source: <https://images.app.goo.gl/4vXrrTggFbAa4Kxw6>.

The instruments for data collection were students' achievement records from the state organized junior secondary school certificate examination/basic education certificate examination (JSSCE/BECE) and the WAEC organized WASSCE. The computer result sheets of those examinations were used to extract the students' scores in the two examinations. The grade scores of each student were transformed to raw scores using the obtained grading systems of the two examination bodies. The extracted and converted scores were paired. A correlation analysis was carried out on the paired scores using Linear Regression Analysis in order to answer the research questions while test of significance of *t* was carried out on the paired scores, in order to test the hypotheses.

Presentation of results

Research question 1: What is the predictive validity of students' achievement in basic science JSSCE on their achievement in physics in the WASSCE?

Data collected from JSSCE basic science result sheets and WASSCE physics result sheets for the same students within the three years were analyzed using linear regression model. The summary is presented in table1.

Table 1: Regression analysis showing the predictive validity of students' achievement scores in JSSCE basic science and SSCE physics scores

Computed R	R ²	Adjusted R ²	Standard Error
0.032672	0.00106	0.00260	10.06083

As shown on table 1, the adjusted r² is 0.00260. This indicates that approximately 0.3% of students' achievement scores in physics in the senior secondary school certificate examination is predicted by their achievement in JSSCE basic science. This implies a very low predictive strength. But whether it is significant or not will only be determined after testing of the hypothesis.

Ho1: The achievement scores of students in the JSSCE in basic science do not significantly predict their achievement score in physics at WASSCE.

Table 2: Significance of the predictive strength of JSSCE Basic Science on SSCE Physics

Predictor variable	B	Standard Error in B	Beta	T	Sig T.
JSSCE (basic Science)	0.035569	0.065966	0.032616	0.53920	0.5902
Constant	53.805906	3.614642		14.88584	

The summary of the result of data analysis in table 2 for the test of hypothesis shows that at alpha level of 0.05, the calculated t value of 0.54 is less than the significance t value of 0.59. As a result, the researchers upholds the null hypothesis and conclude that the achievement of students in BECE/JSSCE does not significantly predict achievement in WASSCE in physics. The regression equation for predicted WASSCE physics scores is:

$$Y = 0.036x + 53.81$$

The regression equation is a straight line equation of the form $Y = mx + c$ where 'x' is JSCE basic science/integrated science raw score for each candidate and 'c' is a constant.

Research question 2: What is the predictive validity of male and female student's achievement in basic science on their achievement in WASSCE?

Data collected from the JSSCE basic Science result sheets for males and females and data collected from WASSCE in physics achievement result sheets for males and

females were analyzed separately using regression analysis. The summary of the analysis is presented on table 3 and 4 respectively.

Table 3: Results of linear regression analysis showing the predictive validity of male students' achievement scores in WASSCE Physics

Computed R	R²	Adjusted R²	Standard Error
0.00208.	0.000	-0.00590	9.51439

As indicated in table 3, the summary of the result of the data analysis shows that the adjusted r^2 value is -0.00590. This is the co-efficient of determination. The implication is that approximately 0.6% of the variations in the male students' achievement in physics in the WASSCE are explained by the achievement in basic science in JSSCE/BECE. The test of hypothesis will reveal whether it is significant or not.

Table 4: Result of linear regression analysis showing the predictive validity of female students' achievement scores in JSSCE Basic Science on their achievement score in WASSCE physics

Computed R	R-Square	Adjusted R-Square	Standard Error
0.06069	0.00368	-0.00598	10.96079

The summary of the data analysis presented in table 4 indicated the adjusted r^2 value of -0.00590. This shows that the predictive strength of female students' achievement in basic science in JSSCE/BECE in SSCE in physics is 0.6%. This is a very weak predictive power. To determine the significance of this prediction is by testing the hypothesis.

Ho2: The achievement of students in the JSSCE, basic science does not significantly predict male and female students' achievement scores in the WASSCE in physics.

To test the hypothesis, the predictive strengths of JSSCE basic science obtained for males and females in SSCE physics were further subjected to a test of significance at 95% confidence level. The summaries of the results are presented on table 6 for males and table 7 for females.

Table 5: Predictive strength of male students’ achievement score in JSSCE Basic Science on their achievement score in WASSCE Physics

Predictor variable	B	Standard Error in B	Beta	T	Sig. T
JSSCE (Basic science)	00.002490	0.092673	0.002079	0.02686	0.9786
Constant	54.4960	4.937150		11.03796	

From the result of the data analysis on the test of hypothesis as shown on table 5, at alpha level of 0.05, the calculated t value is 0.02686, while the t significant (critical) value is 0.9786. This shows that the calculated t is less than the critical t value. Based on the values, the researchers uphold the null hypothesis and then conclude that the achievement of male students in BECE/JSSCE does not significantly predict achievement in the WASSCE in Physics. The regression equation for predicted WASSCE physics scores is:

$$Y = 0.003x + 54.50$$

Table 6: Predictive strength of female students’ achievement scores in JSSCE on their achievement score in WASSCE Physics

Predictor variable	B	Standard Error in B	Beta	T	Sig. T
JSSCE (Basic science)	0.062188	0.100297	0.06068	0.62003	0.5366
Constant	51.396490	5.730577		8.9684	

The summary of the result of the test of hypothesis shown in table 6 shows that at the alpha level of 0.05, the calculated t value is 0.062 while the t significant (critical) value is 0.5366. Based on the decision rule, the researchers uphold the null hypothesis. The researchers therefore conclude that the achievement scores of female students in BECE/JSSCE does not significantly predict their achievement score in WASSCE in physics.

The regression equation for predicted WASSCE physics scores is:

$$Y = 0.06x + 51.40$$

Discussion of the findings

The study shows that the academic performance of students in the JSSCE basic science does not significantly predict their achievement scores in the WASSCE physics. This is to say that achievement score in JSSCE basic science is a weak predictor of achievement score in physics. This finding is in conformity with Omiwale’s (2011)

report that the performance of students in JSSCE tends to have a low capacity to predict performance in WASSCE. The finding is also in agreement with Edokpayi and Suleiman (2011) who reported that good academic performance in basic school integrated science JSSCE is a poor predictor of chemistry students' performance in WASSCE. Additionally, the research findings of Asuru and Njigwum (2020) also show that performance in JSCE English language is a weak predictor of performance in SSCE English Language. In a related research work by Achimugu (2017), the results show that there was no significant relationship between the academic performance of students in physical and health education at the JSSCE/BECE and the academic performance of the same students in physical education at the WASSCE. However, the finding contradicts the reports of Osadebe and Orubu (2020) who stated that integrated science in JSSCE is a strong predictor of students' later achievement in science subjects (biology, chemistry and physics).

The finding of the study further showed that there is no significant relationship between students' achievement scores in JSSCE basic science and their male and female student's achievement scores in physics. The implication of this is that gender of students is not a factor or the determinants of how well the students achieved in the two examinations. This finding is not in conformity with Osadebe and Orubu (2020) as they stated that there was a significant relationship between male and female students' achievement in integrated science in biology, chemistry and physics at WASSCE. The present findings are also in agreement with NERDC (2012) findings that gender was not a significant predictor of academic achievement. Furthermore, the research findings of Orubu (2016) indicated that the students' performances in mathematics and integrated science in junior secondary school certificate examination are strong predictors of their performances in the science subjects in WASSCE.

The research findings of this study has clearly proved that excellent performance of physics student in WASSCE is not dependent on good performance of the students in JSSCE/BECE in the study area, in line with the literature (Omachi, 2020; Asuru & Njigwum, 2020; Edokpayi & Suleiman, 2011). The reasons for this is not far-fetched. It is generally understood that when learners are sure that their hardwork will be compensated by better outcomes, it motivates them to work harder in the learning process. The youth unemployment rate is very high in Nigeria (National Bureau of Statistics, 2022) and more severe in south east geopolitical region of Nigeria because of very low industrial development and limited federal government job opportunities. The bane of education in Nigeria is highly attributed to the loss of interest by the teeming youth as most graduands are roaming the streets without jobs. This is in line with findings of Odiya and Iyamu (2016) which opine that decline in youth education is attributed to the high unemployment rate in Nigeria. To buttress this further, Olawe (2019) argue that youth unemployment impact negatively on achieving quality

education by youth in Nigeria. This is a true reflection of the component of AGT theory which holds the view that students' performance is mostly anchored on mastery and performance goal theory (Dawe, 2020). Whereas mastery goal theory argues that instructors can enhance deep learning by supporting student's learning in a positive and encouraging atmosphere, performance goal theory focuses on achieving desired outcomes irrespective of any existing hurdle (Üztemur, 2020).

Conclusion

This study delves into the root causes of academic performance in physics in WASSCE with a view to establishing the link with previous academic performance of the students in basic science in the JSSCE/BECE in a purposively selected three state in Nigeria. The findings of this study revealed that the students' performance in basic science in junior secondary school certificate (JSSCE)/basic education certificate examination (BECE) is a weak predictor of students' achievement in physics in the West African Senior School Certificate Examination (WASSCE). The findings equally show that students' achievement in physics and basic science is not a function of their gender. This means that parents, school authority and the general public should desist from forcing students to study physics or discouraging students from studying physics just because of their performance in JSSCE basic science.

Recommendations

In view of the research findings, it is strongly recommended that the state ministry of education of the respective states used in this study should as a matter of urgency:

1. Undertake an online survey on the issue in order to obtain peoples' opinions on how to address the matter.
2. Increase employment opportunities for the teeming youths in order to make reading more attractive.
3. Encourage teaching and learning of integrated science in Junior Secondary School through provision of adequate instructional materials as it relates to their future academic pursuits in their career.
4. Employ more qualified and competent teachers to teach both basic science and physics.

References

- Achimugu, L. (2017). The Relationship between Students' Achievement in Junior Secondary Physical and Health Education and Senior Secondary Physical Education. *Teacher Education and Curriculum Studies*, 2(4), 47-51. doi: 10.11648/j.tecs.20170204.12
- Aina, J. K. (2015). Analysis of integrated science and computer science students' academic performances in physics in colleges of education, Nigeria. *International Journal of Education and Practice*, 3(1), 28-35. DOI: 10.18488/journal.61/2015.3.1/61.1.28.35

Predictive validity of students' achievement on basic science in relation to students' performance
Ogbaga Emmanuel, Ph.D; Nweke C. O., Ph.D; Beth N. Oluka, Ph.D; I. O. Egbe, Ph.D & M. N. Anugwo, Ph.D

- Anambra State Ministry of Education. (2012). Basic Education Certificate Examination Result. Awka Examination Development Centre.
- Anambra State Ministry of Education. (2013). Basic Education Certificate Examination Result. Awka Examination Development Centre.
- Anambra State Ministry of Education. (2014). Basic Education Certificate Examination Result. Awka Examination Development Centre.
- Asuru, V. A., & Njigwum, A. S. (2020). Predicting students' performance in SSCE English language from their performance in JSCE English language. *Nigerian Universities Journal of Education*, 1(1), 28-38.
<https://www.researchgate.net/publication/355190405>
- Bardach, L., Oczlon, S., Pietschnig, J., & Lüftenegger, M. (2020). Has achievement goal theory been right? A meta-analysis of the relation between goal structures and personal achievement goals. *Journal of Educational Psychology*, 112(6), 1197. doi:10.1037/edu0000419
- Chazan, D. J., Pelletier, G. N., & Daniels, L. M. (2022). Achievement goal theory review: An application to school psychology. *Canadian Journal of School Psychology*, 37(1), 40-56. DOI: 10.1177/08295735211058319
- Dawe, H. (2020). Learning achievement goal theory and teaching students legal problem solving. *The Law Teacher*, 54(2), 249-260.
<https://doi.org/10.1080/03069400.2019.1657733>
- Dull, R. B., Schleifer, L. L., & McMillan, J. J. (2015). Achievement goal theory: The relationship of accounting students' goal orientations with self-efficacy, anxiety, and achievement. *Accounting Education*, 24(2), 152-174.
<https://doi.org/10.1080/09639284.2015.1036892>
- Ebonyi State Ministry of Education (2013). Basic Education Certificate Examination. Abakaliki, Examination Development Centre.
- Ebonyi State Ministry of Education (SMoE) (2012) *Basic Education* (SMoE), (2013). Basic Education Certificate Examination (BECE) 2013 Result. Abakaliki, Examination Development Centre.
- Ebonyi State Ministry of Education (SMoE). (2014). *Basic Education Certificate Examination*. Result. Abakaliki, Examination Development Centre.
- Edokpayi, J. N., & Suleiman, M. A. (2011). Students integrated science achievement as predictor of later achievement in chemistry: A case study among selected secondary schools in Zaria metropolis. *Archives of Applied Science Research*, 3(4), 527-535.
- Federal Republic of Nigeria (FRN) (1986). *National Policy on Science and Technology*. Abuja: NERDC.
- Federal Republic of Nigeria (FRN) (2013). *National Policy on Education* (6th ed). Lagos: NERDC.

- Ibeh, G. F., Onah, D. U., Umahi, A. E., Ugwuonah, F. C., Nnachi, N. O., & Ekpe, J. E. (2013). Strategies to Improve Attitude of Secondary School Students towards Physics for Sustainable Technological Development in Abakaliki LGA, Ebonyi-Nigeria. *Journal of Sustainable Development Studies*, 3(2), 127-135.
- Imo State Ministry of Education (SMOE) (2012). *Basic Education Certificate Examination*. Owerri: Examination Development Centre.
- Imo State Ministry of Education (SMOE) (2013). *Basic Education Certificate Examination Result*. Owerri: Examination Development Centre.
- Imo State Ministry of Education (SMOE) (2014). *Basic Education Certificate Examination Result*. Owerri: Examination Development Centre.
- National Bureau of Statistics (2022). *Unemployment*. <https://www.nigerianstat.gov.ng/>
- Nigerian Educational Research and Development Council (NERDC) (2012). National Policy on Science, Technology and Innovation. In *News African: Federal Government Approves new Policy in science Technology and Innovation, Feb. 12*.
- Nwankwo, M. N., & Madu, B. C. (2014). Effect of Analogy Teaching Approach on Students' Conceptual change in Physics. *Greener Journal of Educational Research*, 4(4), 119-125. <http://dx.doi.org/10.15580/GJER.2014.4.032414160>
- Odia, A. A., & Iyamu, E. O. (2016). Education and Unemployment in Nigeria: A Critical Analysis. *Benin Journal of Educational Studies*, 24(1&2), 99-110.
- Omachi, D. (2020). Predicting students' senior SSCE performance in English language from performance in junior school certificate examination in Kogi state, Nigeria. *British International Journal of Education and Social Sciences*, 7(3), 13-20.
<https://www.researchgate.net/publication/359231740>
- Omiwale, J. B. (2011, June). Relationship between problem-solving ability and achievement in physics among senior secondary school students in Osun state, Nigeria. *The Africa Symposium: An Online Journal of the African Educational Research Network*, 11(1), 158-165.
- Onah, D. U., & Ugwu, E. I. (2010). Factors which predict performance in Secondary School Physics in Ebonyi North Educational Zone of Ebonyi State. *Pelagia Research Library Advances in Applied Science Research*, 1(3), 255-258.
- Olawe, B. A. O. (2019). *The effect of youth unemployment on quality education in Nigeria. A critical view of Ikere Local Government Area of Ekiti State*. <https://www.grin.com/document/1023063>.
- Orubu, M. E. N. (2016). Junior secondary certificate examination scores in mathematics and integrated science as predictors of senior secondary school students' performance in science [Unpublished PhD thesis]. Delta State University, Abraka.

Predictive validity of students' achievement on basic science in relation to students' performance
Ogbaga Emmanuel, Ph.D; Nweke C. O., Ph.D; Beth N. Oluka, Ph.D; I. O. Egbe, Ph.D & M. N. Anugwo, Ph.D

- Osadebe, P. U., & Orubu, M. E. (2020). Junior secondary certificate examination scores in integrated science as predictor of senior secondary school students' performance in science. *Journal of Education in Developing Areas*, 27(2), 131-138.
- Otuka, J. O. E. (1983). Problem relating to the Development of Physics' Education in Secondary Schools. *Journal of the Science Teachers Association of Nigeria*, 21(2), 133-136.
- Ramnarain, U. D., & Ramaila, S. (2016). The achievement goals orientation of South African first year university physics students. *International Journal of Science and Mathematics Education*, 14, 81-105. DOI: 10.1007/s10763-014-9590-5
- Üztemur, S. (2020). Achievement Goals and Learning Approaches in the Context of Social Studies Teaching: Comparative Analysis of 3x2 and 2x2 Models. *Participatory Educational Research*, 7(2), 1-18. <http://dx.doi.org/10.17275/per.20.16.7.2>
- West African Examination Council (WAEC) (2015). Senior Secondary Schools Certificate Examination Result. Yaba-Lagos.
- West African Examination Council (WAEC) (2016). Senior Secondary School Certificate Examination Result. Yaba-Lagos.
- West African Examination Council (WAEC) (2017). Senior Secondary School Certificate Examination Result. Yaba-Lagos.