Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS) 2 (6): 531-536
 (ISSN: 2141-6990)
jeteraps.scholarlinkresearch.org

# Practicing Teachers Perception of Undergraduate Preparation for Science Teaching in Secondary Schools in Nigeria

**[1]Uchenna Udeani and [2]Charity Ejikeme**

[1]Department of Science and Technology Education
University of Lagos, Nigeria
[2]Federal College of Education (Tech)
Lagos, Nigeria

**Corresponding Author: Uchenna Udeani**

*The purpose of this survey study was to find out practicing teachers' perceptions of undergraduate preparation for science teaching in the areas of content knowledge, pedagogical knowledge, work habits and safety, fostering best practices and continued professional development. A focus group interview was conducted and a 4-point likert type questionnaire was administered to eight hundred and ten practicing science teachers drawn from secondary schools within Lagos West senatorial Zone, consisting of three Local Education Districts (LED). Data was analyzed using frequencies and percentages. The results indicated that practicing teachers perceived inadequate preparation particularly in the utilization of (i) West Africa Examination Council Examination Syllabus (ii) prescribed textbooks (iii) ICT (iv) Meta-cognitive instructional strategies, (v) science –Technology-Society approach (vi) communication skills. Teachers in the sample also mentioned inadequate exposure to work habits and safety issues and the skills that foster best practices in their training. On professional development, the teachers supported re-certification examination and the introduction of a period of mentoring for beginning teachers. The implication of the findings for improving science teacher education in the 21st century was highlighted.*

**Keywords:** practicing teachers, science teaching, undergraduate preparation and teacher training.

## INTRODUCTION

Teacher education has become a central issue of public concern across the world in recent years as the ramifications of political, economic and social change impinge on educational systems and raise fundamental questions for societies regarding the students, teachers, the educational institutions and the quality of education being provided to satisfy the developmental needs for society (Afe, 1995). Adegoke (2000) also noted that teacher education is central to both quality of education and development, hence the diverse interest in the philosophy, goals, content structure, quality control, certification of the pre-service and in-service training of teachers. Teacher education is a necessity not a luxury. No meaningful development can take place without adequate manpower resources. No adequate manpower training can take place without competent teachers who are products of good teacher education.

In Nigeria, teacher education is the statutory function of pre-service and in-service training institutions like Colleges of Education, Faculties of Education, Institutes of Education, National Teachers Institutes and Schools of Education in Polytechnics. The common nomenclatures for certification include NCE (Nigeria Certificate in Education); B.Ed or BA/B.Sc.Ed and the PGDE (Postgraduate Diploma in Education). The National Policy on Education (2010) in recognition of the importance of the teacher in the educational process pointed out that the main objective of teacher education is in the production of highly competent and well-motivated skilled teachers. The aim is to produce teachers who are emotionally, intellectually and professionally equipped for effective teaching of the various subjects at all levels.

The National Universities Commission Minimum Academic Standard (NUC-MAS) document provide for minimum course contents for each teacher education programme, minimum floor space for lecture and laboratory facilities per student; minimum amount of laboratory space, library and other facilities par student as well as the minimum student-staff ratio for effective teaching and learning in any particular science discipline.

The NUC-MAS also provides for the following ratios of weighting of teaching subject vis-à-vis Education in each area of specialization to be 2:1. A student shall be required to pass 120 credit units to earn a degree in the Faculty of Education. Core education courses include-History, Philosophy, Psychology and Sociology of Education; Curriculum and Instruction, Methods Courses, Instructional Technology, Research Methods and Statistics, Test and Measurement, Research Project and Teaching Practice. These core courses add up to about a total of 40 units. The remaining, about 80 units should be principally from the teaching subject. Since NUC is

regulatory it is expected that teacher awarding institutions are uniform across board. Regardless of where preparation occurs, the science teacher education programme has responsibility for demonstrating that candidates are prepared in relation to these standards and to content recommendations.

The Science Teacher Association of Nigeria standards for science Teacher Preparation are based upon a review of the professional literature and on the goals and framework for science education set forth in the National Policy of Education (NPE, 2010). The NPE envisions that scientific literacy for citizenship should be a primary-if not exclusive-goal of science education at the secondary school level.

Scientifically literate citizens understand the subject matter of science, also know and understand the evidence behind the major concepts of science, how such evidence was obtained and why it has been accepted. They are able, for example, to distinguish between science as a process of investigation and technology as a process of design.

Teachers of science at all level of secondary education must demonstrate competencies consistent with the achievement of these goals. They should not only demonstrate that they have the necessary knowledge and planning skills to achieve these goals; but also that they are successful in engaging their students in studies of such topics as the relationship of science and technology, nature of science, inquiry in science and science-related issues. The training of science teachers is crucial to the successful implementation of government policy on science education. This is because teachers are the final arbiters of curricular programmes. A science teachers needs to be trained in order to perform his expected role within the school setting. He should have an adequate background in his area of specialization and also be able to communicate same to his students effectively.

Recent innovations in science curriculum content at various levels are geared towards making science more relevant to personal social needs of learners. These innovations involve changes in methodology and also in the ways of imparting the information to the learner. This implies that the competencies of the science teachers be continuously updated to take care of changes in the content and processes of science. In recent years there has been renewed concern expressed about the state of science teaching in many schools and the poor science background knowledge of many teachers. The teachers'' lack of confidence to teach science have been attributed to their poor background knowledge.

Many authors are of the view that for effective teaching and learning of science, the preparation programmes of science teachers in our tertiary institutions should be critically examined.

It is in the light of the above, that the study reported here, which is a part of a larger study sought to find out the perceptions of practicing science teachers about undergraduate preparation for science teaching.

**Purpose of the study**

The major purpose of the study was to seek the perceptions of practicing teachers about undergraduate preparation for science teaching in the following programme areas:

(i) Content knowledge
(ii) Pedagogical knowledge
(iii) Work habits and safety
(iv) Fostering best practices

Another purpose was to seek their views about continued professional development for science teachers.

**Research Questions**

The following research questions were raised to guide the study:-

1. What are the perceptions of practicing science teachers with regards to undergraduate preparation for science teaching in the areas of:
   (i) Content knowledge
   (ii) Pedagogical knowledge
   (iii) Work habits and safety
   (iv) Fostering best practices
2. What are the teachers' views about continued professional development for science teachers?

## METHODOLOGY

**Sample**

A total of eight hundred and ten practicing teachers were used (male 477; female 333). The teachers were selected based on the following criteria-they are bachelor's degree holders, (B.Sc.Ed) have been teaching for at last two years and currently either teaching Physics, Chemistry, Biology and or Integrated Science. The teachers were drawn from secondary schools within Lagos West Senatorial zone consisting of three Local Educational Districts (LED).

**Instrument**

A structured questionnaire consisting of sections A, B, C, D&E developed by the researcher was used to elicit information from the science teachers. The questionnaire was structured on a 4-point Likert type scale (4 Points = Very Adequate; 3 = Points = Adequate; 2 Points = Inadequate; 1 Point = Very Inadequate). Section A contained 5 statements on the content knowledge; Section B, 14 statements on pedagogical knowledge. Section C and Section D contained 5 statements each on Work Habits and safety and Fostering Best Practices. Section E containing questions on professional development of teachers was used together with an interview

protocol. The protocol enabled the to researcher collect additional qualitative data. The questionnaire was pilot tested on a sample of fifty five science teachers in Mainland Educational District of Lagos state. A reliability coefficient of 0.72 was obtained using test-retest procedure with Kuder Richardson formula 21. The questionnaire was distributed to the 810 teachers individually and also by mail. The group interview was conducted within school clusters with each group having approximately twenty one teachers. About forty sessions were held.

**RESULTS**

In analyzing the data for this study we assumed that a seventy percent figure obtained from the addition of Very Adequate and Adequate categories represented a satisfactory preparation for that statement and vice versa for inadequate preparation. The results of the study are summarized in Tables 1, 2, 3 & 4.

The data presented in Table 1 showed the perceptions of the teachers with regards to content knowledge of science teacher preparation programme. The teachers perceived that they were adequately prepared to teach the science concepts and conduct practical classes in their subject areas at the secondary school level. They also indicated that the education courses they were taught prepared them adequately to handle their classes. However, they mentioned inadequate preparation in the utilization of WAEC examination syllabus (49.9 %) and prescribed textbooks (60%).

Three areas in Table 2 showed inadequate preparation for teaching using ICT (79%); using the Science-Technology-Society approach to science teaching (80%); and communication skill (76%). On work Habits and safety the teachers indicated inadequate preparation in the area of avoiding risks from fire hazards (70%) and Biological and chemical contaminants (79%).

The statements on Fostering Best Practices recorded frequencies that indicated inadequate preparation by the teachers. All the five skills interrogated presented very high percentages for inadequate preparation-Leadership 71%; Information sharing 65%; Effective interaction 69%; Reflective 83%; and Flexibility 77%. Teachers view about professional development were captured with the questions on Section E of the questionnaire and focus group interviews.

Data collected showed that 82% supported re-certification examination for practicing teachers every five years. They (68%) mentioned professional improvement as the major reason for their answers. These teachers (56.7%) also supported the introduction of a period of mentoring for beginning teachers before they are allowed to teach. They however differed in their opinions on the period of mentoring (33% = 1 term; 24% = 2 terms; 5% = 1 academic session; 38% responded that each situation should be reviewed on its merit). Attendance to workshops, seminars and conferences by these teachers showed very low numbers (only 20% of them have benefited in the last two years). During the interview session majority of the teachers indicated that they do not know how to stay abreast of the latest research in practice. 57% of them are members of the Science Teachers Association of Nigeria (STAN) and 43% of them have registered with the Teachers Registration Council of Nigerian (TRCN).

Table 1: Content knowledge of Science Teacher Preparation Programme

| | **Statement** | **4 (%)** | **3 (%)** | **2 (%)** | **1 (%)** |
|---|---|---|---|---|---|
| 1 | **To what extent did the content of the science courses you took in the tertiary institution equip you to teach the subject you teach?** | 414(51.1) | 315(38.9) | 9(1.1) | 72(8.9) |
| 2 | **To what extent did the science practical classes you were exposed prepared you for handling secondary school practical classes?** | 387(47.8) | 351(43.3) | 36(4.4) | 36(4.4) |
| 3 | **To what extent did the content of the Education courses you offered prepare you for teaching the subject you teach?** | | | | |
| | a. Educationally Technology Courses | 225(27.8) | 459(55.6) | 81(10.0) | 0(0.0) |
| | b. Methodology Courses | 333(41.1) | 369(45.6) | 45(5.6) | 63(7.8) |
| | c. Psychology Courses | 270(33.3) | 342(42.2) | 171(21.1) | 27(3.3) |
| | d. Evaluation | 180(22.2) | 450(55.6) | 117(14.4) | 63(7.8) |
| 4 | **To what extent did the content of the education courses offered prepared you to teach the science subject you teach with regards to** : | | | | |
| | a. Core curriculum in your subject area | 225(27.8) | 414(51.1) | 90(11.1) | 81(10.0) |
| | b. WAEC examination Syllabus | 144(17.8) | 261(32.13) | 198(24.4) | 207(25.5) |
| | c. National Policy on Education | 153(18.9) | 459(56.7) | 0(0.0) | 198(24.4) |
| | d. Prescribed Textbooks | 171(21.1) | 315(38.9) | 207(25.60) | 117(14.4) |
| 5 | **Did you have an in-depth study of the nature of science and scientific Inquiry?** | 378(46.7) | 315(38.9) | 36(4.4) | 81(10.0) |

Table 2: Pedagogical Knowledge of the Science Teacher Preparation Programme

| | Statement | 4 (%) | 3 (%) | 2 (%) | 1 (%) |
|---|---|---|---|---|---|
| 1 | Instructional methods for Science Teaching | 351(43.3) | 360(44.4) | 81(10.0) | 18(2.2) |
| 2 | Selection of instructional materials | 198(24.4) | 369(45.5) | 171(21.1) | 72(8.8) |
| 3 | Using meta-cognitive instructional strategies | 117(14.4) | 297(36.7) | 153(18.9) | 243(30.0) |
| 4 | Using the science-technology-society approach to science teaching. | 72(8.9) | 90(11.1) | 189(23.3) | 459(56.7) |
| 5 | Were you exposed to the use of ICT in the teaching and learning of Science? | 72(8.9) | 99(12.2) | 144(17.80 | 495(61.1) |
| 6 | Using teaching skills and techniques | 261(32.2) | 252(31.1) | 153(18.9) | 459(17.8) |
| 7 | Exposure to microteaching during initial training | 225(27.8) | 360(44.4) | 153(18.9) | 126(15.6) |
| 8 | Training in the act of improvisation | 153(18.9) | 378(46.7) | 198(24.4) | 81(10.0) |
| 9 | Breaking down of syllabus into schemes | 234(28.9) | 297(36.7) | 171(21.1) | 108(13.4) |
| 10 | Writing of lesson notes | 360(44.4) | 288(35.6) | 81(10.0) | 81(10.0) |
| 11 | Classroom management | 306(37.8) | 324(40.0) | 135(16.7) | 45(5.6) |
| 12 | Fostering a conducive learning Environment | 207(25.6) | 360(44.4) | 144(17.8) | 99(12.3) |
| 13 | Encouraging student participation in the teaching and learning process | 243(30.0) | 324(40.0) | 144(17.8) | 99(12.3) |
| 14 | Communication skills | 36(4.4) | 144(17.8) | 450(55.6) | 180(22.2) |

Table 3: Work Habits and Safety

| Statement | | 4 (%) | 3 (%) | 2 (%) | 1 (%) |
|---|---|---|---|---|---|
| **How did your training prepare you for** : | | | | | |
| 1. | Maintaining a safe Environment for in students | 270(33.3) | 342(42.2) | 117(14.4) | 81(10.0) |
| 2. | Checking and using Equipment properly | 180(22.2) | 117.(14.4) | 180(22.2) | 396(48.9) |
| 3. | Avoiding risks from fire hazards | 117(14.4) | 117(14.4) | 180.22.2() | 396(48.9) |
| 4. | Avoiding risks from Biological/Chemical contaminants | 90(11.1) | 81(10.0) | 261(32.3) | 378(46.7) |
| 5. | Giving First Aid when required | 270(33.3) | 207(25.6) | 189(23.3) | 144(17.8) |

Table 4: Fostering Best Practices

| Statement | | 4 (%) | 3 (%) | 2 (%) | 1 (%) |
|---|---|---|---|---|---|
| **Were the principles of the following skills that foster best practices incorporated in your training programmes?** | | | | | |
| 1. | Leadership skills | 135(16.6) | 90(11.1) | 126(15.5) | 459(56.7) |
| 2. | Information sharing skills | 189(23.3) | 90(11.1) | 117(14.4) | 414(51.1) |
| 3. | Effective interaction skills | 171(21.1) | 72(8.9) | 135(16.6) | 432(53.3) |
| 4. | Reflective skills | 81(10.0) | 63(7.8) | 99(12.2) | 567(70.0) |
| 5. | Flexibility skills | 99(12.2) | 81(10.0) | 144(17.8) | 486(60.0ss) |

## DISCUSSION OF RESULTS

The desirability of a strong content background for science teachers is widely recognized and generally accepted, even while it is also generally recognized within the professional community that science content alone is not sufficient to define a good teacher. Science teaching is a composite profession requiring knowledge and skills in both science and education. Ideally these skills should come together in the preparation programme. The results of this study confirms previous researches in Nigeria (Ajeyalemi,2002; Akande, 2002; Udeani, 1999) and the NUC accreditation documents that the science and education content taught in Nigeria teacher

training institutions are adequate both in content and scope. However the findings here corroborates the study of Ogunniyi who reported that Nigerian science teachers are ill-prepared in the use of the core curriculum in their subject, the West African Examination Council (WAEC) syllabus, National Policy on Education (NPE) and the prescribed textbooks.

Inadequate preparation in the use of ICT for teaching was recorded for the teachers in the present sample. ICTs are having a huge impact on everyday classroom activities. World Wide Web and other internet application are promoting deep discussions of the role of teachers. Science is becoming a significant context for using computer technology. The obvious implication of the above is that Teacher Preparation Programmes must equip teachers with ICT skills needed for knowledge creation and dissemination.

The Science-Technology and Society (STS) movement is now in its fourth decade and has had a profound effect in both primary and secondary science teaching and learning. Teacher education programmes must equip student teachers with understandings regarding the teaching and learning of STS content. The finding from this study showed that the teachers in the sample were not adequately prepared to use the STS approach. A lack of exposure to STS approach implies that teachers and their students will lack the ability to understand and examine societal issues and problems and apply scientific principles and process to them (Solomon 2002).

The process of purposefully monitoring our thinking is referred to as meta-cognition (Baker and Brown, 1984). Meta-cognition is characterized by (1) matching thinking and problem-solving strategies to particular learning situations (2) clarifying purposes for learning, (3) monitoring one's own comprehension through self question and (4) taking corrective action if understanding fails (Dermody and Speaker, 1995). Teachers in the sample indicated inadequate preparation in the use of meta-cognitive instructional strategies. Learners use meta-cognitive strategies to enhance their understandings (McLaughhn and Allen, 2002). Teachers need to be knowledgeable in their use and to be able to direct students accordingly.

Questions regarding safety in the laboratories were asked both in the questionnaire and during the group interviews. The teachers indicated that work habits and safety issues were not adequately addressed during their preparation programme especially in the area of avoiding risks from fire hazards and Biological/Chemical contaminants. Teacher preparation programmes must ensure that candidates possess the knowledge needed to maintain a safe environment for all students. This includes knowledge of how to avoid or control hazardous materials or organisms, how to prepare and/or store materials properly and how to clean up spills and dispose of chemicals safely. Pre-service teachers must also be taught how to check and use safety equipment properly and the hazards of improperly shielded equipment and must be able to avoid risk from fire hazards and biological contaminants.It is also important that students teachers are taught how to behave in a safe manner, model ethical and safe behavior and to ensure that students behave safely at all times. They must give proper safety instruction and causations and must label materials and equipment in such a way as to maintain safety.

Issues related to fostering best practices and professional development are taken together. From the responses gathered it was concluded that skills that foster best practices in the preparation of the teachers were inadequate. All the skills-communication, leadership, information sharing, effective interaction, reflective and flexibility are necessary as it allows them to relate with students and to modify and improve their practices. On professional development, the result of this study has contributed to our understanding of the need for an integrated in-service development programme. Udeani et al(2010) and Lumpe (2007) both noted that the one short professional development programmes have been shown in research to be ineffective. During the focus group discussion teachers in the sample indicated that they would require their employers to have a programme for in-service training that will see them attend conferences and workshops that are specific to certain need instead of generic ones. They suggested teacher development programmes that focus on contextualizing professional development to enable them interact with other teachers to socially develop new ideas and distribute learning over different situation, such as learning individually in groups and through tools. Also meeting regularly over an extended period of time, sharing common values and goals and engaging in collaboration and critique of each others' work. Teaching becomes a profession when teachers practice with a common knowledge base and apply their knowledge to effective practice (Wise and Leibbrand, 2003)

## CONCLUSIONS

Nationwide concern for the quality of science education in general has been heightened for nearly two decades. Evidence of a 'crises' in science teaching includes declining scientific literacy, negative students attitude toward science, declining achievement and aging outdated, facilities and laboratory equipment.(Udeani, 1999). Challenges of the 21st century require concomitant paradigmatic shifts in science teacher education. There must be

significant innovations in the curriculum to enable the science teacher cope with the problems of new knowledge in the 21st century as a result of improvement in science and technology. Areas of inadequacies mentioned by the teachers especially in the present study- use of ICT, work habits and safety, Science-Technology-Science approach to teaching should be addressed to enable science teachers discharge their duties effectively. On aspects of professional development, viz: recertification of serving teachers and mentoring for beginning teachers has some policy implications and calls for more research and advocacy before implementation.

The obvious implications for all these findings for science teacher education is the necessity for the development of closer links between pre-service and in-service programme-between initial training and circles of retraining which will ensure the continuing education of teachers-so that areas of inadequacies can be addressed,. The system should build in adequate provision and planning of in-service education to take cognizance of changes both in methodology and curriculum content.

**REFERENCE**

Adegoke, K.A (2000) Nigeria Teacher Education System in the 21st century. A keynote address at the 4th Annual Public Lecture of the Udogie Ivowi Education Foundation

Afe, J.O. (1995) Teacher Education in Nigeria: Trends, Issues and Challenges. Nigerian Educational Research Association.

Ajeyalemi, D. (2002). Capacity building in the science: imperative for Teacher Education in Nigeria. University of Lagos Inaugural lecture series

Akande, M.O. (2002). Revisiting the Nigerian School Curriculum. University of Lagos series in Education. Vol. IV. P 27-34

Bajah, S.T (1979) How should we educate Chemistry teachers for a changing world. Proceeding of the 3rd International Conference on Chemical Education. Department of Chemistry, University College, Dublin, 81-90.

Baker, L. and Brown, A .L. (1984) Metcognitive Skills and Reading. In P.D. Reason (Ed), Handbook of reading research. New York: Longman.

Dermody, M. and Speaker, R. (1995) Effects of reciprocal strategy training in prediction, clarification, question generation, and summarization on fourth graders reading comprehension. In K.A. Hinchman, D. Leu, and C.K. kinzer (Eds) perspectives on Literacy research and practice. Chicago: National Reading Conference.

Federal Ministry of Education: National Policy on Education (1998) 3rd Edition

Lumpe, A. T. (2007) Peer integration in science concept development and problem solving.

Solomon, J. (2000). The Dilemma of Science, Technology and Society Education. In S. Amos and R. Boohan (Eds) Teaching Science in Secondary Schools (pp, 94-101)

Udeani, U.N. (1999) A quantitative Analysis of Secondary School Biology Texts for Scientific Literacy Themes. Proceedings of the 40th conference of Science Teachers Association of Nigeria, 340-345.

Udeani, UN, Adeyemo, S, and Atagana H.I. (2010). Utilizing Student Assessment Measures to improve Science Teachers' Effectiveness. Ghana Journal of Education and Teaching, No. 10, June 2010, pp 107-120

Wise, A and Lei bbrand, J. (2003) Accreditation and the creation of a profession of teaching. Phi delta Kappan, 75(2), 133-157