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# METHODS, STRATEGIES AND OPPORTUNITIES FOR THE ACQUISITION OF PRACTICAL SKILLS AND EXPERIENCES BY STUDENT-BIOLOGY TEACHERS IN TEACHER EDUCATION INSTITUTIONS IN ENUGU STATE: AN INVESTIGATION

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## Abstract

*The study investigated the methods and strategies employed in teaching biology-teacher trainees and area of competences where opportunities are provided for them to acquire practical skills and experiences. The study covered two government-owned Universities and Colleges of Education in Enugu state. One of each type of institutions are owned by the federal government and the other by the state government. Two research questions guided the study and two null hypotheses were tested at 0.05 level of significance and at 328 degrees of freedom. A 44-item structured questionnaire of four option response type was used to collect data. The questionnaire was face-validated by one lecturer each from each of the two types of institutions. Findings of the study include that innovative instructional methods and strategies are not employed in teaching the student-teachers. Also revealed was that in all the institutions, the student-teachers are not provided with opportunities to acquire practical skills, experiences and competencies that would enable them teach biology effectively on graduation. It was recommended that opportunities should be provided for them to acquire practical skills, experiences and competencies; they should be trained by experienced, competent, and current educators among others.*

Education which is the bedrock of all forms national growth and development is primarily concerned with development of human beings and it does this through or with the teacher. The place and role of the teacher in every educational endeavour is therefore not only central but crucial and in fact, indispensable. Based on the fact that one cannot give what he/she does not have, teacher preparation (training) programmes and their implementation processes should be of the best quality possible otherwise, the educational system of the nation which is manned by the teachers can never be of high quality. It means therefore that the reformation of all or some aspects of a nation's

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education system to enhance functionality without giving priority attention to the quality of teachers who are the most important human resource in the industry will achieve close nothing in terms of the objectives of the exercise. This is because the place and role of the teacher in the education industry is quite indispensable hence, no meaningful improvement can be achieved without good quality crop of teachers. The teacher is a critical factor in the overall growth and development of the nation hence, Odimegwu (2005; 65) asserted that “no education system can rise above the quality of its teachers and no nation can rise above the level of its educational system”.

Many claim that they can (and they actually) teach but not everyone can teach effectively. Only those who cultivated specialized knowledge, arts, and skills on which teaching is based can teach effectively (Broudy, in Elobuikwe, 2010). Adequate and proper teacher preparation which helps to develop teachers’ quick understanding, perception, spirit of enquiry, experimentation, creativity and innovation deserves priority attention in every educational system reformation agenda. Teachers may be born as perceived by some, but effective teachers can only be made through adequate and proper development of human capital potentials through training.

Development means the enlargement of personal potentials through the acquisition of beliefs, value, skills, habits, knowledge (Agbowuro and Oriade, 2006) preferably during training, schooling, or apprenticeship. Human capital, according to Odimegwu (2006), is the human capability and productivity engendered through knowledge and skills acquired from education, training, experience and facilitated by an enabling environment. It consists of individuals capabilities and knowledge, skills and experiences as they are relevant to the task at hand as well as the capacity to add to the reservoir of knowledge, skills and experience through individual learning (Dees and Picken 2000 in Eya, 2010).

According to Agbowuro and Oriade (2006), utilization of human resources is not just a matter of providing specific number of jobs but also of providing jobs that enable individuals to do what they have become capable of doing. Planning a strategy of human resource development and utilization demands constant awareness of both the potential and aspiration of the individuals and the prospective need of the society.

The need of the Nigerian society today is functional education. Literature is replete with studies that identified science education and learner-centred, learner-activity pact, process-focused science subject instructional strategies as ways of ensuring functional science education in the country. Also replete in literature are studies which identified poor teacher quality and employment of inappropriate institutional strategies by science teachers among others as the causes of lack of interest, low enrolment, poor performance in science subjects by students in the nation’s educational institutions at all levels, etc.

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Non-existence of studies on nature and quality of training given to prospective science teachers in literature known to this researcher is a serious gap that deserves urgent attention. It is that gap that this study was set to attempt to fill. Specifically, this study was out to find out if science (biology) student-teachers are actually prepared (trained) to teach science subjects the way they are expected to teach them to students in schools. It should be recalled that Osafehni (1986) observed that Nigeria's education system has been so structured that teachers training, curriculum development and classroom activities are different activities that run parallel to one another hence, he noted, that curriculum changes take place without training the teachers who actually implement them.

Teacher education programmes generally (but particularly those for science teachers) have been operated on the naive assumption that it is only the knowledge of the curriculum content that matters. This most probably could be highly responsible for most of the problems plaguing science education in the country. Knowledge of curriculum content should be augmented with elaborate preparatory techniques involving requisite methodologies to enable them (teacher trainees) acquire practical skills, experiences and knowledge in biology teaching methodologies. In the words of Agbowuro and Oriade, (2006), effective biology teaching requires a blend of knowledge, subject methodology and creative attitudinal orientation on the part of the teacher.

Biology is the most popular of all the science subjects among secondary school students. This is informed by the erroneous belief that it is the "easiest" of all science subjects. The error in the belief is substantiated by the highest percentage failure recorded for it in Senior Secondary School Certificate Examinations (SSCE) organised by West African Examination Council (WEAC) and National Examination Council (NECO) ( Chibogwu and Anekwe 2006, STAN, 1992).

The importance of practical experience in any science subject is crucial for the real understanding of principle and the application of knowledge ingrained in that subject for cognitive growth, technological orientation and advancement. Constraining factors which include lack of facilities, teacher factors such non exposure to practical experiences during training and lack of creativity awareness and practice among others, affect the teaching of biology (particularly the practical aspect) in schools. (Anderson, 2004; Ajaja, 2002; Ige, 2000 and Cifrat and Zumyil 2000). Biology teacher-trainees should therefore be exposed to various modern science instructional strategies and methods which have been established empirically to be effective in enhancing effective learning, acquisition of practical skills, knowledge and experiences in communication,

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manipulation, creativity and organization all of which are required for the teaching of the subject effectively.

As stated earlier, the absence in literature known to this researcher of studies that assessed the type of strategies employed in the implementation of Biology-teacher education programmes is the problem of this study.

### **Purpose of Study**

The main purpose of this study was to find out the strategies employed in teaching the Biology-teachers trainees in teacher education faculties and institutions. Specifically, the study;

1. determined teaching methods and strategies employed in teaching the Biology teacher student-teachers.
2. determined the practical skills, experiences and knowledge acquisition opportunities to which the Biology education student-teachers are exposed to in the course of their training.

### **Scope of the Study**

The study was restricted to only the teaching methods and strategies employed for the trainees as well as the specific opportunities for the acquisition of practical skills, experiences and knowledge they were exposed to during training. The respondents were only the 2<sup>nd</sup> & 3<sup>rd</sup> year Biology education student-teachers in the government-owned Colleges of Education and, 3<sup>rd</sup> & 4<sup>th</sup> year Biology education student-teachers in the government-owned Universities in the state. One of the Universities and one of the Colleges of Education are owned by the federal government while the others are owned by state government.

### **Significance of the Study**

The information revealed by the study hopefully, will sensitize the Biology education student-teachers educators in teacher-education faculties and institutions in Enugu state to live up to what is expected of them. Specifically, the findings will sensitize them on the need to employ adequate and appropriate instructional methods and strategies when teaching the trainees as well as create ample opportunities for them to acquire adequate doses of appropriate and requisite practical skills and experiences which would enable teach the subject effectively when they graduate. Critics of the science teachers' quality of performance may, based on the findings of the study, be re-directed to the root cause of the teachers' poor performance.

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### **Research Questions**

The following research questions guided study:

1. What are the methods/strategies employed in teaching the Biology-education students in teacher-education institutions?
2. What specific practical skills, experiences and knowledge acquisition opportunities have the Biology-education students been exposed to in the course of their training?

### **Hypotheses**

The following null hypotheses were tested at 0.05 level of significance and at 328 degrees of freedom:

1. There will be no significant difference between the mean rating of exposure of Biology- education student-teachers to practical skills, experiences, and knowledge acquisition opportunities in federal and state government owned institutions.
2. The mean rating of exposure of Biology education students-teachers to practical skills, experiences and knowledge acquisition opportunities in Colleges of Education and Universities will not differ significantly.

### **Research Method**

**Design:** Sample survey research design was adopted in the study

**Population:** All the third and fourth year Biology education student-teachers in two Universities and second and third year Biology education student-teachers in two Colleges of Education in Enugu State constituted the population for the study. The universities are University of Nigeria Nsukka (UNN) (federal University) and Enugu State University of Science and Technology, (ESUT) (state University) while the College of Education are Federal College of Education, Eha-Amufu and Enugu State College of Education (technical), Enugu.

### **Sample and Sampling Techniques**

Cluster and random sampling techniques were employed in obtaining total of 330 2<sup>nd</sup> & 3<sup>rd</sup> and 3<sup>rd</sup> & 4<sup>th</sup> year Biology education student-teachers from the two colleges and two Universities respectively. Out of this, 62 were from UNN, 48 from ESUT,; 131 from Federal college of Education, Eha-Amufu and 89 from Enugu State College of Education.(Tech.) Enugu. It means that 110 were from Universities while 220 were form Colleges of Education. Also, 193 respondents were from federal government-owned institutions while 137 were from state government-owned institutions.

### **Instrument for Data Collection**

A two-part 42-item structured questionnaire of the four response option type was used to collect data for the study. The first part of the instrument with only one item served to determine type of institution while the second part contained forty-one items which were arranged in two clusters in line with the two research questions that guided the study. The respondents indicated their opinion about the frequency of the employment/ exposure of the different teaching methods/strategies and to different opportunities for the acquisition of practical skills, experiences and knowledge respectively. The response options were Very Often (VO), Often (O), Seldom (S) and Never (N) and to these numerical values of 4, 3, 2 and 1 were respectively assigned.

### **Validation of the Instrument**

The instrument was validated by two lecturers- one from College of Education Eha-Amufu and one from Enugu State University of Science and Technology (ESUT). Their comments led to the addition of five new items to the list, rewarding of instruction to the respondents and some items and also the deletion of two which they described as “not necessary” and “repetition” respectively.

### **Method of Data collection**

With the assistance of three Biology education Postgraduate students of ESUT who are lecturers, one in each of the three institutions and the researcher in the fourth institution, copies of the questionnaire were administered and collected. On the instruction of the researcher, the questionnaire copies were administered on the respondents in the classes just after lectures that involved only the stipulated classes of Biology education students in each of the institutions. This was to ensure that all the students present in the class for the days lecture was among the respondents They were instructed not to disclose their identity on the questionnaire by writing their names, registration numbers, etc and there were no provisions for such information on the questionnaire. This was to enhance honesty in the responses given by the students. They returned the filled copies of the questionnaire to the researcher/research assistants through their class representatives same day.

### **Method of Data Analysis**

The statistical tools employed for data analysis were the mean ( $\bar{X}$ ), Standard Deviation (SD) and the student, t-test. Mean value of 2.50 was adopted as the criterion mean for rejecting/accepting a statement as having positive value. Low and high values of SD were respectively interpreted as indications of the responses of the respondents varying closely or widely. A Null hypothesis was to be rejected when calculated t-value was equal to or greater than critical or table t-value and not rejected when less than critical/table value.

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**Presentation and Analysis of Data**

Analysis of data collected are presented in tables below in accordance with the research question and hypotheses that guided the study.

**Table 1: Mean Rating and Standard Deviation of Employment Frequency of Different Teaching Methods/Strategies by Lecturers**

S/N	ITEM	MEAN (X)	SD	DECISION
<b>Teaching method/strategies employed by lecturer often are:</b>				
1	Field Trips/Excursion	0.98	1.38	Not Employed Often
2	Discovery/Enquiry Method	1.22	0.81	Not Employed Often
3	Co-operative Learning	2.07	1.47	Not Employed Often
4	Practical/Experiments	2.56	1.86	Often Employed
5	Individual Projects	2.51	1.84	Often Employed
6	Group Projects	2.13	0.77	Not Employed Often
7	Science-Technology and Society(STS)	1.17	0.14	Not Employed Often
8	Lecture	4.83	0.12	Often Employed
9	Discussion	3.13	0.73	Often Employed
10	Demonstration	2.54	0.13	Often Employed
11	Advance Organiser	0.92	0.01	Not Employed Often
12	Concept Mapping	1.18	0.11	Not Employed Often

Data in Table 1 above shows that only items 4,5,8,9 and 10 have mean(x) values above the criterion on mean of 2.50 adopted for the study. The implication is that Biology student- teacher educators employ only practical/experiment, individual project, lecture, discussion and demonstration methods/strategies in teaching the students. All the other strategies listed are not employed by the lecturers. The low values of SD as shown in the table indicate that the respondents responses are do not vary widely.

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**Table 2: Mean Rating and Standard Deviation of Practical Skills, Experiences and Knowledge Acquisition Opportunities Biology Student-Teachers are Exposed To**

S/N	ITEM	X	SD	DECISION
	I had opportunities to do the following practically:			
1	Microteaching	4.97	0.04	Acquired
2	Teaching Practice in Secondary/primary Schools	3.00	0.00	Acquired
3	Prepare different reagents like stains in the lab.	2.07	0.97	Not Acquired
4	Collect Biology practical specimens.	2.38	1.74	Not Acquired
5	Preserve specimens with chemicals.	2.04	2.13	Acquired
6	Prepare specimens for Practical biology.	2.56	0.11	Acquired
7	Produce/Construct Teaching aids.	2.51	1.23	Acquired
8	Carry out experiment in the lab.	2.27	2.38	Not Acquired
9	Identify different lab apparatus.	2.63	0.78	Acquired
10	Use Laboratory apparatus for practical	2.22	0.71	Not Acquired
11	Repair damaged laboratory tools and equipment	1.78	0.78	Not Acquired
12	Prepare culture media	1.11	0.13	Not Acquired
13	Cultivate micro organisms.	1.02	0.12	Not Acquired
14	Identify micro organisms.	1.02	0.12	Not Acquired
15	Isolate micro organism.	1.08	0.04	Not Acquired
16	Make sections of plant specimens.	2.02	1.86	Not Acquired
17	Make sections of animal specimens	2.14	1.44	Not Acquired
18	Practice different staining techniques	2.45	2.68	Not Acquired
19	Prepare temporal slides	2.02	1.13	Not Acquired
20	Prepare permanent slides	0.02	0.06	Not Acquired
21	Sterilize laboratory equipment/tools	1.87	0.09	Not Acquired
22	Identify unlabelled specimen.	2.01	2.14	Not Acquired
23	Classify organisms based on their features	2.46	1.87	Not Acquired
24	Draw and Label specimens	2.57	0.13	Acquired
25	Keep laboratory records	1.07	0.61	Not Acquired
26	Practise laboratory management skills like labelling and sorting laboratory tools and equipments	1.88	2.61	Not Acquired



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27	Keep laboratory rules	3.74	0.08	Acquired
28	Administer first aid treatment	2.01	0.19	Not Acquired
29	Work with microscope, microtome, autoclave	2.13	2.53	Not Acquired

Data in Table 2 above show that Biology education student-teachers acquire practical skills, experiences and knowledge in only seven out of twenty nine areas listed in the table. Specifically, they acquire practical skill in the area of micro teaching, teaching practice, preparations of specimens for practical, production of teaching aids, identifying laboratory apparatus, drawing and labelling of specimens and lastly, keeping laboratory rules. These are items whose mean ratings by the students are above the adopted 2.50 criterion mean. It means they are not provided with opportunities to acquire practical skills in all the other areas listed in the table. The low values of SD indicate that the respondents do not vary widely in the rating of the items.

**Table 3: t-Test of Significant Difference between the Mean Rating of Federal and State Institutions on Exposure of Biology Student-Teachers to Practical Skills and Experiences Acquisition Opportunities**

Variable.	N	X	SD	Df	t-cal	t-crit	Decision
Federal Institution.	193	2.13	0.89	328	0.364	1.96	Not Sig.
State Institution.	139	2.09	1.02				

At 0.05 level of significance and at 328 degree of freedom, t-calculated of 0.364 is less than the critical value of 1.96 hence, the null hypotheses which says that there is no significant difference between mean rating of exposure of students to opportunities for the acquisition of practical skills, experiences and knowledge in federal and state government-owned is not rejected. In other words, the mean rating of exposure of Biology education students to opportunities for the acquisition of practical skills, experiences and knowledge in federal and state government-owned teacher education institutions in Enugu State do not differ significantly.

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**Table 4: t-test of Significant Difference Between Mean Rating of Students Exposure to Opportunities for Acquisition of Practical Skills and Experiences in Universities and Colleges of Education.**

Variables	N	X	SD	df	t-cal	t-crit	Decision
Universities	110	1.82	0.94	328	-5.89	1.96	Not Sig.
Colleges of Education	220	2.48	0.88				

As shown in table 4 above, t-cal of -5.89 is less than t-critical of 1.89 at 328 df and 0.05 level of significance. The null hypothesis which says that there is no significant difference between the mean rating of students' exposure to opportunities for the acquisition of practical skills, experiences and knowledge in universities and colleges of education is not rejected. It means that there is no significant difference between the rate of exposure of the students to opportunities to acquire practical skills, experiences and knowledge in both Universities and Colleges of Education in the state.

### **Discussion of Findings**

The quality of any education system is to a large extent, determined by the quality of teachers manning the system. It follows then that education can effectively achieve its objectives only if effective teachers are implementing its programmes and curricular. Properly and professional trained teachers are effective teachers because as stated earlier, effective teachers are made and not born. Proper training in both content and pedagogy is what makes effective teachers. An effective science teacher, according to Maduabum (2009), is one who works towards the achievement of the objectives of a particular science course under consideration at any level of the education system. A teacher is effective if he is able to accomplish all the objectives set for him to achieve (Ituen, 2004). Ukeje (1991) had earlier stated that an effective teacher must have a broad educational background, possess an adequate and sound professional knowledge and also sound in his or her own teaching field in other to be sensitive and responsive to and effective in meeting the needs of the learner and responding to the challenges of the time.

Effective biology teachers, according to Eniayeju, Akpan and Eniayeju (2005) should be able to practice high level of efficiency in competences required for mastery of subject matter, pedagogy, bench skills proficiency, resourcefulness and evaluation of

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learning. These, among other qualities, should be acquired by the biology teacher trainee during training in teacher education faculties and institutions.

Colleges of Education and Faculties of Education in Universities are meant to produce professionally trained teachers who should be of high quality to enhance their effectiveness in performing the jobs of teaching. Simply put, they should produce effective teachers who should be able to meet the requirements and challenges of the time. Teachers (particularly science teachers) are no longer dispensers of knowledge and skills to learners. Teaching-learning process has shifted from being content-focused and teacher-centred to process-focused and learner-centred hence, emphasis is now on activities carried out by the learners and not the teachers (Idoko, 2010). This fact should be reflected in the way science (biology) teachers are trained bearing in mind that one cannot give what he does not have. The findings of the study (Table 1) show that Biology teacher trainees are not trained with teaching methods and strategies that make them active participant in their own learning. This is rather sad because they in turn, would not be able to make their own students to participate actively in their own learning. They do not experience active participation in their learning during training; they are merely “told” or at most, “shown” what it means. This should not be so rather, the Chinese saying “*what I hear, I forget, what I see, I remember but what I do, I learn*” should be the guiding principles for the training of Biology teachers.

Biology is an activity-pact subject replete with knowledge and skills which learners can acquire effectively only by experiencing them practically. The revelation of this study that in both federal and state government institutions, Universities and Colleges of Education in Enugu state, the Biology education student-teachers are not provided with opportunities to acquire most of the knowledge, experience and skills practically is very sad and spells doom for the society at large but particularly for the students these Biology education student-teachers will teach when they graduate (see Tables 2, 3 and 4). The implication is that the Biology teacher trainees are not given the opportunity to acquire and develop most of the requisite experiences and skills which they should do through training, practice and experience (Baiyeto, 2007:16). No wonder then why Adikwu (2008), asserted that many science teachers lack the skills and competences they require to teach science effectively. One cannot help to wonder how the crop of Biology teachers produced in the institutions can teach Biology to students applying the methods and strategies that are learner-activity pact, learner-centred and process-focused. Can one give what he/she does not have (was not given)? Why would they be blamed by teaching Biology didactically when they were /are trained didactically? Bassey (2010) identified ineffective teacher preparation as one of the challenges of science teacher education, while ineffective pre-service and in-service training of teachers were identified to be among the causes of poor quality education across states of the nation (Adebisi in Ibrahim and Zubainatu, 2008).

### **Conclusion**

It is the conclusion of this study that Biology teacher education programmes implementation process in teacher education faculties and institutions in Enugu state is deficient in two significant areas. These are:

- I. Employment of learner-centred, process-focused and learner-activity pact methods and strategies in the training of the Biology student-teachers.
- II. Providing the opportunities for the Biology student-teachers to acquire practical experiences, skills and knowledge that would enable them teach Biology effectively as professionally trained Biology teachers on graduation

### **Educational Implication**

The educational implication of the findings of this study is that the application of ineffective methods and strategies for teaching Biology in nation's schools will continue together with its consequences until better and appropriate method, strategies and opportunities are employed/made available for Biology student-teacher in teacher education institutions. This is informed by the fact that one cannot give what he/she does not have.

### **Recommendation**

Based on the findings of the study, it is recommended that

- 1) Adequate opportunities should be provided for Biology teacher trainees to acquire, develop and practice the knowledge, skills, experiences and habit they are expected to impact on learners at their places of primary assignments after graduation. They should be made to “do” and “experience” science content and pedagogy and not just to “hear” and “see” them while in training to enable them imbibe and internalize them sufficiently so that they can put them into practice while on the job.
- 2) Experienced and competent educators who are also current in terms of innovative instructional methods and strategies should train Biology student-teachers.
- 3) Practicing Biology teachers should belong to science education professional associations like Science Teachers' Association of Nigeria (STAN), attend seminars, workshops and conferences particularly those organized by the professional association so that they would be abreast of innovations in areas Biology content and pedagogy.

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