

**EVALUATION OF NIGERIA CERTIFICATE IN EDUCATION CHEMISTRY
PROGRAMME IN COLLEGES OF EDUCATION IN SOUTH-SOUTH AND SOUTH-
EAST GEO-POLITICAL ZONES OF NIGERIA**

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ABSTRACT

The study was carried out to evaluate the NCE chemistry programme in the Nigerian Colleges of Education. Two research questions and two null hypotheses guided the study. The study adopted an evaluative survey research design. The population comprised 318 chemistry students in 11 Colleges of Education in South-South and South-East Geo-political Zones in Nigeria. Two instruments were used for data collection: A researcher-design questionnaire and observation checklist. The instruments were faced-validated by three experts, two in Science Education and one in Measurement and Evaluation in the Faculty of Education, University of Nigeria, Nsukka. The overall reliability coefficient value of 0.78 was obtained for the instruments using Cronbach Alpha Method. Mean and standard deviation were used for answering the research questions while t-test was used for testing the hypotheses at 0.05 level of significance. The findings of the study reveal that (1) low attainment of the objectives of course contents in NCE chemistry programme in the Colleges of Education by students. (2) Chemistry teachers in the Colleges of Education do not make effective use of recommended teaching methods in the Colleges. Based on the findings, the researchers among others recommended adequate supply of facilities and equipment to Colleges of Education as well as employment of qualified chemistry staff in the Colleges of Education for proper attainment of the objectives of chemistry by students in the institutions.

Keywords: *Education, Chemistry, Evaluation, Students, Colleges of Education, NCE Programme, Attainment, Teaching.*

INTRODUCTION

Education is regarded as a core instrument for national development. Ogbonnaya (2010) defines education as a process of training individuals to acquire skills, knowledge, attitude and values that will make them functional members of the society. The above implies that education is a lifelong process acquired by an individual to ensure sustainable development. The key to any educational success lies in a number of stakeholders such as the teachers, pupils, work forces, members of the community and the political authorities. Babalola (2010) states that of all factors determining the quality of education and its contributions to national development, the teacher is the most important factor. This demands effectiveness in Teacher Education. This implies that the non-governmental agencies, communities and individuals as well as the government should make teaching and teacher education effective as well as an attractive profession. Formal Teacher Education in Nigeria took its genesis from the arrival of missionaries in the country. The need for evangelization motivated the training of personnel for the purpose of teaching. Initially, these personnel functioned as catechists (those who teach religious doctrines in the church), but later the need to train them to provide manpower for other services such as teaching was realized.

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According to Omelewa (2012), this trend continued until the 19th century when the formal institution for the training of teachers was established in the country. The revolution of the Teacher Education came with the Ashby commission in 1960. The Ashby commission reports that the country's (Nigeria) manpower development depends on the number of qualified teachers and recommends priority attention of Teacher Education Programme upon which the whole system of education depended. Following the recommendation, two schemes of Teacher Education were introduced. One of these schemes was Teachers Certificate programme which was established with the assistance of the UNESCO. The federal and the then regional government were established in all five Advance Teacher Training College (ATTC) in 1962, with the recommendations of the Ashby commission. The ATTC was later changed to College of Education (COE). The Colleges of Education are charged to train teachers in various teaching subjects and methods. These teachers are supposed to teach in the senior section of the primary schools and in the junior section of the nation's secondary schools. Specifically, the National Policy on Education (NPE, 2008) for Teacher Education stipulates that the aims of Teacher Education are to:

- Produce highly motivated, conscientious and efficient classroom teachers for all levels of our educational system;
- Encourage further the spirit of enquiry and creativity in teachers;
- Help teachers to fit into the social life of the community and society at large and to enhance their commitment to national objectives;
- Provide teachers with the intellectual and professional background adequate for their assignment and to make them adaptable to any changing situation not only in the life of their country but in the wider worlds; and
- Enhance teachers' commitment to the teaching profession.

The above mentioned objectives indicate that teaching in tertiary institutions that prepares teachers demands more than instructing. More broadly, it means providing a framework in which student teachers acquire productivity with subject matter through the teachers. Further indication of the objectives is that teacher's development requires self-understanding and therefore educational effectiveness depends on their quality of training, experience and commitment.

The important role of teacher education programmes cannot be overemphasized in any educational system. It equips teachers with the knowledge of selecting what to teach, what to assess and how to embrace new techniques in improving the quality of teaching and learning. Teacher education programmes are also expected to enhance national development.

Achieving these goals demands operative curriculum that are effective. The emphasis on the production of curriculum programmes, effective and competent science teachers that will pilot the Science Education Programmes is required. To adequately study most of the sciences (both basic and applied) in the tertiary institutions requires a good knowledge of Chemistry, Joint Admission and Matriculation Board, (JAMB, 2010). The above idea shows that Chemistry permeates into other sciences and gives them values.

Chemistry is defined as that science which treats the structure, composition and properties of substances and of the transformation which they undergo. According to Wachanga and Mwangi (2013), chemistry is the branch of science that deals with the study of the composition and properties of matter, changes in matter, the laws and the principles that govern these changes. It is an important part of what is called science and an active and continually growing science that has vital importance to our world in both the realm of nature and realm of society. On the other hand, chemistry is a subject that has both intrinsic and utility values in virtually all spheres of life (Ikeobi, 2010).

The versatile need for chemistry in everyday life's situation implies that the preparation of secondary School students to effectively utilize the knowledge inherent in chemistry in solving the day to day problems of the nation, requires the use of a blend of different teaching methods of Chemistry in Senior Secondary School (SSS) to ensure active participation of the students in teaching learning process. These teaching methods include demonstration, discussion, activity-oriented and participatory methods, problem solving and other practical approaches. The Secondary school Chemistry Teachers are to be well prepared professionally and committed to teaching the subject using the above methods to help students realize functional learning outcome (Nworgu, 2004). In Nigeria, the preparation of chemistry teachers for teaching in senior secondary schools is an important curricular component at the higher level of education. Chemistry Education is an active area of research which focuses on learning and teaching of chemistry in schools, colleges and universities. Hence, the Chemistry Programme in the Nigerian Colleges of Education has aims and objectives of Chemistry programme as to: Inculcate the intrinsic values as well as the utility values of Chemistry in all spheres of human activity and produce competent, effective and efficient individuals (teachers and Chemistry educators) capable of inculcating requisite knowledge of chemistry in learners, among others. Specifically, the aims of Chemistry Education in Nigerian Colleges of Education are to: develop functional knowledge of chemistry concepts and principles, observe and explore the chemistry environments, apply the skills and knowledge gained through the study of chemistry to solve day to day problems. Others include; explain simple natural phenomena, develop scientific attitudes such as curiosity, manipulate simple apparatus for a purpose of demonstration and use/improvise simple equipment from available junk in the chemical environment (NCCE, 2012)

In order to institute measures that will enable the colleges of education achieve the above aims and objectives, the Federal Government established the National Commission for Colleges of Education (NCCE) as an advisory agency in the cabinet office. The NCCE is a regulatory body that ensures that quality standards are maintained in all Colleges of Education across the country. Hence, to guide Colleges of Education in achieving the aims and objectives, and to ensure that standard is maintained in the education being offered in Nigerian Colleges of Education, the National Commission for Colleges of Education (NCCE) spelt out the guidelines to be followed by both the Federal, State and Private Colleges of Education to achieve the aims and objectives of the programme. These guidelines are contained in a Federal Government Document called the Approved Minimum Academic Standards for Education for all Nigerian Colleges of Education (NCCE, 2010).

The approved minimum Academic Standards for Education for all Nigerian Colleges of Education, prepared by the NCCE is one of the series of efforts made by the government of Nigeria (federal and state) to lay a solid foundation in science education in the country. For example, in the area of personnel, NCCE stipulated a minimum of eight (8) academic staff with at least the following qualifications: B.Sc (Hons) should be with Second Class Lower plus PGDE; and B.Sc(Edu.) should be with Second Class Lower. Other minimum resources for Chemistry Education programmes, as stipulated by NCCE are in the areas of: methods of instruction; evaluation procedure, minimum quantity of instructional materials, admission criteria/mode. Others include: course content offered and duration of students teaching practice.

In the area of methods of instruction, emphasis is on the provision of opportunity for active participation of chemistry students in classroom learning activities through the use of activity-oriented and participatory methods. This method subsumes in partial terms such other methods as demonstration, experimentation, field trips and computer assisted instruction, activity, tutorial, games and simulation and project methods in varying forms (NCCE, 2010). For students' assessment, NCCE recommended that Continuous Assessment (CA) of students' progress should be done through a combination of a written essay examination, individual and group projects, seminar presentation, among others.

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For admission criteria, students could be admitted into the NCCE Chemistry Education programmes through the University Tertiary Matriculation Examination (UTME) and Pre- NCE programmes. For students' teaching practice, the NCCE recommended twenty-four (24) weeks for new full semester. Furthermore, in the area of course content requirements, the NCCE recommended that a student should pass a minimum of 132 credit units in order to graduate in NCE Chemistry Programme. According to Anaso(2010), these minimum resources will form the input and process indicators upon which the achievement of the objectives of NCE Chemistry Programme in the Colleges of Education is predicated (Carter, 1998). The issue therefore, is whether the NCE Chemistry programme in the Nigerian Colleges of Education is meeting the NCCE's minimum standards. The perception of the adequacy of the various teaching resources for chemistry Programme in the Colleges of Education, in relation to the minimum standards could differ between the teaching staff and the students. This difference in perception will go a long way to determine the attitude of chemistry teachers and chemistry students towards Chemistry Programme in the colleges of Education, which invariably affects the performance of students in the programme (Anaso, 2010).

Experience of the teaching staff of Chemistry Programme determines to a large extent the quality of chemistry instruction in the classroom (Wachanga, Arimba and Ubugwa,2013). The author maintains that experience in a profession (teaching) requires the possession of skills and knowledge in that profession because of long period of service. One can therefore infer that the quality of NCE Chemistry Programme in the Colleges of Education could differ due to the experience of the teaching staff. In this study, chemistry teachers are taken to mean those teaching staff from Chemistry Departments in the Colleges of Education who are involved in teaching courses of chemistry to students. It is regrettable to note that in spite of the effort to maintain quality in the Chemistry Teacher Education Programmes in the country, the quality of chemistry teachers seems to be deteriorating at an alarming rate. Oguine and Adelakan in Onu (2007) noted that the turnout of "trained chemistry teachers" was impressive in terms of numbers but quality appears to be deteriorating at an alarming rate. They conclude that indeed, the products of some of the Colleges of Education in the area of chemistry teachers were "half-baked". One of the consequences of poor quality of chemistry teachers is the poor performance of students in chemistry in Senior Secondary School Certificate Examinations (SSSCE). Millar (2009) maintained that students' performance in chemistry is a function of the proficiency of the chemistry teachers among other factors. Indeed, the protracted poor performance in SSCE in chemistry certainly cast doubt on the quality of chemistry teachers that teach these students. This makes the evaluation of NCE chemistry programme expedient.

Evaluation has been defined differently by several evaluation theorists. Adeyemi, (2008) defines evaluation as a way of assessing the strengths and weaknesses of programmes, policies, personnel, products and organization to improve their effectiveness. It simply means systematic collection and analysis of data needed to make decisions, a process in which most well-run programmesengage from the outset. It is on this bases that evaluation is taken in this study. Programme evaluation which the study focuses on therefore consists of those activities undertaken to judge the worth or utility of a programme in improving some specified aspects of an educational system. Programme evaluation is the systematic collection, analysis and reporting of information about a programme or some aspects of a programme to assist (Carter, 1998). This implies that programme evaluation is a procedure to check whether the stated objectives have been achieved by comparing the observed with the standard to find out if there exists any difference. Programme evaluation is the actual assessment or evaluation of the extent of implementation of the prescriptions in the NCCE minimum standards for proper functioning of the NCE programme, such as chemistry education. Programme evaluation alsoContributes to decision about programme installation and decision about programme modification among others.

There are many models of programme evaluation and these differ and none is dominant over the other (Emmanuel, 2013). Some of the programme evaluation models are: behavioural objective model, goal free evaluation model, responsive evaluation model, the decision making model, context input process and product (CIPP) model among others. The present study is based on CIPP model of programme evaluation, which is a type of decision making programme evaluation model. The CIPP model provides a systematic way of looking at many different aspects of the curriculum development process. This is because it covers all facets of the evaluation process- content, input, process and product. The model being a comprehensive model is regarded as a cyclic process requiring a systematic programme of implementation, and involving cooperation between the evaluation and the decision makers (Stufflebeam, 2000). Chemistry Education may not be an exception. However, Udo discovered that the major constraints facing the NCE business education programme are; lack of facilities, finance, staff development, inadequate trained manpower and lack of support services for teaching and learning in Colleges of Education. The above study indicated that most of the programmes mounted by Colleges of Education in Nigeria were inadequate to meet the needs of the learners and society. Hence, the researcher considered it imperative to embark on evaluation of the NCE Chemistry Programme in Nigerian Colleges of Education.

Statement of the Problem

Despite the government's desires to promote Science Education Programme in the country, there is a drift away from Science Education Programme, generally and from Chemistry Education in particular. The quality of chemistry teachers produced by the nation's Colleges of Education seems to be deteriorating at an alarming rate. From the Colleges of Education, the turnout of "trained" Chemistry Education Teachers is impressive in terms of numbers but quality appears to be very poor. Hence, a significant number of the Chemistry Education Teachers is described as being half-baked. This ugly situation makes it imperative to examine the implementation of Chemistry Programmes in Nigerian Colleges of Education in relation to the approved guide lines by NCCE. Based on the above observation, could this poor quality of chemistry teachers' performance be attributed to inadequate equipped chemistry laboratories in the Colleges; poor quality of academic staff or inadequate instructional facilities? Answers to the above questions are the major problems this study is poised to address.

Purpose of the study

The main purpose of this study is to evaluate the NCE Chemistry programmes in Nigerian Colleges of Education. Specifically, the study intends to:

- Determine the extent chemistry students attain the objectives of the course content in NCE Programme in the Colleges of Education.
- Determine the extent recommended teaching methods by NCCE are being used by chemistry teachers in the Colleges of Education.

Research Questions

The following research questions were formulated to guide the study:

- To what extent do the chemistry students attain the objectives of the course contents offered in NCE Chemistry Programme in the College of Education, relative to NCCE recommendation?
- To what extent do chemistry teachers in the College of Education utilize the recommended teaching methods?

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Research Hypotheses

The following null hypotheses guided the study:

- ✓ There is no significant difference in the mean responses of chemistry students in federal and state Colleges of Education on the extent chemistry students attain the objectives of the course contents offered in NCE chemistry programme.
- ✓ There is no significant difference in the mean responses of male and female students' in federal and state Colleges of Education on the extent chemistry teachers in the College of Education utilize the recommended teaching methods

METHODOLOGY

Design of the study: The study adopted evaluation survey design to find out the strength and weakness in the implementation of NCE chemistry programme in South-South and South-East Geo-political Zones. The study was conducted in all the Federal and State Colleges of Education in South-South and South-East Geo-political Zones

Population of the study

The population comprised 159 NCE chemistry final year students in Federal and state Colleges of Education in the two zones.

Instrument for Data Collection: Questionnaire was used for instrument for data collection. The instrument was divided into two parts: I and II. Part I was on general information about the respondents while part II was further divided in two clusters A and B with 10 items each. Cluster A elicited information on the extent of the attainment of the chemistry course content by NCE chemistry students, while Cluster B elicited information on the extent chemistry teachers utilized chemistry teaching methods in the colleges. The response category for the two clusters was based on 4 point rating scale which ranges from 4 to 1. Very High Extent (VHE) = 4, High Extent (HE) = 3, Low Extent (LE) = 2 and Very Low Extent (VLE) = 1 respectively.

The questionnaire was validated by two experts in the Department of Science Education, and one lecturer from Measurement and Evaluation, all in University of Nigeria, Nsukka while the internal consistency of questionnaire items was calculated using Cronbach Alpha Method which yielded a reliability coefficient of 0.78.

Method of Data Collection: The questionnaire was administered to the respondents by the researchers using direct method at their different institutions

Method of Data Analysis: The two research questions were analyzed using mean and standard deviation. Mean scores of 2.50 and above were regarded as high extent while mean scores below 2.50 were regarded as low extent, while t-test was used in testing the hypotheses at 0.05 level of significance.

RESULTS

Research question 1: To what extent do the chemistry students attain the objectives of the course contents offered in NCE Chemistry Programme in the College of Education, relative to NCCE recommendation?

Table 1: Mean responses of chemistry students on the extent of the attainment of the objectives of the course contents offered in NCE Chemistry Programme in the College of Education, relative to NCCE recommendation.

N= 159				
S/NO	Items: statements	\bar{X}	SD	Remark
1	Students attained adequate knowledge of chemistry concepts.	3.03	0.84	Agreed
2	They have developed adequate knowledge of chemical skills	2.90	0.78	Agreed
3	They possess adequate knowledge of observation skills	3.24	0.37	Agreed
4	They have developed problem solving skill in chemistry	3.21	0.54	Agreed
5	They can apply chemistry concept to everyday life in solving day-to-day problems in their environments	3.11	0.71	Agreed
6	The content has exposed them to adequate knowledge of natural phenomena e.g. earthquake	3.20	0.81	Agreed
7	They have not developed proper attitude towards chemistry	3.11	0.71	Agreed
8	Their attainment is below the required minimum standard by NCCE	3.12	0.73	Agreed
9	They have developed adequate analytical skills	3.10	0.70	Agreed
10	They have improved in their exploration skills	2.94	0.76	Agreed
	Grand mean/deviation	3.10	0.70	Agreed

In Table 1, the grand mean score was 3.10 and this implied that the respondents agreed that the NCE chemistry students in Colleges of Education attained the objectives of chemistry content in Colleges of Education in South-South and South-East Geo-Political Zones to a high extent. The grand standard deviation is 0.70 which implied that opinions of the respondents were close to each other

Research question 2: To what extent do chemistry teachers in the College of Education utilize the recommended teaching methods?

Table 2: Mean responses of chemistry students on the extent teachers utilize recommended teaching methods in the Colleges of Education.

N=159				
Students				
S/NO	Items: statement	\bar{X}	SD	Remark
1	Discussion method	3.00	0.66	Agreed
2	Activity method	3.07	0.79	Agreed
3	Demonstration method	3.03	0.54	Agreed
4	Lecture method	3.13	0.63	Agreed
5	Project method	3.27	0.61	Agreed
6	Tutorial method	3.05	0.71	Agreed
7	Field trips method	2.46	0.52	Disagree
8	Games method	3.13	0.57	Agreed
9	Concept mapping	2.94	0.71	Agreed
10	Computer assisted instruction	2.48	0.53	Disagree
	Grand mean/ deviation	3.06	0.78	Agreed

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In Table 2, the grand mean score was 3.06 which implied that the respondents were in agreement that the chemistry teachers in NCE chemistry programme utilized recommended teaching methods by NCCE in Colleges of Education in South-South and South-East Geo-Political Zones to high extent. Also, the grand standard deviation 0.78 implied that the range in the responses of the respondents was not far from the mean.

DISCUSSION OF THE FINDINGS

The study revealed that the NCE chemistry students in Colleges of Education attained the objectives of chemistry content in Colleges of Education in South-South and South-East Geo-Political Zones in the following areas, adequate knowledge of chemistry concepts, knowledge of chemical skills, observation skills, problem solving skill in chemistry and application of chemistry concept to everyday life in solving day-to-day problems in their environments. Others include: knowledge of natural phenomena e.g. earthquake and development of adequate analytical skills. The findings are in line with that of Ali in Bugajie, (2013) and Ezeife (2000) who in their respective studies found out that chemistry students attained their course content objectives in chemistry in Colleges of Education through mastering of chemistry concepts and application of chemistry in solving their everyday problems respectively. The result of the hypothesis revealed no significant difference between the mean ratings of male and female NCE chemistry students on the extent they attained chemistry content in the Colleges of Education.

The study also revealed that NCE chemistry teachers utilized NCCE recommended teaching methods in the Colleges of Education under study. Hence the NCE chemistry teachers effectively utilized discussion, activity, demonstration, lecture, project, tutorial, games, and concept mapping methods for teaching NCE chemistry students in the colleges. The findings are in consonance with the results of Bugajie, (2013) who found out that chemistry teacher made effective use of lecture, demonstration, and activity methods in teaching chemistry in Colleges of Education. The result is also in line with the findings of Emmanuel, (2013) that NCE teachers in Colleges of Education applied the recommended teaching method by NCCE such as demonstration, lecture and concept mapping in their teachings in the Collages of Education. The result of the second nullhypothesis showed that there was no significant difference between the mean ratings of male and female NCE chemistry students on the extent NCE chemistry teachers utilize recommended teaching methods by NCCE in teaching chemistry in the Colleges.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

- NCE chemistry teachers should be encouraged by the institutions to make use of field trip in helping the students in having personal experiences through visits to chemical companies relevant to their studies.
- School authorities should provide and equip chemistry laboratory with computers to enable the teachers utilize computer assisted instructions in teaching chemistry students in the colleges.

CONCLUSION

The study concludes that NCE chemistry students in Colleges of Education attained the NCE chemistry content objectives and that also NCE chemistry teachers effectively made use of the recommended teaching methods by NCCE in teaching chemistry.

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