THE RELATIONSHIP BETWEEN ACQUISITION OF SCIENCE PROCESS SKILLS AND SCIENCE ACHIEVEMENT FOR NATIONAL DEVELOPMENT

Ochuba, Ogugua E. (Mrs.)

Abstract

The relationship between students' acquisition of science process skills and science achievement for national development was investigated. The study covered all the secondary' schools in all the local government areas that make up Anambra State. The sample comprised eight (8) secondary schools randomly selected. The students were selected based on the number of science subjects (biology, chemistry and physics). A total of four hundred (400) students were used. Instruments used were Test on Process Skill (TPS) and Mean Scores of the third term Senior Secondary One (SSI) results of the Senior Secondary Two (SS2) Science students. The students' scores were presented in percentage to show students' success at good performance level in the Test Process Skill and Mean Scores in Science achievement. The data were analyzed using coefficient correlation and with degree of freedom/ 400) at 0.05% level of significance (0.98) and the findings were discussed. The result showed a positive relationship at the level of 0.64 between students acquisition of Process Skill and Science achievement. The hypothesis formulated was rejected beyond 0.05% probability level. Based on the results of this study, it is recommended that science teachers should inculcate the spirit of enquiry early enough in the children through their exploration of nature and local environments. This will help the students' acquisition of Science Process Skill in addition to equipping their intellectual skills normally employed in the study of science.

Introduction

The main reason why students study science is to acquire the skills to think and reason scientifically and to increase technological manpower needed in national development. But the poor performance of students in science subjects has been of great concern to the general public.

Some students are capable in area of science achievement while others demonstrate peculiar and inappropriate reasoning strategies. Even after the teachers' best efforts, some seem able to follow problem solutions but are at a loss when required to transfer the strategies to slightly different problems. This has led to poor achievement and more often the chances of admission for these would be great scientists are ruined. And once this happens, it becomes difficult for them to acquire both physical and intellectual skills, which will enable them to be self - reliant and useful members of the society (Okebukola. 2001). It is essential to produce graduates who are able to monitor technological trends, assess their relevance to the country's prospects.

Science processes are intellectual skills use in collecting and analyzing data to solve problems. Some variables are likely to influence the learning of science through process skill. Tobin and Capie (1982), stated such variables as learners' attributes, formal reasoning ability and locus of control, and rates and types of academic engagement. Our understanding of these situations and of students' differences can be significantly aided by the development theory of Jean Piaget.

According to Piaget's theory, human cognitive development starts with the sensory motor stage, through the pre - operational and concrete operational stages, to the formal operational stage when abstraction is generally possible.

The question then is "what is the relationship between acquisition of science process skill and science achievement for national development? According to Borishade (2001). graduate unemployment situation in Nigeria is rather paradoxical in the sense that it is a situation of severe unemployment existing side by side with acute shortage of skilled manpower. Graduate output over the ten - year period from 1986 to 1996 in more specialized professional disciples was.

Medicine 9,285 (4.7%),
Pharmacy 1.970 (1.0%).
Engineering/technology 11.763 (6.0%),

Veterinary medicine I. 122 (0.5%). and in 1996. only 2,402 graduates of medicine, 405 pharmacists and 275 veterinary medical graduates were produced for a nation of 120 million people (Dabalen, et al, 2000).

Acquisition of science process skill may be profitable to all levels of cognitive development if appropriate used and as such will influence the academic achievement of the secondary school science students. It requires reasoning about unseen entities. The analysis of formal operational structures reveals at this stage two cognitive skills, which are ability to subordinate the real to the possible and secondary ability to reflect on one's thought.

Contemporary researchers agreed on the fact that national development has much to do with the acquisition of science process skill and science achievement (Cantu and Herron. 1978: I obi and Capie, 1982). In area of science achievement, much work has been done with reference to learning science among students. Due to lack of local literature in this area, references were made to foreign studies.

Pulos and Gans (1981) in their study, content and problem effects of formal thought in 3 - year old adolescents." found out that formal reasoning is closely related to achievement and to general ability. According to them, three controlling variable tasks with different content and two question type tests (analysis and controlling questions) were administered to 120 seventh grades in California. Tobin and Capie (1982) in their work on the relationship between classroom process variables and middle - school science achievement found out that there is a strong relationship between reasoning ability and science achievement. They found out that students who are able to utilize formal thought operation are able to solve problems and form concepts that are beyond the capabilities of those who do not possess formal modes of reasoning. Their population comprised of 13 intact classes from four middle schools in Clark County Georgia. Five of the selected classes were from 8. 4, from grade 7. and 4 from grade 6. The classes that participated in the study were heterogeneous with respect to socio - economic status, race and intelligence.

Also Tobin and Capie (1980) in their study, "teaching process skills in the middle school", discovered that 30% of the variation in process skill achievement was attributed to differences in formal reasoning ability achieved at a higher level. The population comprised of a total of 400 students from grade 6 through 8 in Georgia. They found out that acquisition of science process skill would promote the development of formal reasoning ability.

However, Campbell and Orkney (1977) in their work influencing the planning of teachers with instruction in science process skill", suggested that science process skill enhances intellectual development in elementary school children and also process skill learned in science transfer to other curriculum areas provided increase dividends for learners.

The question after this review is:

How is the acquisition of science process skill related to science achievement for national development?

Objectives of the Study

The study is aimed at ascertaining the relationship between acquisition of science process skills and science achievement for national development among secondary school students.

Research Question

Is there a relationship between acquisition of science process skill and science achievement for national development?

Hypothesis

There is no significant relationship between students' acquisition of science process skill and science achievement for national development.

Scope

The study was concerned primarily with secondary school boys and girls. The focus of interest is on the relationship between acquisition of science process skill and science

development.

Instrument

The instruments used were Test On Process Skill and Third Term Senior Secondary One (SS.I) results of the Senior Secondary Two (SS.2) Science Students.

Test on Process Skill (TPS)

This is a multiple-choice paper and pencil test constructed by Orkney and Dallastown (1979). The test consists of 36 items, twelve (12) of identifying variables, nine (9) of identifying and stating hypothesis, six (6) of operationally defining, three (3) of designing investigations and six (6) of graphing and interpreting data. In the test, a situation is also presented and four options are provided. The students selected from the four options the one that she/he believes is the right answer. The test as used here had a reliability of 0.60 as determined by the use of spit - half method.

Third Term Senior Secondary One (SS.I)
Results of the Senior Secondary Two (SS. 2)
Science Students

These were grades obtained by the students in their third term senior secondary one terminal examination. The grades used in this research are those obtained by the candidates in Biology. Chemistry and Physics in the 2001 /2002 academic session. The researcher obtained the grades by visiting the schools and collecting the relevant information. The mean scores of the students' performance were obtained depending on the number of sciences studied. Therefore the mean score obtained for each student, formed the index for her/his science achievement.

Methodology
Population

The population studied consisted of all the secondary schools in all the local government areas of Anambra State.

Sample and Sampling Techniques

Total of 400 students were used as sample for the study based on the number of science subjects studied in the school. In other words, two groups of students were considered namely those offering Biology, Chemistry and Physics. The second group was those offering Biology and Chemistry.

Through stratified random sampling techniques, two hundred and fifty (250) offering Biology, Chemistry and Physics were selected, and one hundred and fifty (150) students offering Biology and Chemistry were equally selected making it a total of four hundred (400) students.

Method of Data Analysis

Coefficient of correlation was used by the researcher in data analysis to test the extent of relationship between the variables.

Table I: Summary of Analysis Showing Correlation Coefficient "r" on Relationship Between Process Skill and Science Achievement

No	$\sum^{x}$	$\sum^{y}$	$\sum^{xy}$	$\sum^{x2}$	$\sum^{y2}$	r
400	17712	21663	1018677	854536	1327645	+ 0.57

Table II: Summary Table of Analysis Showing Correlation Coefficient 'r' on Relatio Between Process Skill and Science Achievement

No	$\sum^{x}$	$\sum^{y}$	$\sum^{xy}$	$\sum^{x2}$	$\sum^{y2}$	r
400	18109	21663	1042259	878479	1327645	+ 0.64

Table III: Relationship Between Science Process Skill and Achievement

S/N	X	Y	XY	X^2	Y^2
400 students	SpS	Achievement			
	21663	18109	1042259	327645	878479

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

$$\frac{400 \times 1042259 - 18109 \times 21663}{\sqrt{[400 \times 878479 - (18109)^2][400 \times 1327645 - (21663)^2}}$$

$$\frac{435007000 - 392295000}{\sqrt{[351391000 - 327935000][3531058000 - 469282000]}}$$

$$= 24608000 = 0.6464724$$

$$\therefore r = 0.64$$

Discussion of Result Discussion on Hypothesis

There is no significant relationship between students acquisition of science process skill and science achievement.

The Hypothesis was rejected using correlation coefficient with degree of freedom (400) at

0. 05% level of significance (0.098).

From the result of the study shown on Table II, under data analysis, the computed 'f was +

0. 64 indicating a positive relationship between acquisition of science process and achievement.

The finding is in line with the work of Doran and Sellers (1978). Though they recorded that the relationship was not strong, this may be attributed to the fact that they considered only one science subject - biology. Otherwise it would be expected that students who were equipped with process skill were supposed to reason critically and solve problems intelligently leading to higher achievement than those not equipped with process skill.

Relative Performance of Students in Process Skill and Science Achievement

The hypothesis underlying this was:

There is no significant relationship between students acquisition of process skill and science achievement.

The value of *'r'* (coefficient of correlation) in Table II was worked out to be + 0.64. This shows a moderate positive correlation indicating that there is a positive relationship between students' acquisition of process skills and science achievement. Also coefficient of correlation with degree of freedom of 400 at 5% level of significance shows that the value of V obtained was significant. Therefore the hypothesis was rejected.

Recommendations

It is therefore recommended that teachers should take more time in explanations, use of graphic materials, and practice of concepts or even in the use of simple examples to enable learning.

The Relationship Between Acquisition of Science Process Skills ami Science Achievement for National Development

Students equipped with process skills tend to achieve higher than students with low process skill. Therefore it is not wrong to say that students who acquired process skills tackle problem situations better thereby helping in national development.

The study also revealed that acquisition of science process skills and science achievements will help for national development as has been observed by contributions of medical doctors, engineers, pharmacists etc to our nation building.

It is also recommended that tertiary institutions should be guided strictly by a sound admission policy on course basis. This is a view to checking the imbalance in the system and reflecting national developmental needs.

Guidance counselors in secondary schools should tailor career counseling towards areas of national needs.

Conclusions

The students who have acquired process skills tend to think analytically and are more successful with new problems than those that do not possess process skills.

Science teachers should inculcate early enough in the children spirit of enquiry through their exploration of nature and local environments as this will help in developing the students reasoning ability.

Also science teachers should endeavour to plan their lessons in sequence in order to provide continuity of content as well as opportunity for process skill development. Emphasis here is on guidance by the teacher because initially, considerable teacher guidance would be required before students learn to use skills effectively.

Finally, science teachers have to engage the students maximally with activities as this will not only help in developing their reasoning ability but will also equip the students with intellectual skills normally employed in the classroom as well as in overall national development.

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