

Students' Knowledge of Basic Science as a Correlate of Physics Achievement in Senior Secondary Schools

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Abstract

The study investigates the magnitude of prediction of students' performance in physics by their performance in Basic science using correlation design. 250 students from Ohaukwu L.G.A Ebonyi State were used for the study. A Proforma was used to collect students' results in Basic Science and their results in physics. Pearson's Product Moment Correlation Coefficient and ANOVA were used to analyze the data. The findings of the study revealed that 22% of variation in students' performance in Physics is accounted for by their performance in Basic science. This means, that there is a significant relationship between students' performance in Basic science and Physics. Based on the findings, it was recommended that basic science teachers should see the subject as a foundation subject upon which other science subjects are laid and as such take its teaching seriously so as to enable the students have good mastering of the subject.

Keywords: Basic Science, physics and Achievement

Introduction

Basic science is the foundation of successful career in sciences. This means that successful future career in science is predicated upon sound knowledge of basic science. Corroborating, Ajaja (2007) stressed that Basic Science subject studied at the Basic Education level in Nigeria occupies a unique position in the school curriculum. This is because it equips students introductory scientific with necessary and technological knowledge and skills necessary to build a progressive society and this forms the bedrock on which further scientific and technological studies rest (Ajaja, 2007). Thus, at basic education level, pupils should be equipped with the three components of science, which are process, product and attitude. Scientific process is the method/way of doing science, the products are the outcome of scientific investigations/the process, while the attitude is the ethical orientations/worldviews of the scientists. This implies that at basic education level, the three educational domains (cognitive, affective and psychomotor) must be activated and sustained to maturity for successful learning, especially in science. But what is basic science?

Basic science is the science that aims at inculcating in the learners at very early stage in life the fundamental knowledge, skills and attitude of scientists by breaking scientific boundaries and taking them as a whole. Basic science is a science that describes the most basic objects, forces, relations between them and the laws governing them, such that all other phenomena may be in principle derived from them (free encyclopedia, 2011). This means that basic science is the subject that enables students to learn the fundamental unity of science, by combining ideas, principles and concepts in sciences (physics, chemistry, biology and mathematics) in its teaching and learning so as to enable students view science from holistic point as opposed to piece meal point of view. According to Ikeobi (2004), basic science aims at presenting a holistic picture of science and technology content to the students. This is because its content basically encompasses all the various components of science being presented to the learner in holistic manner. To this end, in basic science teaching and learning, ideas/concepts and principles in physics are used to advance knowledge of biology or chemistry and vice versa. For example, knowledge of circuit wiring in physics can be used to explain the flow of blood round the veins and arteries in human being etc. Thus, suffice to say that basic science is not the same as subjects' combination, and any attempt to view it from that perspective goes contrary to its objectives.

The objectives of basic science according to Nigeria Educational Research and development Council (NERDC, 2007: 4) are to:

- (i) Develop interest in science and technology;
- (ii) Acquire basic knowledge and skills in science and technology;
- (iii) Apply their scientific and technological knowledge and skills to

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meet societal needs;

- (iv) Take advantages of numerous career opportunities offered by science and technology;
- (v) Become prepared for further studies in science and technology

In Nigeria, basic science objectives above and the entire curriculum were developed in the year 2006 sequel to directive given to Nigeria Educational Research and Development Council (NERDC) by National Council on Education (NCE) in the year 2005 (Obioma, 2007). From this period till date, its implementation is over a decade now, without researches aim at finding out how the teaching and learning of the subject has been. This means that studies that aimed at finding out whether or not the products of the curriculum (students) are actually prepared for further studies in science and technology need to be carried out. Corollary, can students' achievement in basic science predict their achievement in other science subjects, in this case physics. That is, can students who graduated from this basic science have interest and achieve well in physics. Therefore, the study aimed at finding the relationship between students' achievement in basic science and their achievement in physics.

In line with the above purpose, the following question was posed to guide the study:

1. What is the relationship between students' achievement in basic science and their achievement in physics?

Also, the following null hypothesis was formulated to guide the study and was tested at 0.05 level of significance.

1. there is no significant relationship between Students' performance in Basic Science and their achievement in Physics

Research Method

This study adopted a correlation survey design. According to Nworgu (2015), correlation survey is a type of study that seeks to establish what relationship exists between two or more variables. Usually such studies indicate the direction and magnitude of the relationship between the variable. The study was carried out in Ohaukwu Local Government Area of Ebonyi State. Ohaukwu is located in Ebonyi North Senatorial zone. Total number of ten public senior secondary schools and ten public junior secondary schools were selected in the area of study. Ohaukwu Local Government Area is chosen for this study because of the observed poor performance of students in physics over a decade in Secondary Senior West Africa Certificate Examination and Senior Secondary Certificate Examination in the area, and this informed the researchers' choice of carry out the study there. The population of this study is 250 students in the junior secondary school three (JSS 3) and physics students in senior secondary school three (SS 3) in Ohaukwu Local Government Area. This means that no sampling was carried out since the entire population of the students was used.

A proforma was used to collect students' 2015 Basic Education Certificate Examination result of JSS 3 and 2018/2019 Unified Mock Examination Result of SS 3 students in public secondary schools in Ebonyi State. (Source: Ministry of Education Abakaliki, Ebonyi State). The choice of the year (2018/2019) was borne out of the fact that this set of students that sat for their West African Examination Council (WAEC) in that year had their Junior WAEC examination in the year 2015. The proforma contains columns for JSS 3 results and that of SS 3 results including students' gender. The instrument was face validated by one expert in measurement evaluation and another one from Physics Education all in department of Science Education University of Nigeria Nsukka. No reliability testing was carried out because the instrument is a proforma and does not contain item statement. The data were collected by the researchers through Ebonyi State Ministry of Education Abakaliki and State Universal Basic Education Board (SUBEB), Abakaliki, Ebonyi State.

The data collected were analyzed using Product Pearson's Moment Correlation Coefficient(PPMCC) for research question and analysis of variance (ANOVA) used to test the hypothesis at 0.05 level of significance. This statistics was used because PPMCC is used for variables with bivariate (a predictor and criterion variables) relationship. In this case, the predictor variable is students' basic science achievement and the criterion variable is the students' achievement in physics. ANOVA precisely one-way was used because it is used to test hypothesis that has one independent variable (predictor) and one dependent variable (criterion). This can also be tested with t-test with the same result from both statistics.



their achievement in Physics?

Results

The results of the study are presented in line with the research questions and hypothesis.

Research Question 1: What is the relationship

Table 1: Correlation coefficient indicating the magnitude of relationship between students' achievement in basic science and physics

between Students' achievement in Basic Science and						
s/n		Ν	r	r^2	P-value	decision
1	Students achievements in basic science	250	0.47	0.22	0.00	S
2	Students achievements in physics	250				
ND, n correlation coefficients n^2 coefficient of determination						

NB: r = correlation coefficient: r^2 = coefficient of determination

Table 1, revealed that there is a moderate relationship between students' achievement in Basic science and their achievement in Physics. This is so because a correlation coefficient of 0.47 was found. According to Downie and Heath (1974) a correlation coefficient that is between 0.3 and below 0.8 indicates moderate relationship. Also, from the table, it could be seen that students' achievement in Basic science contribute 22% to their achievement in Physics. This is evident by the coefficient of determination (r^2) of 0.22. This suggests that students' achievement in Physics, can be accounted for by 22% of their achievement in Basic science.

Hypotheses 1: There is no significant relationship between Students achievement in Basic Science and their achievement in Physics.

In Table 1, the P-value (probability value) (0.00) is less than 0.05 level of significance. This means that the null hypothesis is rejected in favour of the alternative hypothesis. Hence, there is a significant relationship between students' achievement in Basic science and achievement in Physics.

Summary of the Major Findings

The following constitute the major findings of the study:

1. there is a moderate relationship between students' achievement in Basic science and Physics. Thus, there is a significant relationship between students' achievement in Basic science and Physics.

Discussion

The results obtained from the study revealed that there is significant relationship between students' achievement in Basic science and their

achievement in Physics. It indicates that there is a moderate relationship between students' achievement in Basic science and achievement in Physics. This

could be attributed to the fact that in basic science. basic physics concepts are introduced to the students early enough. For example, concepts of motion, force, mass, weight, distance, speed, velocity etc are taught to the students at basic education level. Thus, students learn these concepts early enough, which are repeated in the senior secondary schools. Also, at basic education stage, students are taught basic physics problem solving, like how to find the distance between two places when the speed and time are given among others. This finding is in line with the findings of Wanhar (2008) who found that there is a linear relation between students' comprehension of physics knowledge and the ability to solve mathematical problems. Wanhar (2008) added that science especially physics comprehension needs knowledge of Mathematics concepts. Also, positive correlation between basic science and science achievement was also reported by Ghozali (2001). This finding, also corroborates with the assertion of Long and Jiar (2014) who avers that mathematics provides symbols expressed in Physics to show relationship structure between different factors. The same thing is also stated that the expressed symbols may enable students for deep comprehension and correcting student procedural knowledge to different but interrelated symbols required in problem solving in Physics process.

Conclusion

Based on the findings and discussion, it was concluded that there is a moderate relationship between students' achievement in Basic science and Physics. This is supported that 22% students' achievement in Physics achievement in senior

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secondary is predicated by their achievement in Basic science.

Recommendations

Based on the findings of the study, the following recommendations are made:

Basic science teachers should see the subject as a solid foundation in which other science subjects were built and as such teach this subject with all seriousness it deserves; and Government and nongovernmental organizations should ensure that all the apparatus required for the teaching and learning of basic science are provided so as to help inculcate scientific process early enough on the children.

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