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Prequalification Science Practical Activities for the Production of Effective Science Teachers: a Strategy for Sustainable National Development

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Abstract- The future of science teaching is a function of the number of prequalified candidates willing to take science education at the tertiary level. This research was aimed at finding science practical activities as a motivating factor in simplifying science subjects, making the study of science harder as well as developing prequalified students' interest in becoming science teachers. Out of nearly 800 students in final year in Government Science Secondary Schools Bama, and Gombe, respectively in Borno and Gombe States, 400 hundred students were randomly selected as representative sample. Four research questions were answered using *Prequalified Students Interest Questionnaire* (PSIQ) as an instrument for data collection and simple percentage in analysis. The results showed that half of the responded agreed that they have been doing practical from junior secondary school and most of them agreed to doing it in the senior class. It was also found out that science practical activities makes understanding of the science subject simpler and candidates study harder the subject they prefer its practical most. Besides, it was discovered among others that practical activities have motivated one third of the respondents to take science education at higher institutions and become science teachers. Hence, it was concluded that the future of science teaching is bright.

Index Terms- science practical, science teachers

I. INTRODUCTION

What cannot be over emphasised in national development is the role science can play. Myriad publications and speeches by distinguished authorities and great personalities indicated the importance of science in national development. In fact, no country can record any meaningful development without science playing the most important role. Therefore, it is not surprising if the then Head of State, General Gowon, said in an opening address of STAN conference, as far back as 1968, that no country can either survive or develop without due emphasis given to science and technology. Any country and its policy makers that decide to overlook this significant truism will never achieve any meaningful development and shall continue to spend much of its resources in the importation of products from developed countries (Neil, Adam and John, 2010; Ali, 2009; Bajah, 1982). To this end Rashidwan, (2009) and Akinmade, (1985) contended that the emphasis accorded science in the contemporary world seems very appropriate as ours in an age where science and technology are part and parcel of the world's culture. It is obvious that nowadays no one doubts the significance of science and technology for sustainable national development.

The issue now at stake is how effective is science teaching at all levels of our education which is the most fundamental aspect of the future of science in Nigeria. Science, being an activity based subject, needs practical activities regularly at all level of education for the effective and efficient achievement of the goals of science and science education as outlined clearly in the National Policy on Education (NPE, 2004) in section 7, subsection 39 (a) and (b) as follows:

a- Emphasis shall be given to the teaching and learning of science process and principles. This would lead to fundamental and applied research in the sciences at all level of Education.

b- The goals of Science education shall be to:

i. Cultivate inquiring, knowing and rational mind for the conduct of good life and democracy.
ii. Produce scientists for national development.
iii. Service studies in technology and the cause of technological development.
iv. Provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

These are indeed the goals of Science education as far as the Federal Government of Nigeria is concerned. However, in order to show that it is not oblivious of the significance of effective teaching and learning of science, it further stated its position again in subsection 39 (c) through (d) of the NPE (2004) thus:

c- Special provision and incentives shall be made for the study of sciences at all levels of the national Education system. For this purpose, the government shall adequately support the functions of all agencies involved in the promotion of the study of sciences.

d- Government shall popularise the study of sciences and the production of adequate number of scientists to inspire and support national development.

Therefore, there must be a proper way and techniques for Science teaching at all levels of the Nigerian Education system in order to achieve the above stated goals. There is the need for competent **Science Teachers** who shall undergo training in university Faculties of Education, Colleges of Education and schools of Education in Mono/Polytechnics. These science teachers are responsible for making the scientists needed in such disciplines as medical sciences, engineering technology, communication technology, space sciences, mining technology and many more but to mention a few. All these are determinants of national development and the strength of any nation economy.

II. STATEMENT OF THE PROBLEM

Nevertheless, science, being an activity based subject, effective teaching and learning cannot be feasible unless enriched with practical activities. *Practical Activities* must occupy greater part of the time allocated to science subjects than the chalk and talk method of teaching of the theoretical aspects. However, some schools and Science Teachers seem to abuse this fundamental aspect of teaching and learning sciences at our secondary schools despite the fact that the Science Teachers themselves know best the significance of practical activities in effective teaching and learning. To this end, what is the future of science education in Nigeria? What percentage of Nigerian prequalified candidates are willing to take science teaching as a career in future? All these and other unanswered question informed the need to carry out such a study.

III. PURPOSE OF THE STUDY

This research is purposely aimed at finding out whether the science practical activities are regularly carried out in Nigerian secondary schools. Moreover, it is also to find out whether or not the students have developed interest in studying sciences harder because of the science practical activities they are involved in and whether or not the science practical activities have made the study and understanding of sciences simpler. Finally, it is also to examine whether the science practical activities have motivated students to study sciences at tertiary institutions with emphasis to Science Education so that there is going to be a boost in the production of highly qualified and competent science teachers who can help in actualising the goals of the NPE (2004).

IV. RESEARCH QUESTIONS

To guide the conduct of this study with clear direction and or focus, the following four (4) research questions are going to be answered:

1. Are science practical activities regularly being carried out in secondary schools for teaching and learning sciences?
2. Have the science practical activities developed students' willingness to study sciences harder?
3. Have the science practical activities made the study and understanding of sciences simpler?
4. Have the science practical activities motivated students to take science education at tertiary institutions and become qualified Science Teachers?

V. METHODOLOGY

Based on survey research design, the study investigated Senior Secondary III (SS III) students of Government Science Secondary schools Gombe and Bama in Gombe and Borno states respectively. The rationale behind the selection of this category of students is because at the moment they have undergone several science practical activities from Junior Secondary classes in Integrated Science and in SS I-III science classes. Any student outside this specification is out of the scope of this study. Four hundred (400) students were randomly selected from the senior classes (SS III) of the schools totalling close to 800. Due to time constraints as well as inability to use all the students, this number of students (50%) was simply selected randomly as representative sample of the population from which data were collected. Data were collected in November 2009 at Bama, Borno state and November 2011 at Gombe, Gombe state.

A *Prequalified Students Interest Questionnaire* (PSIQ) was used in data collection which comprises of sections 'A' (Demographic data) and 'B' the ten item questions. The questionnaire was subjected to experts in educational research: one Chief Lecturer and one Academic Doctor. All their observations, corrections and comments were taken into consideration and corrections made to that effect. The questionnaire was pilot tested on some 40 students of the target schools who were not part of the study sample. The questionnaire administration was successful with the permission of the school authorities. With the kind assistance of the schools' staff, the questionnaires were distributed to the students and 100% returned in few hours after responding to the items.

VI. DISCUSSIONS

Demographically, all respondents are males (table 1) and 50% are from Gombe, Gombe state and the other half from Bama, Borno state. They are all in SS III and so in their final year. They are youths in the age range of $\leq$ 19 years (80%) and $\geq$ 20 years (20%).

Figure 1 indicates responses of the students on the performance of science practical activities in junior and senior secondary schools. While they positively agreed to doing it in senior classes (95%), the result proved otherwise in junior classes because more than half (52%) posted a negative response. This may not be unconnected with the reluctance of the teachers at the junior secondary level. In fact some of the teachers teaching science at such level are not even qualified science teachers (Abdullahi, 2010; Babatunde & Ali, 2009; Gombe SUBEB 2011). It is just a mere feeling that *it is only Integrated Science* and so can be taught by any teacher.

In the second figure, respondents have shown a greater positive response to interest and enjoyment of practical activities in sciences (88% and 74% respectively). This is true of scientific discovery of facts and involvement of learners in teaching and learning process. At any level of teaching and learning, learners enjoy all aspects that call for their active participation and also at the same time arrest their interest and readiness to the activities making them active rather than passive learners. Active participation and manipulation of apparatus or instructional materials help to a greater extent in illustrating and reinforcing a skill, fact or idea and relieve anxiety, fears or boredom since many teaching aids are like games (SIL international, 1999). Practical activities make learning more real than abstract, more enjoyable than boring and above all skills, ideas, knowledge and attitudes are easily acquired and readily put into practice. Hence, it is not surprising if the learners well responded positively to the questions that seek their opinion on the simplicity of the subject they enjoy its practical most and the tendency to study that subject harder. This is because 88% agreed that the subject they prefer is simpler and similarly 89% agreed that they study that subject harder (figures 3 and 4). Also on the preference of the subjects, 42% prefer Biology Practical most, 43% Chemistry practical and only 10% prefer Physics' while only 5% go for other subjects or are undecided (figure 3). Therefore, according

to the findings of this study, science practical activities encourages students to study science harder, which translates in to the simplicity of the subjects to them attesting to the significance of science practical activities. This is in consistence with the findings of Shaibu and Usman (2001) who revealed that high positive relationship existed between students' performance in practical activities and their academic achievement in integrated science but contrary to what Babayi, (2005) asserted that most students perceived laboratory activities as compulsory for passing examination not for effective meaningful learning.

Also in figure 4, 69% of the respondents indicated that they do not want to study science and become science teachers while 29% agreed to take teaching science as a career with 2% undecided. Also in figure 5, more than half of the respondents (63%) agreed that despite the interesting nature of science practical activities, they do not wish to be science teachers but one third (33%) positively responded to taking teaching science as a career because of the practical involved in it. However, going by professional preference (figure 5), close to one third (29%) agreed that because of the practical involved, they want to study science so that they can become Engineers, more than half (55%) go for medical sciences as Doctors or Nurses (may be because of the attractive welfare being enjoyed there). Only very few (4%) prefer to be Laboratory technicians with one tenth (10%) for Architecture and the least (2%) decided other professions which were not specified. However, according to the results, it is encouraging to have one third of the respondents wishing to be science teachers. This showed that if practical activities are being carried out regularly in secondary schools, students' interest would be captured, they will study science harder and science education has a brighter future since a considerable percentage is willing to take science teaching as their profession because of the practical involved in it.

VII. CONCLUSION

The research questions that guided the conduct of this study on prequalified students were fully addressed. Results showed that teachers in junior secondary schools are not performing science practical activities as in the senior secondary school classes as found out from the results. The result showed that learners enjoy practical activities and as a result found the subject they prefer its practical most simpler and are at the same time pay more attention in studying the subject harder. Besides, despite interest and enjoyment of practical activities, most of the prequalified students do not aspire to be science teachers although those who willingly showed interest in science teaching because of the practical involve therein is encouraging. That is to say that the future of science teaching is ensured according to the findings.

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APPENDICES

Appendix 1 **Prequalified Students' Interest Questionnaire (PSIQ)**

Introduction - Please this questionnaire is designed to seek your opinion about science practical activities you have been performing since your JSS classes and in all science subjects you are currently offering. Your opinion is going to be of great contribution to the education sector and be sure that it is going to be used only for this research.

Section A

Personal Data

School……
……

Sex Male ( ) Female ( )

Class……
……..

Section B

Instruction: tick as appropriate please after carefully having read the questions.

(1) Do you performed practical in your Integrated Science in JSS class? (Yes) (No)

(2) From your SS I to SS III do you perform practical activities in science subjects? (Yes) (No)

(3) Do you enjoy the practical activities? (Yes) (No)

(4) Apart from enjoying the practical are you interested in doing the practical activities regularly? (Yes) (No)

(5) Which science subject do you enjoy its practical most?
(Physics) (Chemistry) (Biology) (Others)

(6) Do you study the subject harder? (Yes) (No)
(7) Has the subject proved simpler than other subjects? (Yes) (No)
(8) Would you like to be a science teacher because you enjoy practical? (Yes) (No)
(9) I enjoy practical but I do not wish to be a science teacher? (Yes) (No)
(10) I enjoy practical and wish to be a scientist like:

Appendix 2

Table 1: Demographic features of the sample

Demographic Features	n	%
Gender		
Males	400	100
Females	00	00
Age Range		
≤ 19 years	320	80
≥ 20 years	80	20
Schools		
GSSS Bama, Borno State	200	50
GSSS Gombe, Gombe State	200	50
Class SSS III	400	100

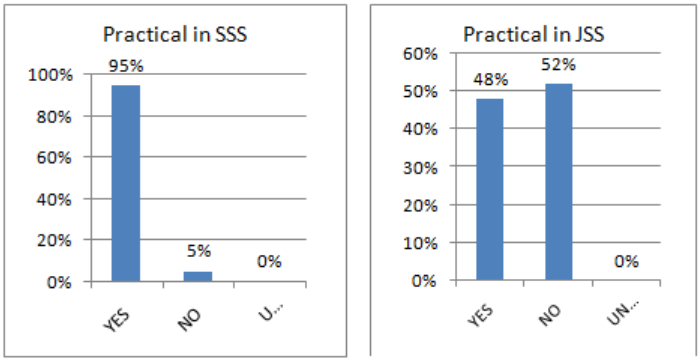

Figure 1: Performance of Practical Activities in JSS and SSS Classes (n = 400)

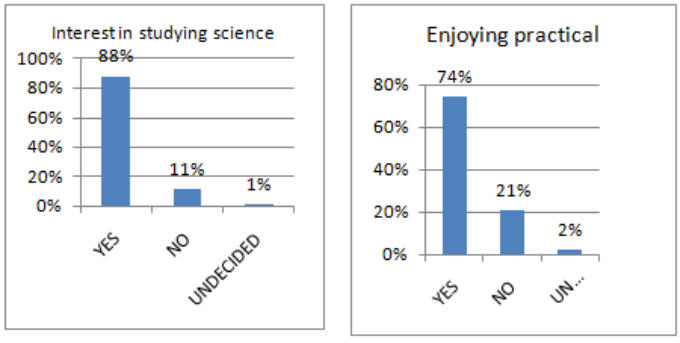

Figure 2: Interest and enjoyment of practical activities (n = 400)

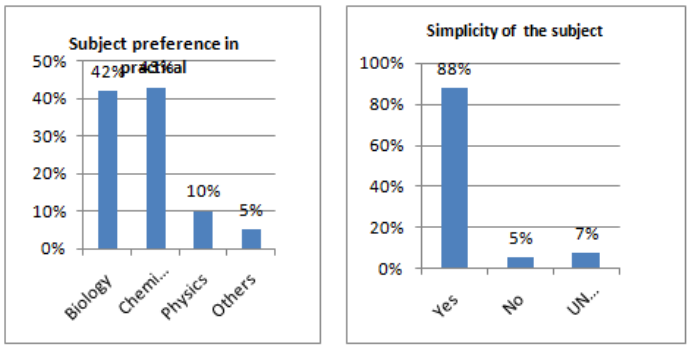

Figure 3: Subject preference and simplicity of the subject preferred (n = 400)

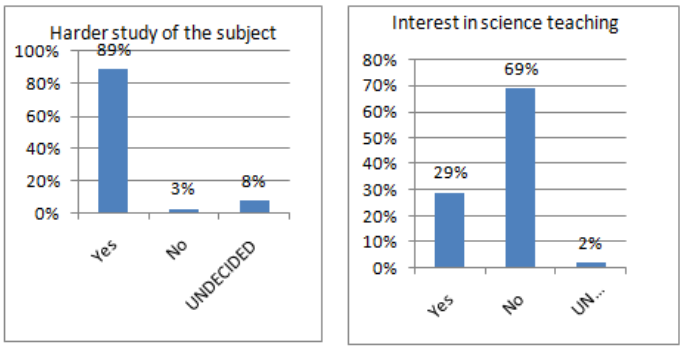

Figure 4: Harder study of preferred subject and interest in teaching science (n = 400)

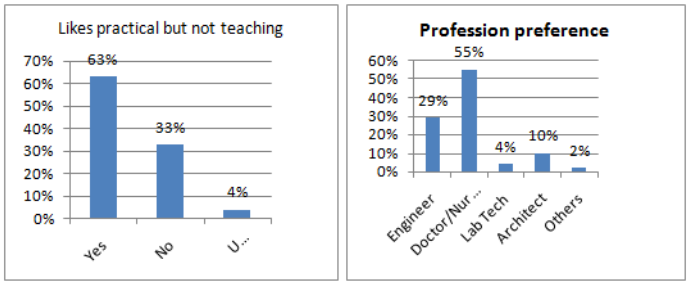

Figure 5: Profession preference (n = 400)

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