ENTREPRENEURSHIP DEVELOPMENT OF SECONDARY SCHOOLS STUDENTS THROUGH ACQUISITION OF SCIENCE PROCESS SKILLS

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Abstract

Due to present youth unemployment in Anambra State, Nigeria, the research investigated science process skills acquisition of secondary school students for their entrepreneurship development. Three research questions guided the study and three hypotheses were tested at 0.05 alpha levels. A descriptive survey design was adopted in which a sample of 528 students in the state was used. Data were collected using Science Process Skills Test (SPST) which was validated and reliability index found to be 0.82. Mean, percentage and ANOVA were used for data analysis. The findings revealed that there was a significant difference in the acquisition of five process skills (classification, description, observation, inference and measurement) between male and female students; and a significant interaction between gender and school location in the acquisition of all the skills except observation skill. The study recommended that curriculum planners should identify what skills to be inculcated into the students from specific topics.

Introduction

The role of science in the life of any nation is obvious but the meaning of science itself has been grasped by different people from different perspectives. Science is defined as "activities that culminate into testable, falsifiable and verifiable body of knowledge … including formulating hypothesis, designing experiments and synthesizing theories" (Abdulahi, 2004, p.32). It is "a systematic investigation of nature leading to the collection and unbiased treatments of data with a view to evolving meaningful generalization that may engender further investigation" (Okigbo & Okekeokosisi, 2014, p.2). All the definitions of science sum up to the fact that science is a body of knowledge and a search for such knowledge.

Science plays a lot of roles ranging from the inculcation of a sense of creativity among students and scientists, and cutting across exploration and manipulation of physical objects within the students' environment. It is almost impossible to live a satisfactory life in a society devoid of science culture. The

development of sound character such as open mindedness, honesty, curiosity and optimistic approach to failure are closely connected to scientific teaching and training which can help to solve social problems. As Nigeria is shifting from an agrarian to a technology society, science training will help the children adjust to the changing environment. "Nigeria needs engineers, doctors, architects, geologists and science teachers and these professionals could only be obtained through the teaching of science in our schools" (Abdulahi, 2004, p.45) . Thus, the study of science can bring about some educational advantages that could foster intellectual and emotional growth right from secondary school.

Research (Obioma, 2006; Okigbo & Okeke, 2013) have revealed students persistent poor performance in science, technology and mathematics subjects in the secondary schools. Many variables were faulted including low interest in mathematics, lack of incentives and motivation for science teachers and students, and inadequacy of instructional materials and method. However, occupying a central position in these factors is inadequate emphasis on the acquisition of science process skills. Science process skills are specific intellectual skills used by scientists and which when applied to a situation help in understanding of the phenomenon (Nwosu, 2007). Science process skills as opposed to the concept approach of science "are central to scientific thinking, regardless of its biological, physical or applied science … and include the broad categories of mental process skills that involve mental activities associated with scientific investigations" (Young, 2007, p.44).

Acquisition of science process skills devoid of entrepreneurial skills or entrepreneurship may not be possible since the acquisition of one leads to attainment of the other. Thomas in Olabode (2012, p.33) defined entrepreneurship as "a way of thinking, that include reasoning and acting that is opportunity obsessed, holistic in approach and leadership balance". It involves seeking opportunities to learn new skills and take on new responsibilities, listening to new ideas, observing opportunities and thinking about solution to problems, among others (Olabode, 2012). In other words, entrepreneurial skills include listening, observing, and thinking, which are the basic characteristics of an entrepreneur. For secondary school leavers to be able to fit in the world of very competitive labour market especially in Nigeria, they have to be acquainted with the basic process skills in science. This could be achieved through effective science teaching and learning.

To make science effective, there has to be materials for building it up. These form the process skills which almost interpret all domains of science. The pre-requisite scientific knowledge can be obtained only if the students have certain underlying capabilities – the science process skills, which are needed to practice and understand science. Science processes are arranged from simple to complex and they are observing, experimenting, measuring, recognizing, formulating hypothesis, controlling variables, interpreting data,

drawing conclusions and others. The processes are hierarchically organized with the ability to use simpler underling processes. Observation is considered to be the fundamental skill and is needed to discover the broad knowledge required to conduct an enquiry. Unfortunately, in Nigeria, the approach to science has for some time now emphasized the acquisition of concepts and already existing facts to the detriments of process skills. Yet, a critical look at the Nigerian National Policy on Education shows its aims and objectives to be education geared towards the building of a strong united and self-reliant nation (Federal Republic of Nigeria, 2013). The concept approach to science requires teachers to feed the students with already existing facts of which the students are expected to digest, absorb and then regurgitate during examination and forget immediately they step out of the examination hall. This does not encourage long life learning but rote and mechanical learning in which the much desired positive transfer of learning by the students becomes impossible.

In addition, Macbeth (2009) emphasized that the data collected from kindergarten and third grade experiments suggests that influence on directed first hand manipulative experience in the development of process skills may be more important for the early primary grade child. Therefore, process approach to science, technology and mathematics is a true solution and inevitable in Nigerian secondary schools. No headway can ever be made in the field of science and technology both within and outside the classroom no matter the teaching method adopted, if appropriate acquisition of science process skills that may lead to entrepreneurial skills development is not guaranteed among students. It is against this background that the research set out to determine the level of acquisition of science process skills by senior secondary school students in Anambra State, Nigeria.

Nigeria is rated internationally as a third world country because of her low level of participation in science and technology. The major task facing scientists today is also to lay a sound foundation for the growth of technology. Today, there are many scientists and science educators, yet a remarkable impact has not been created in the field of science and technology. Any headway in this field should be a function of performance level in the science process skills.

The roles of science process skills and activity have been spelt out but much attention has not been focused on the actual evaluation of the level of acquisition of such skills among secondary school students. The present researchers are faced with the problems which can be stated thus: "To what extent have the students acquired the science process skills and which of these skills are pre-dominantly deficient among the students?"

Three questions guided the study and they include:

- What is the performance level on science process skills acquisition of SS1 students

- Is the level of acquisition of the process skill sex linked?
- To what extent does school location influence the level of acquisition of science process skills among SS1 students?

While three null hypotheses were tested at 0.05 alpha levels.

1. There is no significant difference in the level of acquisition of science process skills between male and female SS1 students.
2. There is no significant difference in the level of acquisition of science process skills between students from urban and rural schools.
3. There is no significant interaction between gender and school location in the level of acquisition of science process skills as measured by Science Process Skill Test (SPST).

Method

The research adopted a descriptive survey design in which the performance level on acquisition of science process skills of SS1 students was determined using SPST. This design was considered appropriate for the study because according to Nworgu (2015), "descriptive survey involves those studies which aim at collecting data on, and describing in a systematic manner the characteristics, features or facts about a given population" (p.96).

The sample for the study was 528 (200 males & 328 females) SS1 students selected from 13 out of 261 secondary schools in Anambra State, Nigeria. Eight schools (n = 348) and five schools (n = 180) were selected from urban and rural locations respectively. The selection was done using stratified and simple random sampling techniques (balloting with replacement).

The instrument for data collection was Science Process Skill Test (SPST). This was developed by the researchers. The SPST is a 40-item multiple choice objective questions which covered five process skills (classification, description, observation, inference and measurement). Eight items were used to assess each of the skills. The SPST has five options A – E with only one correct answer that carry one mark each.

The content validity of the instrument was determined using a test blue print while the reliability of SPST was established using Kuder-Richardson (KR) Formula 20 and the coefficient of internal consistency was found to be 0.82 for the whole test and 0.79, 0.80, 0.77 and 0.78, 0.84 respectively for classification, description, observation, inference and measurement subscales.

To collect data for the study, the SPST was administered to 13 intact classes of SS1 students during the revision period of their third term examinations for 2016/ 2017 session. The test was administered for one week by the researchers with the help of the respective form teachers of the classes who were used as Research Assistants. The test lasted for 1 hour and at the end scripts were collected and marked. A total of 535 copies of SPST were distributed but 528 were returned. Thus, the researchers used 528 for data

analysis. The research questions were answered using mean, standard deviation and percentage while the hypotheses were tested at 0.05 alpha levels using two-way Analysis of Variance (ANOVA).

Results

Table 1: Performance Level on Science Process Skills Acquisition of SS 1 Students
N=528

S/N	Skills	Mean	Percentage (%)	Standard deviation
1	Classification	4.67	58.4	0.89
2	Description	2.82	35.3	0.93
3	Observation	4.50	56.3	1.52
4	Inference	3.24	40.5	0.95
5	Measurement	2.25	28.1	1.45
	Total	3.50	43.7	1.15

Table 2: Level of Acquisition of Science Process Skills among SS1 Students Based on Gender and School Location

S/N	Skills	Sex		School Location	
		Male	Female	Urban	Rural
1	Classification	60.2%	56.6%	62.0%	54.8%
2	Description	40.7%	29.9%	42.5%	28.1%
3	Observation	58.8%	53.8%	52.5%	60.1%
4	Inference	45.8%	35.2%	48.7%	32.3%
5	Measurement	35.4%	20.8%	34.3%	21.9%
	Total	48.2%	39.3%	48.0%	39.4%

Table 3: A 2x2 Analysis of Variance Scores of Students in Five Skills by Gender and School Location

Source of variance	Sum of squares	df	Mean sum of squares	F-cal	F-crit
Gender	484.13	1	484.13	11.02	3.85
School location	369.80	1	369.80	8.42	3.85
Gender X School location	177.61	1	177.61	4.16	3.85
Error	21048.99	524	40.17		
Total	22080.53	527			

Discussion

The findings from the results revealed that students are deficient in all the five skills (classification, description, observation, inference and measurement) in which the skill of measurement is almost lacking. The findings further showed a significant difference between the performance of male and female students in all the five skills in favor of males. Thus, male students performed significantly better than their female counterparts in the science process skill test. The findings were in line with those of Shaibu and Mari (1999) and Nwosu (2007). Shaibu and Mari found that integrated science students exhibited low understanding of science processes while Nwosu revealed a significant difference between male and female students in the acquisition of science process skills in favor of males. However, the findings deviated from that of Ofoegbu (2007) who reported that there was no significant difference in the performance on science process skills between male and female students.

In addition, the finding showed that there was a significant difference in the level of acquisition of science process skills between senior secondary school one students from urban and rural schools in favor of urban group. The finding gave credence to that of Ekakitie (2006) who revealed a significant difference in the acquisition of science process skills between students from urban and rural schools even when difference methods were used in favor of urban. However, the finding deviated from that of Ofoegbu (2007) and Tamir (2002). They found that a non-significant difference existed in the performance on science process skills between students from urban and rural schools.

Further finding from the results showed that there was a significant interaction between gender and school location as measured by Science Process Skills Test (SPST). By implication, though males performed significantly better than their female counterparts in the five process skills, their better performance is not consistent in urban and rural schools. This was in line with the findings of Uzzel (2006) that gender not school location in a significant factor in the school achievement when students are exposed to experimental conditions. This could be because male is always male and female always female irrespective of their school location.

Conclusion

The findings from the present study indicated a low level of acquisition of science process skills among SS 1 students. One may rightly concludes that the poor performance of students in those schools was as a result of their low level of acquisition in the science process skills. Worst still, measurement which is a psychomotor activity was found to be predominantly lacking in the students. By implication, secondary school students after graduation can hardly manipulate simple equipment and tools effectively. Thus, efforts should

be made towards redressing and arresting this dismay situation through proper training of science teachers and provision of material and non material teaching resources in schools.

Recommendations

Based on the findings from the study, the following recommendations were made.

1. Curriculum planners should identify what skills are to be inculcated into the students for specific topics. This would help the teachers to teach science as how scientists work.
2. The teacher educators should inculcate the method and science process skills into the student teachers during their training in various educational institutions.
3. The workload of teachers should be reduced by Ministry of Education and various education bodies to achieve high level of science process skills acquisition.
4. The Career Counselors should re-orientate themselves towards guiding female students and those from rural schools towards improvement in their level of acquisition of the science process skills.

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