AN EVALUATION OF THE NIGERIA CERTIFICATE IN EDUCATION
MATHEMATICS PROGRAMME IN NORTH-WEST, NIGERIA

Ph.D. Research Proposal Seminar

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CHAPTER ONE
INTRODUCTION

Background to the Problem

Mathematics as a subject could be defined in many ways. One of the definitions referred to Mathematics as a Science and the study of quantity, structure, space, and change (Wikipedia, 2009). Mathematicians seek out patterns, formulate new conjectures, and establish truth by rigorous deduction from appropriately chosen axioms and definitions (Wikipedia, 2009).

Fajemidagba & Adegoke (2008) view Mathematics as a logical development which is made up of undefined terms, principles of logic, hypotheses and logical conclusions that follow from the hypotheses. According to the researchers, the logical conclusions make no claims concerning absolute truth or falsity. Salman (2005) described Mathematics as an indispensable tool in the study of Sciences, humanities, and technology. It was further explained that, human being uses Mathematics directly or indirectly in areas such as, measurement of parts of the body, clothing materials, cutting planks, determination of speed, time and distance, calculation of angles and so on. In line with this, Salman & Ogunlade (2011) posited that without Mathematics there is no Science, without Science there is no technology and without technology there is no modern society.

The Nigerian National Policy on Education (FRN, 2004) regards Mathematics as one of the core subjects to be studied at the Basic school level. It is also indicated in the policy that for a teacher to teach at this level of Education, he/she requires a minimum qualification.
easily worn out by the "system". One set of institutions expected to produce such teachers in
Nigeria are Colleges of Education (COE).

Nigerian Colleges of Education (COE) are saddled with the responsibility of training
pre-service NCE teachers in different courses including Mathematics. The training of pre-
service NCE Mathematics teachers is being done in two different Departments in the COE.
These are: Mathematics (MAT) Department under School of Science Education, and Primary
Education Studies (PES) Department under School of Education. The two Departments
however have different Programme philosophies, objectives and requirements. For instance
according to the National Commission for Colleges of Education (NCCE) minimum standard
(2009), the Philosophy of NCE Mathematics Programme under Mathematics Department is
inspired by: (1) The desire to help students become intellectually informed in mathematical
ideas, notations and skills for logical reasoning, scientific enquiry and for the pursuit of
 techno-scientific Education. (2) The need to produce non-graduates but well-groomed and
qualified professional teachers of Mathematics for the Basic Education Levels. Whereas the
Philosophy of PES is that it aims at training students to become teachers with sufficient
knowledge of the Primary School Curriculum, skills, attitude and methods to enable them
teach the subjects of Primary 1 – 6 (Including Mathematics).

To maintain quality, standard and uniformity among the operations of the COE, the
Federal Government of Nigeria (FGN) established the NCCE through an Act in 1989 as the
third leg of the tripod of excellence in the supervision of tertiary Education in Nigeria. Its
mandate includes, inter alia, the laying down of Minimum Standards for all Programmes of
the Commission culminated into the production of the first edition of the harmonized NCE Minimum Standards in 1990. Since then, the Commission has evolved a comprehensive curriculum process in response to both the changing needs in the Education sector and the statutory periodic reviews to which the Minimum Standards are subjected to every five years (NCCE, 2009). From 1990 to 2009 four editions of the minimum standard were produced and implemented; and very recently though yet to be implemented is the 2012 edition which is distributed to the Colleges in the last quarter of the year 2013. Olorundare & Akande (2011) noted that the process of producing the 2012 edition of the NCCE minimum standard started in the year 2008 without the involvement to any significant level of either College of Education lecturers or the beneficiaries of the training. It was reported that most of academic staff in the Colleges of Education got to know about this development in 2011. Olorundare & Akande (2011) therefore concluded that the curriculum was hastily reviewed, and installed into Colleges of Education without sensitization, pilot trial or impact assessment, and this indicates a disregard for the sensibilities of teachers in Colleges of Education. Isiyaku (2006) opined that one of the missions of NCCE is ‘To assure the development of a balanced and well coordinated teacher Education system in Nigeria that is capable of producing well motivated teachers with high personal and professional discipline, integrity and competence’ (Isiyaku, 2006, p. 211). While the mission of the Colleges of Education in Nigeria is ‘To produce highly motivated and skilled NCE teachers worthy of character and learning through effective teaching, research and public service for the basic Education system’ (Isiyaku, 2006, p. 212). Thus the main focus and function of an NCE Programme is to service the
the Daily trust Newspaper of 30th September, 2012, revealed that the then Executive secretary of the National Commission for Colleges of Education (NCCE) said that “In a research conducted during a classroom interaction in the primary and junior secondary schools, results indicated that the teachers lack the appropriate pedagogical skills that enables them teach well in the primary schools and in the lower grades” (The purpose of which they are produced as stipulated in the National Commission for Colleges of Education NCCE minimum standard, 2009). It was therefore concluded that Teachers’ Education curriculum has failed to disseminate the requisite knowledge and skills for teaching. Be it as it may, such conclusion can only be reached if a holistic evaluation of the Programme or a portion of it is fully done; for designing a certain curriculum is one thing but implementing it is another. For instance, related questions to the curriculum are issues such as who are involved in designing the curriculum, who implement the curriculum, under what condition in terms of the required personnel, resources and facilities is the curriculum implemented, what is the level of the quality of the students at the entry point in to the Programme, how do we determine who qualifies to be admitted; and what is the degree of feedback about the quality of the NCE products (if any) from their employers State Universal Basic Education Board (SUBEB) to the producers (COES) need to be answered.

Whereas it is a fact that the said primary and junior secondary schools are flooded with all manner of teachers mostly unqualified as contained in some reports, even the remaining so call qualified ones have their training in question. For instance, Ikeotuonye (2011) is of the view that most of the teachers currently teaching in Nigeria’s primary and
Universal Basic Education Commission (UBEC) is quoted to have lamented on the poor quality of teachers in the country, disclosing that the survey undertaken by the Commission on teacher capacity, revealed that 80 per cent of teachers in Sokoto are not qualified, on the other hand the Nigeria’s State minister of Education is quoted to have said that the Government will shut down all private Colleges of Education in the country operating without approval by the National Commission for Colleges of Education.

Other forms of dissatisfaction expressed on the product of pre-service training in Nigeria’s Colleges of Education can be seen in a memorandum submitted to the Joint Consultative Committee on Education (JCCE) meeting on the issue of re-engineering teacher Education and development for quality service delivery held at Dutse Jigawa state, Nigeria between 19th-23rd of September 2011, the Kwara state ministry of Education and Human Capital Development lamented that the quality of the product of Colleges of Education over the years left much to be desired; as a result of which it had to conduct the teachers development need assessment for teachers in the state public primary schools in 2008. The report from the assessment revealed that the teachers performed poorly. To arrest the embarrassment of bad products graduating from the Colleges of Education in the state, the Colleges were given a complete turnaround which covers four key areas: Curriculum transformation to reflect the pedagogical need of basic Education teachers, training and re-training of lecturers in line with the new development and raising the entry qualification of students going in to the Colleges of Education to five credit passes including Mathematics and English language. All these were started with the College of Education Oro in Kwara
Similarly, at the same meeting, the Federal Capital Territory Education Secretariat, Abuja (2011) submitted a memorandum on the Need to admit quality Entrants in to Teacher Education Programmes. In the memorandum an observation was made that in recent times, teacher Education Programmes in Nigeria are failing to attract quality entrants. That the scenario in the admission process is usually such that, after all other fields of endeavour have been filled up, the “Leftover” then resort to Education as the last option. The consequence of which according to the memorandum is that teacher Education, and of course teaching profession, is rife with mediocre who lack intrinsic motivation to sustain their commitment to catalyse our national Education. In line with this, Ikeotuonye (2011) observes that hardly can you see anybody who scored credit in five subjects, including English and Mathematics applying to study Education in the University. That only those with poor performance in the School Certificate examinations, and reluctantly too, go to Colleges of Education.

The level of dissatisfaction on the quality of training being received by pre-service NCE teachers is shown in an article written by Kperogi (2013) in which a call is made to bring back the old Nigeria’s teachers Colleges to complement or replace the current Nigeria’s Colleges of Education. One of the reasons adduced to this call is that Nigeria’s teacher training Colleges had high standards. The teachers understood child psychology and were trained to be all-rounders; they taught all subjects with ease. Kperogi (2013) opined that the Nigeria Certificate in Education (NCE) offered by Nigerian Colleges of Education is designed to train teachers to teach in secondary schools. Its curriculum does not offer any kind of intellectual exposure to early childhood Education. Its course offerings are ill-suited
one of the options offered by Kperogi (2013) is to change our current Colleges of Education into institutions that prepare people to teach in elementary schools. The current College of Education curriculum prepares students to teach secondary schools, which is a waste of efforts since our Universities’ faculties of Education already do this. This, of course shows a serious mismatch between the NCE curriculum content and the principal intent of the program which is production of teachers to man Basic schools.

Prior to Kperogi’s (2013) submission, Salman (2003) noted a mismatch between the NCE Mathematics Curriculum and the purpose for which it was designed. This was found in a study by Salman (2003) who investigated the relevance of NCE Mathematics Courses to the implementation of Nigerian Universal Basic Education Programme. It involved three Colleges of Education in Kwara state Nigeria and 100 NCE pre-service purposively sampled. A researcher designed questionnaire was used to determine the relevance of the courses and skills acquired by the trainees. Findings from the study showed that the content of the NCE courses are not directly accommodating the topics/concepts in the primary and junior secondary school Mathematics curricula. All these assertions can only be ascertained or debunked through the process of evaluation.

Evaluation is defined as an act, process or outcome of assessing or appraising something and expressing an opinion on its quantity, quality or worth. The outcome of such appraisal or judgment is usually expressed in various degrees of such qualitative terms as big or small, plentiful or scanty, strong or weak, long or short, high or low, satisfactory or unsatisfactory, good or bad, cheap or dear, bright or dull, pleasant or unpleasant, successful or unsuccessful, useful or useless, important or unimportant, valuable or worthless, improving, static or deteriorating (Abiri, 2006). Thus through an evaluation, one can see the presence or absence of a certain phenomenon, and to what degree, level, quantity or quality.
purposes in an Educational Programme such as NCE. Thus it can serve the formative purpose in order to bring about improvement in the Programme; and the summative purpose to ascertain the worth or merit of the Programme based on the degree of quality of its product. In line with this, the present study intends to evaluate the NCE Mathematics Programme so as to establish its worth and suggest ways of improving it where necessary based on the findings of the research.

**Statement of the Problem**

Submissions have been made by individuals or organisations through reports on the level of dissatisfaction with the quality of teachers produced through pre-service training or the processes adopted in the pre-service teacher program. This can be affirmed in the reports by the Daily Trust Newspaper of 30th September 2010; This Day newspaper of Wednesday 25th April 2012; Kwara State Ministry of Education and Human Development (2011); the Federal Capital Territory Education Secretariat, Abuja (2011); Ikeotuonye (2011), Kperogi (2013) and Salman (2003) as described in the background to this study. However, an Educational Programme such as the Nigeria Certificate in Education (NCE) which is meant to produce teachers for the Basic level of Nigeria’s Education system, cannot be adjudged as successful or not until the purpose of its establishment is justified through evaluation, a process that helps to determine the strength and weaknesses of a Programme and upon which changes could be made legitimately if need be (Eraikhuemen & Oteze, 2010). For this reason, attempts have been made by researchers to evaluate different aspects of the NCE Programme. For instance, [Mustapha (2001) evaluated the Nigeria Certificate in Education Double Major Integrated Science Curriculum.](#)
determining the teacher training quality and effectiveness in the context of Basic Education;

Akanbi (2010) investigated lecturers’ and students’ evaluation of the Nigeria Certificate in Education (NCE) physics curriculum; Bello (2010) assessed the suitability of Nigeria Certificate in Education Integrated Science Curriculum and Ajayi & Emoruwa (2012) assessed the academic achievement scores of students with the new curriculum of National Commission for Colleges of Education in College of Education, with particular reference to the Department of Primary Education Studies in College of Education, Ikere-Ekiti.] Such studies came with reports of findings and recommendations for further research in other aspects of the Programme such as Mathematics, this inform the need to evaluate the NCE Mathematics Programme so as to complement the efforts of other researchers.

Although, researchers like Diepreye & Jeremiah (2011), and Eraikhuemen & Oteze (2010) evaluated the Mathematics Programme of National Teachers’ Institute’s NCE by Distance Learning System (NCE/DLS). Findings of these researchers cannot be generalized over regular NCE Mathematics Programme hence the need to undertake the study in a wider scope. For instance, the study conducted by Diepreye & Jeremiah (2011) involved six NTI study centres in Bayelsa state of Nigeria. Findings from the study revealed that there are inadequate facilities at the centres studied. Also the findings showed that there is a need for the training and retraining of course tutors for the effective implementation of the curriculum. In the same vein, the study conducted by Eraikhuemen & Oteze (2010) was limited to NTI study centres in Edo state of Nigeria. The study focused on the content of the Mathematics modules, the Educational qualifications of Mathematics Course Tutors, the adequacy of the
there are adequate facilities and materials for the implementation of the Mathematics Education component of the NCE Programme and the general coordination of the Mathematics Education Component of the NCE Programme is adequate although there is still room for improvement.

The need for evaluating the NCE Mathematics Programme in a wider scope was affirmed by Sule (1991) who evaluated the effectiveness of the then components of the Nigeria Certificate in Education (NCE) Mathematics Programme using some randomly selected Colleges of Education in Nigeria in line with the academic contents and pedagogical demands of the then secondary school Mathematics curricula. The input component of the CIPP evaluation model (Stufflebeam, 1971) was used as a basis of the evaluation in the study. Findings from the study showed that:

1. Only 47% of the total available secondary school teachers of Mathematics were competent to teach the then secondary school Mathematics curricula.
2. The remaining 53% of the secondary school teachers of Mathematics were only competent to teach the then Junior Secondary School Mathematics curriculum.
3. The NCE teachers of Mathematics whose entry qualifications were WASCE or GCE understood the content of secondary school Mathematics curricula significantly better than their counterparts whose entry qualification was Teacher Grade II certificate.
4. The female pre-service NCE teachers of Mathematics displayed a more consistent, positive attitude towards Mathematics problem-solving than their male counterparts.
5. There was a significant relationship between attitudes towards and achievement in Mathematics problem solving among pre-service NCE teachers.
The basis of the evaluation in the Sule’s (1991) study was the input component of the CIPP evaluation model of (Stufflebeam, 1971). However, Input component alone will not give a comprehensive evaluation of an NCE Mathematics Programme without due consideration for the Process of utilising the Input, since providing the required resources may not necessarily ensures its usage.

The main focus of Sule’s (1991) study was academic contents and pedagogical demands of the then secondary school Mathematics curricula. Now the mandates of NCE Programme generally and NCE Mathematics Programme in particular is the production of teachers for Basic level of Nigeria’s Education system.

As a result of reforms in the Educational sector from 1991 to date, there are changes in both the NCE Mathematics Programme, primary and secondary school Mathematics curricula.

This gap of not providing a comprehensive evaluation of the NCE Mathematics Programme based on the changes that occurred from 1991 to date in the NCE Mathematics Programme as well as curricular of Basic level of Nigeria’s Education system is what the present study intends to fill, hence formed the problem of the study.

Purpose of the Study

The main purpose of this study is to Evaluate the Nigeria Certificate in Education Mathematics Programme in North-west, Nigeria. Specifically the study intends to determine whether:

1. The Philosophy and objectives of the NCE Mathematics Programme are suitable and
3. NCE Mathematics Curriculum content is suitable and adequate for the achievement of the philosophy and objectives for teaching NCE Mathematics.

4. The credit hours allocated to the teaching of Mathematics courses in the NCE Curriculum Content is adequate.

5. The level of involvement of the NCE Mathematics lecturers in the development and periodic review of the NCCE minimum standard is adequate and appropriate.

6. The required facilities to run the NCE Mathematics Programme are adequate.

7. The required personnel to run an NCE Mathematics Programme are adequate and of good quality.

8. The lecturers are conscious of the philosophy and objectives of the NCE Mathematics Programme.

9. The admission process into the NCE Mathematics Programme is adequate.

10. The process of conducting supervision and quality assurance in the running of the NCE Mathematics Programme is adequate.

11. The process of conducting Examinations and continuous assessments in the running of the NCE Mathematics Programme is adequate.

12. The process of conducting Students’ Teaching practice in the running of the NCE Mathematics Programme is adequate.

13. The teaching methods being employed by NCE Mathematics lecturers in teaching NCE Mathematics students are varied as stipulated in the NCCE Minimum standard.

14. There exists a feedback process between State Primary Education Boards and
Research Questions

The following research questions are posed to guide the study:

1. What are the NCE Mathematics lecturers’ assessments about the suitability and adequacy of the philosophy and objectives of NCE Mathematics Programme in line with the need for qualified Basic School Mathematics teachers?

2. What are the Basic School supervisors’ assessments about the adequacy of NCE Mathematics Programme as a means of producing the needed qualified Basic School Mathematics teachers?

3. What are the NCE Mathematics lecturers’ assessments about the suitability and adequacy of the Mathematics Curriculum content towards the achievement of the NCE Mathematics Programme’s philosophy and objectives?

4. What are the NCE Mathematics lecturers’ assessments about the adequacy of the credit hours of teaching allocated to courses in the NCE Mathematics Curriculum content?

5. What are the NCE Mathematics lecturers’ assessments of their level of involvement in the development and periodic review of the NCCE minimum standard in Mathematics?

6. What are the NCE Mathematics lecturers’ assessments about the availability and adequacy of the required facilities to run an NCE Mathematics Programme?

7. What are the NCE Mathematics lecturers’ assessments about quality and adequacy of the required personnel to run an NCE Mathematics Programme?
10. What are the NCE Mathematics lecturers’ assessments about the adequacy of the process of conducting supervision and quality assurance in the running of the NCE Mathematics Programme?

11. What are the NCE Mathematics lecturers’ assessments about the adequacy of the process of conducting Examinations and continuous assessments in the running of the NCE Mathematics Programme?

12. What are the NCE Mathematics lecturers’ assessments about the adequacy of the process of conducting Students’ Teaching Practice in the running of the NCE Mathematics Programme?

13. What are the NCE Mathematics lecturers’ assessments about the varieties of teaching methods being employed by NCE Mathematics lecturers in teaching NCE Mathematics students?

14. What is the level of feedback process between State Primary Education Boards and Colleges of Education about the productivity of the NCE Mathematics graduates?

15. What is the level of performance of the NCE III Mathematics students in a test about the content of Basic Education Mathematics curriculum and pedagogical skills required to teach the content.

**Research Hypotheses**

Based on the research questions posed, the following corresponding null hypotheses are formulated and will be tested in this study.

**H0₁**: There is no significant difference between the assessments of less experienced,
H0₂: There is no significant difference between the assessments of less experienced, moderately experienced and experienced Basic School supervisors about the adequacy of NCE Mathematics Programme as a means of producing the needed qualified and professional Basic School Mathematics teachers.

H0₃: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the Mathematics Curriculum content towards the achievement of the NCE Mathematics Programme’s philosophy and objectives.

H0₄: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the credit hours of teaching allocated to courses in the NCE Mathematics Curriculum content.

H0₅: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers on their involvement in the development and periodic review of the NCCE minimum standard in Mathematics.

H0₆: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the availability and adequacy of the required facilities to run an NCE Mathematics Programme.

H0₇: There is no significant difference between the assessments of less experienced,
H0₆: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about their level of consciousness about the NCE Mathematics Programme philosophy and objectives.

H0₇: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the process of admitting students into an NCE Mathematics Programme.

H0₈: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the process of conducting supervision and quality assurance in the running of the NCE Mathematics Programme.

H0₉: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the process of conducting Examinations and continuous assessments in the running of the NCE Mathematics Programme.

H0₁₀: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the process of conducting Student Teaching Practice in the running of the NCE Mathematics Programme.

H0₁₁: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the process of conducting Student Teaching Practice in the running of the NCE Mathematics Programme.

H0₁₂: There is no significant difference between the assessments of less experienced, moderately experienced and experienced NCE Mathematics lecturers about the adequacy of the process of conducting Student Teaching Practice in the running of the NCE Mathematics Programme.
H0_{1.4}: There is no significant difference between the assessments of less experienced, moderately experienced and experienced Basic School supervisors about the feedback process between State Primary Education Boards and Colleges of Education about the productivity of the NCE Mathematics graduates.

H0_{1.5}: There is no significant difference between the performances of the NCE I and NCE III Mathematics students in a test about the content of Basic Education Mathematics Curriculum and pedagogical skills required to teach the content.

Scope of the Study

The geographical scope of this study will be limited to all Colleges of Education in the North-Western, Nigeria. They are fourteen (13) in number, out of which five (5) are Federal Colleges of Education [Federal College of Education Kano, Federal College of Education Katsina, Federal College of Education Zaria, Federal College of Education (Tech.) Bichi, Federal Girls’ College of Education (Tech.) Gusau], and eight (8) are State Colleges of Education [Adamu Augie College of Education Argungu, Isa Kaita College of Education, Dutsinma, Jigawa State College of Education Gumel, College of Education Kafanchan, College of Education Gidan-Waya, Sa’adatu Rimi College of Education, Kumbotso, Zamfara State College of Education Maru, Shehu Shagari College of Education Sokoto]. The scope will also include State Primary Education Boards (SUBEB) of all the states in North-Western Nigeria.

The sample scope will be Mathematics lecturers, NCE III and NCE I Mathematics students of the selected Colleges of Education; as well as Basic school supervisors in the
independent variables are lecturers’ assessments, supervisors’ assessments and students’ performance.

**Significance of the Study**

This study would be beneficial to, students of Mathematics in Colleges of Education, lecturers of Mathematics in Colleges of Education, authorities of Colleges of Education, Universal Primary Education (UBEC) and National Commission for Colleges of Education (NCCE), researchers, and the entire society. Findings of this study would be of benefit to pre-service NCE Mathematics teachers (students) since the whole essence of the study is to bring about improvement in form of quality of service delivery in the Programme and by extension improving their lot. Mathematics lecturers of the Colleges of Education would be part of the beneficiaries of the findings of this study, since some recommendations based on the findings would be suggested as to how they can improve on their mode of operations such as teaching style, mode of conducting tutorials, and assessment of students’ performances. Another benefit of this study to the lecturers is that some recommendations to be given may bring about changes in the mode of operations within the system, by way of supplying all the facilities and materials required, and such changes may make the lecturers’ work easier for instance providing a Mathematics laboratory and appropriate mathematical kits will ease lecturer’s work in describing the concept of Pythagora’s theorem. Other beneficiaries of the study include authorities of Colleges of Education since findings from it would support the operations of the Colleges or recommends ways of adjustment for better improvement. **Significance of this study would also be of immense benefit to UBEC since it is the major**
authorities of NCCE in either upholding the present Mathematics Curriculum or improve on it where the study would recommends. Another significance of this study is that it may provide Educational researchers with useful empirical evidence to advance basis for further research in Mathematics Programmes. Finally, the benefits in all that have been mentioned would at the end improve the society where such a Programme is in operation.

**Clarification of Major Terms and Variables**

The following terms are defined as applied to this study:

**Evaluation:** The process of determining and passing judgment about the worth and merit of an NCE Mathematics Programme.

**NCE:** (Nigeria Certificate in Education) a certificate given to a person that underwent a teacher training course of study for a minimum period of three (3) years or a maximum period of five (5) years in a Nigerian College of Education or National Teachers’ Institute.

**Mathematics Programme:** A teacher training Programme that trains pre-service Mathematics teachers

**North-West:** A Nigerian Geo-Political zone in Northern Nigeria comprising of Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara states.

**Laboratory:** A spacious room where Mathematical models and designs as well as instructional materials are displayed and used to discover the truth about Mathematical theorems practically.

**Workshop:** A spacious room where students make use of technical appliances and Mathematical set to construct shapes and Mathematical models.
Moderately Experienced Lecturers: Mathematics Lecturers with teaching experience of four to six (4 – 6) years in a Nigerian College of Education.

Highly Experienced Lecturers: Mathematics Lecturers with teaching experience of more than six (> 6) years in a Nigerian College of Education.

Less Experienced Basic School Supervisor: Basic School supervisor with less than six (6) years experience of Supervision.

Moderately Experienced Basic School Supervisor: Basic School supervisor with seven to nine (7-9) years’ experience of Supervision.

Highly Experienced Basic School Supervisors: Basic School supervisor with more than nine (>9) years experience of Supervision.
CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter discusses literature relevant to this study under the following subheadings

1. Philosophy, Objectives and Contents of the NCE Mathematics Curriculum
2. Challenges of Curriculum Implementation in Colleges of Education
3. The concept of Curriculum Evaluation and its functions
4. Models of Curriculum Evaluation
5. Empirical studies on Curriculum Evaluation and NCE Programme
6. Theoretical Framework for the Study
7. Appraisal of the Reviewed Literature

Philosophy, Objectives and Contents of the NCE Mathematics Curriculum

The training of pre-service NCE Mathematics teachers is being done in two different Departments in the Nigerian Colleges of Education. These are: Mathematics (MAT) Department under School of Science Education, and Primary Education Studies (PES) Department under School of Education. The two Departments however have different philosophies, objectives and requirements. For instance according to NCCE minimum standard (2009), the Philosophy of NCE Mathematics Programme under Mathematics Department is inspired by:

The desire to help students become intellectually informed in mathematical ideas, notations and skills for logical reasoning, scientific enquiry and for the pursuit of techno-scientific Education. The need to produce non-graduates, but well-groomed
- Solve abstract problems through the use of mathematic skills and ideas
- Stimulate pupils’ interests in Mathematics by the use of appropriate teaching/learning strategies particularly at the Basic Education levels
- Make learners appreciate the use of computers in solving mathematical problems
- Use Mathematics to solve day to day problems
- Teach Mathematics in a way that learners can apply Mathematics principles in solving daily problems
- Make the teaching of Mathematics learner friendly through games and simulations
- Improvise materials for effective teaching/learning of Mathematics
- Set up a Mathematics laboratory (NCCE, 2009, p. 1).

Whereas the Philosophy of PES is that it aims at training students to become teachers with sufficient knowledge of the Primary School Curriculum, skills, attitude and methods to enable them teach the subjects of Primary 1 – 6 (one of which is Mathematics). Its objectives involve enabling the PES students to be able to:

- Teach the Primary School Subjects in the 9-Year Basic Education Mathematics curriculum
- Demonstrate school management skills and supervisory roles
- Implement the curriculum, write lesson plan, and teach effectively
- Improvise/produce instructional materials using local materials
- Develop the attitude to continue learning (NCCE, 2009, p. 123).

Thus the essential difference between the two Departments in terms of their philosophies and objectives on the process of Mathematics teacher production is that the PES Department is the production of teachers to man the first six levels of Basic Education; whereas the MAT Department has concern on the entire levels of Basic Education. To achieve the stated objectives the NCCE minimum standard (2009) provided
the curriculum content to be used in the two Departments. The summary of the content is as shown below, the detail of which can be found in Appendices A & B.

Mathematics Course Codes, Titles Credit Units and Status

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<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Status</th>
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</thead>
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<tr>
<td>NCE I</td>
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<td>MAT 111</td>
<td>Algebra</td>
<td>2</td>
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<td></td>
<td></td>
<td>MAT 112</td>
<td>Trigonometry</td>
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<td></td>
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<td>MAT 113</td>
<td>History of Mathematics</td>
<td>2</td>
<td>C</td>
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<td></td>
<td></td>
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<td>Dynamics</td>
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<tr>
<td></td>
<td>Second Semester</td>
<td>MAT 121</td>
<td>Different Calculus</td>
<td>2</td>
<td>C</td>
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<tr>
<td></td>
<td></td>
<td>MAT 122</td>
<td>Co-ordinate Geometry</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>MAT 123</td>
<td>Maths. Methodology</td>
<td>2</td>
<td>C</td>
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<td></td>
<td></td>
<td>MAT 124</td>
<td>Maths Lab. Practical</td>
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<td>C</td>
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<td></td>
<td>MAT 115</td>
<td>Complex number</td>
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<td></td>
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</tr>
<tr>
<td>NCE II</td>
<td>Second Semester</td>
<td>MAT 221</td>
<td>Integrated Calculus</td>
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<td>C</td>
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<tr>
<td></td>
<td></td>
<td>MAT 222</td>
<td>Vector Analysis</td>
<td>2</td>
<td>C</td>
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<tr>
<td></td>
<td></td>
<td>MAT 223</td>
<td>Probability Theory</td>
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<tr>
<td></td>
<td></td>
<td>MAT 224</td>
<td>Real Analysis I</td>
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<td>MAT 225</td>
<td>Research Method</td>
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<tr>
<td>NCE III</td>
<td>First Semester</td>
<td>MAT 321</td>
<td>Static</td>
<td>2</td>
<td>E</td>
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<td></td>
<td></td>
<td>MAT 322</td>
<td>Linear Algebra</td>
<td>2</td>
<td>C</td>
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<tr>
<td></td>
<td></td>
<td>MAT 323</td>
<td>Real Analysis II</td>
<td>2</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MAT 324</td>
<td>Abstract Algebra</td>
<td>2</td>
<td>E</td>
</tr>
</tbody>
</table>
student has an option of choosing one or more of such a course, but at least two of the elective courses must be passed for an award of NCE Mathematics certificate. The content of Mathematics courses in PES department is as indicated below:

### PES (Mathematics) Course Codes, Titles Credit Units and Status

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Course Code</th>
<th>Course title</th>
<th>Credits</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCE I</td>
<td>First Semester</td>
<td>PES 113</td>
<td>Mathematics in Primary Education</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Education Studies I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second Semester</td>
<td>PES 122</td>
<td>Mathematics in Primary Education</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Education Studies II</td>
<td></td>
<td></td>
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<tr>
<td>First Semester</td>
<td>GSE 212</td>
<td>Basic General Mathematics III</td>
<td>1</td>
<td>C</td>
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<tr>
<td>NCE II</td>
<td>Second Semester</td>
<td>PES 222</td>
<td>Mathematics in PES Education</td>
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<td>C</td>
</tr>
<tr>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td>First Semester</td>
<td>EDUC 311</td>
<td>Teaching Practice</td>
<td>6</td>
<td>C</td>
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<td>NCE III</td>
<td>Second Semester</td>
<td>PES 324</td>
<td>Mathematics in Primary Education</td>
<td>2</td>
<td>C</td>
</tr>
</tbody>
</table>

**Source: NCCE minimum standard (2009)**

This Table contains an extract of the Mathematics courses in a PES NCE curriculum, the beauty of it is that in all the semesters throughout the Programme there is at least one
basic requirements as well as the condition under which the designed curriculum will operate. These are sub-divided into requirements and condition that affects staffing in terms of qualification and level of experience, students in form of admission and graduation requirements and environment in terms of facilities required in the College where such a Programme will run, a detail of which can be seen in (Appendix A). The summary is as follows:

i. Staffing

A minimum of eight (8) academic staff are specifically required for the NCE Mathematics Programme. All the academic staff must have an Educational background with a minimum of second class lower Bachelor of Education degree in Mathematics or Post Graduate Diploma in Education and a Second Class Lower (Honours) Degree in Mathematics. Other supporting staff include non-Academic comprising of a Computer Technical Data Operator, 2 Library Assistant/Attendant, 1 Laboratory Assistant/Attendant Typist/Secretary and 1 office assistant.

Academic staffs are expected to implement the curriculum using varieties of methodologies such as lectures, tutorials, problem-solving, seminar, demonstration, drill, experimentation, excursion, discovery method, laboratory method etc. Of special interest to the designers of the curriculum is emphasis on discovery method and laboratory work.

ii. Students

One basic necessary requirement for admission in to NCE Mathematics Programme is obtaining a minimum of a credit pass in general Mathematics and English at SSCE (WAEC
expected to register and pass a minimum of 128 credits and a maximum of 132 credits. The breakdown is as follows: Mathematics - 36 Credits, Second Teaching subjects - 36 Credits, Education - 36 Credits, General Study - 14 Credits and Teaching Practice - 06 Credits giving a total of 128 Credits.

iii. Environment

For the successful implementation of the Mathematics curriculum, a conducive teaching and learning environment is required, for this reason (NCCE minimum standard, 2009) stipulates that there should be at least three (3) lecture rooms and a lecture theatre. Other facilities required include a fully air-conditioned mathematic laboratory with mini micro computers of not more than ten students per one, an overhead projector or multimedia projectors. Also in the requirement is that, it is necessary to have a Mathematics workshop where students can make their own instructional materials. Equipments required in the Workshop include: Carpentry equipments, mathematical sets, scales, scissors, cardboard sheets and various consumables (See Appendix A).

The (NCCE minimum standard, 2009) considers the comfort of teaching staff to be of paramount importance; as such it provides that, ideally there should be an office per lecturer, equipped with bulletin boards, book shelves, visitors’ seat and standard furniture. The Head of Department should have an office, furnished with other conveniences and file cabinets. There should also be an office for the support staff i.e. typists and clerks. Other facility required in the Department is a Departmental library which must be equipped with current and relevant textbooks and journals to cover all the areas of the subjects to the ratio of one...
implemented and the attained curriculum. That the intended curriculum is the one prescribed by policy makers, the implemented curriculum is the one that is actually carried out by teachers in their classrooms, and the attained curriculum is the one learnt by students. The mismatch is usually a consequence of the implementation of the intended curriculum which is determined by some factors such as adequacy of the required human, financial and material resources, commitment of the implementers as well as the political will of the administrators of the institutions where the curriculum is to be implemented.

**Challenges of Curriculum Implementation in Colleges of Education**

Curriculum implementation is one of the six steps in curriculum development process as contained in Olivia & Kirkland (2012). Others are: Problem Identification, Needs Assessment of Learners, setting Goals and Objectives, Identifying the Educational strategies by which the curricular objectives will be achieved and finally evaluating the effectiveness of the curriculum.

Ekwueme (2009) defined Curriculum implementation as the process of translating planned or officially designed course of study into action in such a manner that the teacher’s personality, the teaching materials and the teaching environment interact with the learner. Implementation further takes place as the learner acquires the planned or intended experiences, skills, knowledge, ideas and attitudes that are aimed at enabling the same learner to function effectively in the society that he/she lives. The learner is therefore seen as the central figure of curriculum implementation process. Obanya (2004) defined implementation of curriculum as day-to-day activities which school management and classroom teachers
curriculum; as such effective curriculum implementation should be concerned with narrowing such a gap as much as possible. Since as mentioned earlier, teacher’s personality, teaching materials and teaching environment must interact with the learner, Ekwueme (2009) considers such factors to be central for effective curriculum implementation. These factors notwithstanding, are mostly influenced by other factors such as finance and politics.

I. The Teacher

Teachers in schools and lecturers in tertiary institutions are the chief implementers of the intended curriculum. In line with this, Tahir (2013) argues that the teacher is so critical in the implementation of any major thrust of a policy reform. However, Ekwueme (2009) observes that teachers most times are not involved during policy formulation even though they are expected to implement this curriculum. In a similar passion, Olorundare & Akande (2011) noted that in the production of the latest NCCE minimum standard (2012 edition) and most likely the previous others too, neither the lecturers in an NCE Programme nor the beneficiaries of the NCE training were involved to any significant level. That the planning for the reform which produced the document has been top-down which is contrary to the modern practice of bottom-up strategy in which all stakeholders are involved. They finally warned as reported in Obanya (2008), a curriculum reform that is either imposed or merely informed is characterised by poor level of acceptance in form of a total antagonism or at best apathy towards its implementation.

Teachers’ adequacy and quality to a great extent determine the quality of graduates in any institution of learning, and as such it is an issue in curriculum implementation. Adequacy
of Education, is bottom heavy. In terms of quality, 4177 (50%) of the College lecturers were having only first degree. Out of this number, 3142 (38%) had professional first degrees, while the remaining 1035 (12%) with non-professional first degree. 2450 (29%) of the other 50% had postgraduate professional degrees. Those with non-professional postgraduate degrees were 1237 (15%). and PhD holders were 465 (6%). On Lecturers quantity, findings of the research revealed that the total number of the Lecturers in the then 56 Federal and State Colleges of Education as 8329; and the computed Lecturer student ratio in Federal Colleges of Education was 1:28 while that of the state was 1:27.

With the expansion of the number Colleges of Education (both state and federal) from 2009 to date, increase in the students’ population in the Colleges, lecturer’ recruitment process, financial realities of the present time and politics, this report may no longer be valid. For instance, Tahir (2013) opined that the size of the Colleges has increased ten-fold to what existed in the 60s, numbering around 130 Colleges today, while the size of students and their teachers increased in the same proportion as a result of increased demand for teachers at Basic level of Education. These increases in the sizes of the Colleges, students and teacher may affect the quality of the teacher production if the required financial and material resources are not matched proportionately.

II. Teaching materials and environment in Colleges of Education

One of the factors that determine the quality of any Education is conducive learning environment. Tahir (2013) believes that, a conducive learning environment particularly as it applies to Colleges of Education, implies presence and or availability of sufficient
provisions and services is a necessity to good quality of teaching and learning. Tahir (2013) further argues that only very few Colleges approximate to this characterization. That quite a lot of them are in bad shape, while others are struggling to meet the basic minimum for accreditation purposes. On the whole the picture is not quite encouraging and this has dire consequences for teaching and learning since the learning environment is far from being conducive and by extension affects the implementation of the curriculum negatively.

III. The learner

Learning readiness in terms of interest and pre-requisite knowledge in students is an important factor worthy of consideration in curriculum implementation. Interest sustains one to learning; without interest hardly does a student concentrate and attaches importance to what he is taught. For instance, in a memorandum submitted to the Joint Consultative Committee on Education (JCCE) meeting on the issue of re-engineering teacher Education and development for quality service delivery held at Dutse Jigawa state, Nigeria between 19th - 23rd of September 2011, the Federal Capital Territory Education Secretariat, Abuja (2011) submitted a memorandum on the Need to admit quality Entrants in to Teacher Education Programmes. In the memorandum an observation was made that in recent times, teacher Education Programmes in Nigeria are failing to attract quality entrants. That the scenario in the admission process is usually such that, after all other fields of endeavour have been filled up, the “Left-over” then resort to Education as the last option without any interest. The consequence of which according to the memorandum is that teacher Education, and of course teaching profession, is rife with mediocre who lack intrinsic motivation to sustain their
(2013) posited that, studies have shown that less than 5% of Education students in the faculties of Education in Nigerian Universities actually applied to study courses in Education. That the figure is much lower in Colleges of Education as only few students applied for admission in to the Colleges in the past five years. For this reason Tahir (2013) concluded that, the vast majority of students being admitted in to Colleges of Education are academically weak and more seriously have no interest in pursuing career in Education. That many of them see teaching as the last resort and others as a stepping-stone to greener pastures. The implication of all these is that, Nigerian Colleges of Education are flooded with students who are mostly deficient in interest to teaching generally and necessary pre-requisite knowledge to warrant proper implementation of the curriculum content.

The effective interaction of the teacher, the learner in the learning environment is heavily dependent on the available financial resources and political will of the government and the proprietors of the Colleges to effectively make use of these resources towards proper implementation of an existing curriculum. Thus a government which is not interested in Education will not commit its financial recourses to supply all that is needed in the implementation process. Similarly, no matter the level of the political will of the government, such commitment can only be possible if the required financial resources are available.

**The Concept of Curriculum Evaluation and its Functions**

Every term or phenomenon with a certain level of importance requires some element of conceptual explanation. To this end, many scholars define the term Evaluation in different ways and context. For instance, Cai (nd) posited that evaluation is the process of judging the
Sarah (2012) defines Evaluation as a process for assessing and judging the value of a piece of work, an organisation or a service. Its main purpose is to help an organisation reflect on what it is trying to achieve, assess how far it is succeeding, and also identify the required changes.

Ron (nd) opined that Evaluation is the process of gathering information about the merit or worth of a Programme for the purpose of making decisions about its effectiveness or for improvement of the Programme.

Similarly Rowntree (1985), maintain that evaluation is a systematic process of collecting and analysing information about the result of students’ encounters with learning experiences. It is an attempt to identify and explain the effects and effectiveness of the teaching/learning system.

Abiri (2006) sees Evaluation as an act, process or outcome of assessing or appraising something and expressing an opinion on its quantity, quality or worth. The outcome of such appraisal or judgment is usually expressed in various degrees of such qualitative terms as big or small, plentiful or scanty, strong or weak, long or short, high or low, satisfactory or unsatisfactory, good or bad, cheap or dear, bright or dull, pleasant or unpleasant, successful or unsuccessful, useful or useless, important or unimportant, valuable or worthless, improving, static or deteriorating.

Other definitions of Evaluation include Tyler (1942) who defines evaluation as a process of determining the achievement of set objectives. But Stufflebeam (1979) sees evaluation as a process of delineating, obtaining and providing useful information for judging decision alternatives.
in their usage. He maintains that it is quite common in United Kingdom (UK) to use these terms to refer to two different activities—assessment being just one aspect of evaluation. In North America (USA), however, the term “evaluation” tends to do duty for both. Thus in this context evaluation is seen as the process of finding out “how much” has been acquired; and at the same time the term refers to “expressing an opinion” on the quantity, quality or worth of what has been acquired. More particularly, sometimes in Mathematics Education, evaluation has been used interchangeably with assessment and testing, without a clear distinction (National Council of Teachers of Mathematics, 1989) as reported in Cai (nd). Furthermore Cai (nd), noted that assessment is a broad term defined as a process for obtaining information that is used to make decisions about students, curricular programs, and policy. Thus, assessment can provide information to evaluate a Mathematics Education program, but assessment does not always involve in the judgment of worth.

Limited to the process of teaching and learning, Robert (2005) contends that Classroom Assessment is the observation of students in the process of learning, the collection of frequent feedback on students’ learning, and the design of modest classroom experiments that provide information on how students learn and how students respond to particular teaching approaches. Thus classroom assessment helps individual College teachers obtain useful feedback on what, how much, and how well their students are learning. On the other hand evaluation uses methods and measures to judge student learning and understanding of the material for purposes of grading and reporting. Thus evaluation is feedback from the instructor to the student about the student’s learning.
process involves an object to be evaluated, a scale of value, and a way of collecting information so that the object can be placed on the scale of value for judgment. The ultimate goal of program evaluation is to improve students’ learning. To this end, both formative and summative evaluations are needed Cai (nd).

All efforts small or big must serve a purpose. For this reason, there must be a purpose for any evaluation, more so in teaching and learning process. For instance, Rowntree (1985) posits that, the chief function of evaluation is to understand what is happening in the teaching/learning system, with a view to sustain, develop and improve it. Other important function is that of proving or justifying the worth of the effort and cost of mounting up a Programme. In the same fashion, it is stated in Wikipedia (2013), that the primary purpose of evaluation, in addition to gaining insight into prior or existing initiatives, is to enable reflection and assist in the identification of future change.

William (2006) opines that, the generic goal of most evaluations is to provide useful feedback to a variety of audiences including sponsors, donors, client-groups, administrators, staff, and other relevant constituencies. Other purposes include influencing decision-making or policy formulation through the provision of empirically-driven feedback. Anderson (2006) contends that, Evaluation serves the following functions:

- Research purposes, Programme evaluation purposes or both.
- Helps to show whether and how interventions work or not work.
- Helps people to be accountable for Programmes they conduct.
- Results of evaluation may be use as the basis for resource allocation.
However, for such purposes to be realised evaluation is done in a systematic way based on which experienced evaluators over the years developed and used different means through which they conduct the evaluations. Such ways and means are referred to as evaluation models.

**Models of Curriculum Evaluation**

The Encarta (2009) dictionary defined the word Model in ten different ways, the one which is contextual to this study is: “Model is something that is copied or used as a basis for a related idea, system or process”. Also, Rathy (2009) opined that Model is a representation of reality presented with a degree of structure and order. In curriculum evaluation a model is required so as to provide a conceptual framework for designing a particular evaluation depending upon the specific purpose of the evaluation. In the same vein Abimbola (1997) discerned that models assist in examining relationships among components and defining activities, and point ways towards new possible applications or research problems. Different models or approaches are used in evaluating a curriculum, some of which are:

**Tyler’s Objectives Centred Model**

Among the earliest curriculum evaluation models, which continue to influence many assessment projects, was that proposed by Ralph Tyler (1950) in his monograph Basic Principles of Curriculum and Instruction. Rathy (2009) noted that the key emphasis of this model is on instructional objectives, while its main purpose is to measure students’ progress towards the achievement of the stated objectives. Tyler’s approach moved rationally and systematically through several related steps. (Glatthorn, 1987, p. 273) highlighted the steps as
2. Identify the situations that will give the student the opportunity to express the
behaviour embodied in the objective and that will evo
eke or encourage this behaviour.

3. Select, modify, or construct suitable evaluation instruments, and check the instruments
for objectivity, reliability, and validity.

4. Use the instruments to obtain summarized or appraised results.

5. **Compare the results obtained from several instruments before and after given periods**
in order to estimate the amount of change taking place.

6. Analyze the results in order to determine strengths and weaknesses of the curriculum
and to identify possible explanations about the reason for this particular pattern of
strengths and weaknesses.

7. Use the results to make the necessary modifications in the curriculum.

Guskey (2008) noted that, Tyler’s model has several advantages some of which are: It
is relatively easy to understand and apply. It is rational and systematic. It focuses attention on
curricular strengths and weaknesses, rather than being concerned solely with the performance
of individual students. It also emphasizes the importance of a continuing cycle of assessment,
analysis, and improvement. As Guba and Lincoln (1981) pointed out, however, the model has
suffered from several deficiencies. According to the scholars, the model does not suggest
how the objectives themselves should be evaluated. It does not provide standards or suggest
how standards should be developed. Its emphasis on the prior statement of objectives may
restrict creativity in curriculum development, and it seems to place undue emphasis on the
pre-assessment and post-assessment, ignoring completely the need for formative assessment.
Phi Delta Kappa committee chaired by Daniel Stufflebeam (1971). This model emphasized the importance of producing evaluative data for decision making; this is because decision making was considered as the sole justification for evaluation, as viewed by the Phi Delta Kappa committee. To service the needs of decision making, the Stufflebeam model called the CIPP model provides a means for generating data relating to four stages of Programme operation which are: Context, Input, Process and Product evaluation, hence the acronym CIPP model. Context evaluation, involves continuous assessment of needs and problems in the context, i.e. surrounding conditions, circumstances or events that form the environment within which a Programme exists or takes place so as to help decision makers determine goals and objectives. The input evaluation assesses alternative means for achieving those goals to help decision makers choose optimal means while process evaluation, monitors the processes both to ensure that the means are actually being implemented and to make modifications where deemed necessary; and lastly, product evaluation, tries to compare the actual ends with the intended ends which will eventually lead to a series of recycling decisions. During each of these four stages, specific steps are taken. (Glatthorn, 1987, pp. 273–274) identifies the steps as follows:

- The kinds of decisions are identified.
- The kinds of data needed to make those decisions are identified.
- Those data are collected.
- The criteria for determining quality are established.
- The data are analyzed on the basis of those criteria.
- The needed information is provided to decision makers.

Rathy (2009) further described the CIPP model in form of a 2 X 2 matrix as shown below:
<table>
<thead>
<tr>
<th>INTENDED</th>
<th>ACTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENDS</td>
<td>Context Evaluation: Ask the question What? i.e. environment and needs</td>
</tr>
<tr>
<td>MEANS</td>
<td>Input Evaluation: Ask the question How? i.e. Procedural Designs strategies and Resources</td>
</tr>
</tbody>
</table>

**Source:** Rathy (2009)

From table I, it can be seen that the intended ends defines what the curriculum is set to achieve at the end of the Programme; and evaluation at this level asks the question what are the needs to be satisfied and under what context. Similarly intended means defines how the stated objectives of the Programme are going to be achieved, in terms of necessary inputs, procedure and resources needed. Whereas, actual means defines what happens during the implementation of the curriculum process. Evaluation at this stage asks the question such as: Are we really doing what we are supposed to do? The actual end defines exactly what has happened at the end of the Programme; Evaluation at this stage asks the question: Have we achieved or attained the stated objectives and to what extent?

Guskey (2008), explained that the context, input, process, product (CIPP) model, has several attractive features for those interested in curriculum evaluation. Its emphasis on decision making seems appropriate for administrators concerned with improving curricula. Its concern for the formative aspects of evaluation remedies a serious deficiency in the Tyler model. Finally, the detailed guidelines and forms created by the committee provide step-by-
than exists in such situations and ignores the political factors that play a large part in these
decisions.

**Scriven’s Goal-Free Model**

Guskey (2008) reports that Scriven (1972) was the first to question the assumption, that goals or objectives are crucial in the evaluation process. After his involvement in several evaluation projects where the so-called side effects seemed more significant than the original objectives, he Scriven (1972) began to question the seemingly arbitrary distinction between intended and unintended effects. His goal-free model was the outcome of this dissatisfaction. In conducting a goal-free evaluation, the evaluator begins by generating a profile of needs for the group served by a given Programme with unbiased mind. Then, by using methods that are primarily qualitative in nature, the evaluator assesses the actual effects of the Programme. If a Programme has an effect that is responsive to one of the identified needs, then the Programme is perceived as useful.

The main contribution of Scriven (1972), obviously, was to redirect the attention of evaluators and administrators to the importance of unintended effects—a redirection that seems especially useful in Education. If a Mathematics Programme achieves its objectives of improving computational skills but has the unintended effect of diminishing interest in Mathematics, then it cannot be judged completely successful. Scriven’s emphasis on qualitative methods also seemed to come at an opportune moment, when there was increasing dissatisfaction in the research community with the dominance of quantitative methodologies. Guskey (2008) however observes, as Scriven (1972) himself notes, goal-free evaluation
Stake’s Responsive Model

Stake (1975) made a major contribution to curriculum evaluation in his development of the responsive model, because the responsive model is based explicitly on the assumption that the concerns of the stakeholders (those for whom the evaluation is meant for) should be paramount in determining the evaluation issues (Guskey, 2008). Stake (1975) proposed three stages of evaluation. These stages according to him are: Antecedent, Transactions and Outcome (ATO). Rathy (2009) explains that Antecedent is any condition existing prior to teaching and learning which may relate to outcome. Whereas Transactions are the countless encounters of students with teacher, student with student, author with reader, parent with counsellor e.t.c. and Outcome include measurements of the impact of instruction on learners and others.

Stake (1975) recommends an interactive and recursive evaluation process that the evaluator should:

Meet with clients, staff, and audiences to gain a sense of their perspectives on and intentions regarding the evaluation. Draw on such discussions and the analysis of any documents to determine the scope of the evaluation project. Observe the Programme closely to get a sense of its operation and to note any unintended deviations from announced intents. Discover the stated and real purposes of the project and the concerns that various audiences have about it and about evaluation of the project.

Identify the issues and problems with which the evaluation should be concerned. For each issue and problem, the evaluator develops an evaluation design, specifying the...
Be sensitive to the concerns of the stakeholders, decide which audience require which reports and chooses formats most appropriate for given audiences (Glatthorn, 1987, pp. 275–276).

Guskey (2008) opines that, the chief advantage of the responsive model is its sensitivity to clients. By identifying their concerns and being sensitive to their values, by involving them closely throughout the evaluation, and by adapting the form of reports to meet their needs, the model, if effectively used, should result in evaluations of high utility to clients. The responsive model also has the virtue of flexibility: The evaluator is able to choose from a variety of methodologies once client concerns have been identified. Its chief weakness would seem to be its susceptibility to manipulation by clients, who in expressing their concerns might attempt to draw attention away from weaknesses they did not want exposed.

**Eisner’s Connoisseurship Model**

Elliot Eisner (1979) drew from his background in aesthetics and art Education in developing his “connoisseurship” model, an approach to evaluation that emphasizes qualitative appreciation. The Eisner model is built on two closely related constructs: connoisseurship and criticism. Connoisseurship, in Eisner’s terms, is the art of appreciation—recognizing and appreciating through perceptual memory, drawing from experience to appreciate what is significant. It is the ability both to perceive the particulars of Educational life and to understand how those particulars form part of a classroom structure. Criticism, to
Educational criticism, in Eisner’s formulation, has three aspects. The descriptive aspect is an attempt to characterize and portray the relevant qualities of Educational life—the rules, the regularities, the underlying architecture. The interpretive aspect uses ideas from the social Sciences to explore meanings and develop alternative explanations to explicate social phenomena. The evaluative aspect makes judgments to improve the Educational processes and provides grounds for the value choices made so that others might better disagree. The chief contribution of the Eisner model is that it breaks sharply with the traditional scientific models and offers a radically different view of what evaluation might be. In doing so, it broadens the evaluator’s perspective and enriches his or her repertoire by drawing from a rich tradition of artistic criticism. Its critics have faulted it for its lack of methodological rigor, although Eisner has attempted to refute such charges. Critics have also argued that use of the model requires a great deal of expertise, noting the seeming elitism implied in the term connoisseurship.

Kirkpatrick’s Four Level Evaluation Model

This is an evaluation methodology for judging learning processes in a given training Programme; proposed and used by Donald Kirkpatrick (1994). The model involves four levels. Each successive evaluation level is built on information provided by the lower level. Rathy (2009) stated that evaluation in this model, should always begin with level one, and then, as time and budget allows, should move sequentially through levels two, three, and four. Information from each prior level serves as a base for the next level’s evaluation. This is as explained in the figure 1
Figure 1 Donald Kirkpatrick (1994) levels of evaluation (Adopted from Rathy (2009))

The model involves four steps. These are:

Step 1: Reaction - How well did the learners like the learning process?

Step 2: Learning - What did they learn? (The extent to which the learners gain knowledge and skills)

Step 3: Behaviour - What changes in job performance resulted from the learning process? (Capability to perform the newly learned skills while on the job)

Step 4: Results - What are the tangible results of the learning process in terms of reduced cost, improved quality, increased production, efficiency, etc.? (Rathy, 2009, slides 44-48).

Empirical Studies on Evaluation and NCE Programme

Scholars have and are still evaluating various Educational Programmes or field of studies for the purpose of maintaining the same status (where the existing structure is yielding the intended positive result), or effecting some positive changes into the system (where the existing structure is not yielding the intended positive results).
Education (NCE) Mathematics Programmes of some randomly selected Colleges of Education in Nigeria in line with the academic contents and pedagogical demands of the then secondary school Mathematics curricula. The subjects of the study consisted of three hundred and five pre-service NCE teachers of Mathematics randomly selected from the final year Mathematics classes of sixteen Colleges of Education. Three instruments employed for data collection were the Mathematics Attitude Test (MAT), teacher made survey test of achievement (TMSTA) and the CIPP evaluation model. The input components of the CIPP evaluation model (Stufflebeam, 1971) was used as a basis of the evaluation in the study which was structured as a survey research, while the statistical techniques used included: descriptive statistics, analysis of variance, Phi-correlation coefficient, Point-Biserial correlation coefficient and the Pearson Product Moment Correlation Coefficient. The major findings emanating from the study were summarized as follows:

1. Only 47% of the secondary school teachers of Mathematics were competent to teach the then secondary school Mathematics curricula up to the senior classes;

2. The remaining 53% of the secondary school teachers of Mathematics were only competent to teach the then Junior Secondary School Mathematics curriculum.

3. The NCE teachers of Mathematics whose entry qualifications were WASCE or GCE understood the content of secondary school Mathematics curricula significantly better than their counterparts whose entry qualification was Teacher Grade II certificate;

4. The female pre-service NCE teachers of Mathematics displayed a more consistent, positive attitude towards Mathematics problem-solving than their male counterparts.
The conclusion drawn from these findings was that, because of the differences in respondents’ academic backgrounds and variations in the operational components of the NCE Mathematics Programmes, the principal criteria measured by their mathematical competencies were also bound to be philosophically different. It was therefore recommended that, in order to attain the national objectives in the training and production of competent primary and secondary school teachers of Mathematics, there was the urgent need to restructure, modify and re-direct the existing Mathematics teacher Education Programmes in Nigeria’s Colleges of Education.

Momoh (1993) worked on Evaluation of the Introductory Technology Curriculum for Junior Secondary Schools in Kwara State. In the study, the Junior Secondary School (JSS) Introductory Technology Curriculum was evaluated using Context Input Process and Product (CIPP) evaluation model of Stufflebeam (1971). The target population for the study was all teachers of Introductory Technology in Kwara State. Using stratified random sampling technique based on the location (Rural-Urban), 120 schools (60 from each stratum) were selected from all the local government areas of Kwara State. Two hundred Introductory Technology teachers and one hundred and twenty principals of the schools selected participated in the study. A researcher-designed questionnaire which had a reliability index of 0.83 using test - retest method was used to seek Introductory Technology teachers’ assessments on the content and suitability of the Introductory Technology Curriculum. Also, an interview protocol was used to collect data to elicit responses from the principals. Data gathered for the study were analysed using chi-square statistics and Analysis of variance.
Introductory Technology possessed by the students. For instance, 77% of Introductory Technology teachers, irrespective of their academic qualifications, agreed that the objectives and the course contents of the Curriculum were adequate. While 56% of all the Introductory Technology teachers agreed that the facilities available were not good enough for effective teaching of Introductory Technology. Also, 83% of the teachers sampled considered the methods used in teaching Introductory Technology appropriate. While, 60% of the Introductory Technology teachers, rated the knowledge and attitude possessed by the students to be adequate. When students’ achievements in the end of the year examinations, for a period of four years (1989 - 1992), in the Introductory Technology, were examined, findings revealed that the achievement was in the upward trend. All of the one hundred and twenty principals interviewed expressed concern about the poor funding of Introductory Technology.

Babatunde (1998) evaluated the Senior Secondary School English Language Curriculum in Nigeria. The theoretical framework guiding the study was adapted from Stufflebeam’s Context Input Process Product (CIPP) evaluation model. The main instruments used were questionnaires and a checklist on English usages administered on 100 (one hundred) SSS English language teachers (SSSET’s) and 300 (three hundred) SSS II students from 10 rural and urban schools, all in Kwara State. Also interviewed were school administrators and the personnel of the public examinations’ bodies in Nigeria. The data were analyzed using simple frequency count and percentage distribution, and item analysis using mean rating. The t-test was also used to examine the differences between the views expressed by urban and rural teachers on one hand, and experienced and less experienced teachers on
(i) The teachers, who did not use the national English Language curriculum to teach, did not possess adequate competence in the British Standard English (BSE) variety they claimed to teach;

(ii) The personnel involved in the formulation and implementation of the national Educational and language policies did not demonstrate adequate awareness of the necessary insights that should enhance the success of the national English as a Second language (ESL) curriculum;

(iii) The absence of an organised system of writing of the local variety of English in Nigeria helped a lot in lack of its standardization.

Ibikunle (1999) evaluated the Nigeria Certificate in Education Integrated Science Distance Learning Programme of the National Teachers’ Institute (NTI). In the study, suitability and adequacy of the NTI integrated Science Curriculum for Teaching Primary Science in Nigerian Schools was investigated. The sample for the study consisted of two hundred and five (205) course tutors and twenty four (24) members of staff of the NTI. Data were collected using a researcher designed questionnaire to seek course tutors’ opinion of the adequacy of the NTI Integrated Science Curriculum. A researcher-designed Science Achievement Test was used to measure the achievement of the students in Science. Data were analysed in two stages. For instance, course tutors’ assessments were analysed by using frequency counts and percentage distribution; whereas Analysis of Variance and t-test were employed to test all the hypotheses generated in the study.

Findings of the study revealed that the course tutors viewed the National Teachers’
The student teachers seemed not to possess requisite knowledge for teaching primary Science. The deficiency was attributed to their poor background in basic Science. Majority of the integrated Science students are products of Teachers’ Grade Two Colleges where basic Sciences were taught minimally.

In a similar passion, an Evaluation of Nigerian Secondary Schools’ Further Mathematics Curriculum in Osun State was also conducted by Famakinwa (2001). This was done by comparing the implementation process and the actual outcomes with what was intended in order to find out whether the intended objectives were being achieved, inhibited or altered. The study was set to determine:

(a) The level of the implementation and achievement of the further Mathematics curriculum in line with its stated objectives.

(b) The likely reasons for any negative findings that may be found in (a) above.

The sample consisted of 203 students of Further Mathematics (135 boys and 68 girls) purposively selected and 30 further Mathematics teachers (25 males and 5 females) deliberately chosen from 21 secondary schools offering the subject in Osun state. The students were selected from the Senior Secondary III classes. The instruments used were the Further Mathematics Teachers’ Opinion Questionnaire (FUMTOQ), Further Mathematics Students’ Opinion Questionnaire (FUMSOQ) and a Further Mathematics Achievement Test (FUMAT), all constructed by the researcher.

Data on the academic performance of the students on the FUMAT instrument were analysed using descriptive statistics (involving mean ratings and frequency distribution including percentages). The Pearson Product Moment Correlation Coefficient, Chi-Square test, Student t-test and Analysis of Variance (ANOVA) statistical tools were used in testing the nine hypotheses generated by the study.
Findings from the study revealed that:

1. The further Mathematics curriculum was achieving its intended and underlying objectives;

2. The Educational experience intended was suitable for the purpose it was meant and for;

3. The curriculum was being implemented in line with the stated objectives except that the curriculum was not being taught as a continuous one as intended by the curriculum planners;

4. The teachers found some of the different components and topics difficult to teach while the students found almost all the different components and topics, except Indices and Logarithms, difficult to learn.

The work of Mustapha (2001) was on Evaluation of the Nigeria Certificate in Education Double Major Integrated Science Curriculum. The specific objectives of the study were to find out the status and worth of the curriculum in terms of its suitability in achieving the stated objectives in it, how the curriculum was being implemented and the impact of the curriculum on teachers and students who were the users of the curriculum. The study was carried out using the survey method. The instrument used for data collection was a hybrid researcher-constructed evaluation model adapted from Robert Stake’s Antecedents, Transactions and Outcomes (ATO) and Hamilton Models. Data were collected on ATO dimensions of the curriculum by the use of three validated instruments of 0.99, 0.96 and 0.89 reliability coefficients. Eighty four lecturers and one hundred and twenty-four students were the sample for this study and were drawn from seventeen Colleges of Education selected using stratified and random sampling techniques. Twenty research questions and seventeen null hypotheses were stated, tested and answered along the dimension of the Stake’s (1967)
independent variables. Analysis of data involved both descriptive and inferential statistics: percentages, means, and standard deviation, t-test, Analysis of Variance (ANOVA), regression and Cochran’s Q-test respectively. Nineteen major findings were provided by this study and are stated under antecedent, transaction and outcomes sub-headings. Among the findings were:

i. **Antecedent conditions** (numbers and quality of lecturers, laboratories and laboratory materials/equipment and reading materials) were fairly adequate for implementing the curriculum;

ii. Teaching methods and teaching emphasis were at variance with the demands of the curriculum;

iii. Contents of the curriculum were considered relevant and adequate to the professional and academic competency needs of the students to teach JSS integrated Science;

iv. The students had a positive perception of the value and long-term effect of their training;

v. The students lacked confidence to employ inquiry/activity teaching strategies, lacked the mastery of any of the Science process skills enunciated by the curriculum, and would not want to study integrated Science at the University level;

vi. Lecturers’ academic and professional qualifications, specialisation, and in-service training had no statistically significant influence on their perception of the nature of the curriculum, but teaching experience did; and

vii. Specialisation in integrated Science and in-service training influenced lecturers’ perception of the relevance of the content of the double major curriculum to the professional
Specifically, it attempted to determine the suitability of the curriculum for the targeted students; the clarity of the stated objectives; the consistency of the curricular content with the stated objectives; sufficiency of the available human and material resources; the relevance of Arabic language to Islamic Studies, and whether there was the need to review the curriculum.

Purposive sampling technique was used to involve all the 477 Islamic student teachers in the 234 secondary schools in Kwara State. However, 468 (98.1%) of them eventually participated in the study. The variables considered were the teachers’ qualification and length of teaching experience. A 29-item researcher designed questionnaire was used as the instrument for data collection. The data collected were analysed using frequency counts and percentage distribution to answer the 12 research questions raised. The t-test and Analysis of Variance (ANOVA) were used to test the 10 hypotheses formulated at an alpha level of 0.05.

The results obtained from the analyses indicated that the curriculum objectives were clearly stated; the curricular content was consistent with the stated objectives; the 3-year period of the SSS was not sufficient to cover the content of the curriculum; lack of the knowledge of Arabic language did not inhibit students’ performance in Islamic Studies examinations; both human and material resources were in short supply; and all the 3 divisions of the subject (Hidayah, Fiqh and Tarikh) were wider than what the targeted students could cope with and, therefore, there was the need to review the curriculum. It was also revealed through the findings on the hypotheses tested that both teacher qualification and teaching experience did not have any influence on the respondents in their responses to the ISS curriculum evaluation.

The findings in this aspect of the study brought to the fore the importance of an Islamic Studies teacher who had neither professional qualification nor professional experience but who was well grounded in the content area of Islamic Studies.
organizational element model of Kaufman (1982). It also assessed the quality and quantity of human and material resources in the Educational technology centres of the two Universities and three Colleges of Education.

The study was carried out using survey method and was conducted using the National Universities Commission (NUC) and the National Commission for Colleges of Education (NCCE) minimum academic standards as the bases for the evaluation. The sample of the study consisted of 66 lecturers, 700 hundred students and 5 non teaching staff drawn from the Universities and the Colleges of Education. Data were collected through the use of two validated instruments namely, Educational Technology Component Evaluation Questionnaire (ETCEQ) for student teachers and lecturers in the selected Universities and the Colleges of Education, and the observation guide. The research questionnaire had reliability coefficients of 0.77, 0.60 and df of 84 respectively for Sections B, and C. An observation guide was also used to evaluate the centres. There were three samples consisting of seven hundred students, sixty-six lecturers and five non-teaching staff. They were drawn from two Universities and three Colleges of Education using purposive and random sampling techniques. Eleven research questions were answered while eight null hypotheses were tested. The data were analysed using descriptive and inferential statistics: percentages, the mean, the t-test, Analysis of Variance and Duncan Multiple Range Tests. The findings from the research questions indicated that the Educational technology component of teacher Education Programmes in the institutions met the minimum academic standard for Universities as outlined by NUC and for Colleges of Education as outlined by NCCE.
showed that there was significant difference in the performance of student teachers in Educational technology courses in the three Colleges of Education sampled; while there was no significant difference between the two Universities sampled. Also, a significant difference existed in the assessments of student teachers in the sampled Universities. There was also a significant difference found in the use of the centres by University and College of Education students, as University students used the centres more than their College counterparts.

Komolafe (2005) evaluated the Primary School Nomadic Education Programme in Kwara State, Nigeria, using the context, input, process, product, (CIPP) which is the Stufflebeam model of evaluation. The study was a descriptive survey. The context of the evaluation dealt with existing political structure, social, and cultural setting, administrative structure, strategies used in selecting curriculum developers and strategies used in selecting the objectives of nomadic Education. The input dealt with the quantity and quality of the teachers, the infrastructure, and instructional materials. The process dealt with the method used in imparting knowledge in the nomadic schools, while the product deals with students’ performance and students’ completion of Programme.

The research population consisted of all the available nomadic pupils and teachers. In all, a total of 130 pupils and 52 teachers were purposively sampled for the study. A researcher-designed questionnaire titled "Teachers’ Questionnaire" (TQ) was the major instrument used for the study. Students’ performance in a State test in Mathematics and, English Language were collected and analysed. In addition, a structured interview guide was administered to the Coordinator of Nomadic Education in Kwara State. To ensure the
The contextual variables of the CIPP model were based on a critical observation of the national policy on Education and the blue print on nomadic Education. It was found that the cultural setting of nomads was adequately addressed. Similarly, the administrative structure as specified in the blue print on nomadic Education was followed. The researcher also observed the desire of the ruling political party in Nigeria to make Education accessible to all through Universal Basic Education (UBE). A close study of the curriculum also revealed that the adapted curriculum for nomadic Education was developed by experts in various subjects. The input evaluation analysis of results revealed that instructional materials were rated by all the teachers to be inadequate. Also, based on the provision of the National Policy on Education, it was revealed that as far as nomadic Education in Kwara State was concerned, the quantity and quality of teachers were adequate. However, the supervision of nomadic schools was grossly inadequate. The process aspect of the CIPP model was based on observation of learning processes in nomadic schools. It was found that rote learning was commonly used. The analysis of results as it is related to product evaluation revealed poor academic performance of nomadic children in both primaries three and six in the Mathematics and English tests. The test of hypotheses also revealed that the primary six pupils’ performances in English and Mathematics were not significantly different from those of the primary three pupils; as each group was found to perform poorly. There were also no significant differences in the performance of male and female nomadic pupils in the Mathematics and English tests. Similarly, going through records from the Kwara State Ministry of Education, it was observed that the extent of attrition between primaries one and
not different from the assessments of qualified and unqualified teachers on the various aspects of nomadic Education in Kwara State.

Landu (200) Evaluated the Sandwich Science First Degree Programme in State Colleges of Education in Nigeria. The study involved all the sandwich Science degree students and teachers in the four Colleges of Education that were selected out of the eight state Colleges of Education running sandwich Programme in Science Education. Checklist involving the researcher’s physical involvement and questionnaires namely Teachers Opinion Questionnaire (TOQ) and Students Opinion Questionnaire (SOQ) were used to collect relevant data. The students’ final Grade Point Averages for two sets of graduates were collected to serve as a measure of students’ academic achievement. Percentage and analysis of variance were used to analyse the data; and in Post hoc analysis, Scheffe test was used in cases where there were significant differences to determine the direction of the difference.

The result revealed that proximity was a major factor for choosing and attending centres for their sandwich study by the students that were involved in the study. It was also revealed that only two-thirds of the students studying in these centres were employed while the remaining one-third was unemployed. This was against the general requirement that sandwich students should be employed to undertake degree Programme during vacation. On the input variable the result revealed that the space and laboratory available were adequate for student population with a maximum of five (5) and fifteen students per level respectively for Physics being the least and Mathematics the highest. Materials such as Science journals and periodical titles were inadequate, since the quantity available ranged from seventeen (17) to
On the process, the result revealed that the coverage of course content and instructional processes were found to be adequate as the appropriate lecture hours were allotted to each course and utilized. The result further revealed that 51% of the students expressed satisfaction with their interaction with their lecturers and opportunity to express oneself in class, while 47% of the students considered feedback on assignments as only moderately appropriate. The results also revealed that the quality of content, quantity of content and instructional process was appropriate. The quality of teachers, methodology adopted and coverage of content and the instructional processes could be adjudged as being satisfactory. The examination procedure could however be adjudged as inappropriate as three out of the four centres of study ran their courses and examination period separately for time factor, 51% of the students considered such a system as inappropriate.

On the product variable, it was revealed that in the year 2000, one student graduated with first class degree and eleven with third class degree; and in the year 2001 there were two students that graduated with first class degree and eighteen students graduated with third class degree. The results obtained using analysis of variance (ANOVA) when the mean responses were used revealed that significant differences existed in the rating of students on duration of time spent for running the Programme, and coverage of course content. There were also significant differences in the rating of teachers of strategies adopted for selecting the curriculum, standard of examination question set, and the procedure for the selection of students and Programme structure. The results further revealed that there was significant difference in the rating of teachers on perceived relationship between quality of regular and
The Research conducted by Muhammad (2008), is an Evaluation of the Implementation of the Micro-teaching Component of Educational Technology in selected Nigerian Colleges of Education. The study examined the adequacy of resources (human and material) in Federal and State Colleges of Education as regards the implementation of micro-teaching. It sought the opinion of staff and students on the implementation of micro-teaching in sampled Colleges of Education and examined the problems faced in the implementation of micro-teaching, and students’ performance in micro-teaching in Colleges of Education.

It was a descriptive research using survey and observational techniques. The population involved in the study consisted of student teachers, lecturers, and Coordinators of Educational Technology Centres in 60 Nigerian Colleges of Education. From this population a teacher sample of 134 out of 168, 23 Coordinators out of 60, and 768 students randomly selected from 24 purposely sampled Colleges were drawn. Four instruments used for data collection were two researcher-designed questionnaires, one for staff and one for students; an interview schedule; and facilities observation checklist. In addition, the National Commission for Colleges of Education Minimum Standards document and students’ records were used. For content validity, the questionnaires, interview schedule, and facilities observation checklist were given to experts in Educational Technology and English Language and Test and Measurement for validation. For reliability of the instruments, the questionnaires were pilot tested on 18 lecturers and 50 students of Federal College of Education, Kano and Sa’adatu Rimi College of Education, Kumbotso, Kano which were not part of the study sample. The reliability coefficients for the instruments were 0.88 for students’ questionnaire and 0.75 for
and technicians in the Colleges of Education were adequate in terms of their Educational and professional qualifications as well as teaching experience, but only 37 (29.4%) of those who taught micro-teaching were Educational technology specialists. The findings also revealed that frequent power outage, large students’ population, and limited time for the coverage of both theory and practicum, and financial cost of software for recording students’ micro-teaching demonstration sessions were some of the problems affecting the implementation of micro-teaching. Furthermore, the study revealed that 639 (83.2%) of the students whose results were analysed obtained a minimum pass mark of 40% and above. The result of the hypotheses tested indicated that Federal and State Colleges of Education differ in their processes of micro-teaching implementation in favour of the Federal Colleges of Education. There was no difference found in the input and product evaluations based on proprietorship. In addition, both staff and students had positive assessments on the implementation process of micro-teaching in Nigerian Colleges of Education.

Bello (2010) assessed the suitability of Nigeria Certificate in Education Integrated Science Curriculum. The subject of the study consisted of 606 Integrated Science lecturers selected from 66 Colleges of Education in Nigeria. Two instruments (a questionnaire on lecturers’ assessment of the NCE Integrated Science Curriculum, and an observation guide of the Integrated Science materials/instruments) were used for data collection. The reliability index for the instrument was 0.75.

Research hypotheses were formulated and tested using chi-square statistics. Findings from the study showed that:
2. There was a significant difference in the assessment of the course objectives and contents by the qualified and unqualified integrated Science lecturers i.e. the former found it suitable while the later found it unsuitable.

3. There was no significant difference in the assessment of the resources by the qualified and unqualified integrated Science lecturers.

Oyenike, Adesoji, Adebayo and Yakasai (2009), examined the Primary Education Studies (PES) Programme in Two Colleges of Education in Nigeria for the purpose of determining the teacher training quality and effectiveness in the Context of Basic Education. The (PES) curriculum used in training teachers for basic Education in the two selected Colleges of Education were isolated as a case study, using the Integrated Curriculum evaluation model. The researchers employed purposive and random sampling procedures to select subjects from teacher trainees, trainers, in-service teachers, head teachers of basic schools, and officials of the National Commission for Colleges of Education (NCCE). Findings from the study showed, among other things, that the content of PES curriculum is adequate, but the teaching strategies need a lot of improvement. The researchers therefore concluded that this has serious implications for the successful implementation of basic Education in Nigeria.

In the same vein, Sucheera, Jariya, Wilasinee, Kirati, Soisuda, Thanayot, & Natchaphon (2009) evaluated the Masters Degree Programme in Clinical Psychology, offered by the Department of Psychiatry, Faculty of Medicine, Siriraj Hospital, Graduate Study, Mahidol University. Stufflebeam’s Context Input Process and Product (CIPP) Evaluation
curriculum objectives were clearly stated; practice oriented and corresponded to social needs. The curriculum structure was well designed. The instructional and evaluation activities corresponded to the curriculum objectives. The input evaluation showed that the students who attended the Programme found the selection criteria appropriate. The students’ readiness was found to be high. The results show that the working committee and lecturers could conduct the course successfully. The Educational resources were available to serve the teaching and learning process. However, some of the resources were not adequate. With regard to the process evaluation, the operation instruction and evaluation process were very good. Product evaluation suggests that graduates have achieved the general and specific competencies as mentioned in the Programme objectives.

Akanbi (2010) investigated lecturers’ and students’ evaluation of the Nigeria Certificate in Education (NCE) physics curriculum. The study was conducted using descriptive survey method. The target population for the study consisted of all the physics lecturers and students Colleges of Education in Nigeria. 66 lecturers and 1128 students in 24 purposely selected Colleges of Education offering physics participated in the study. Two researcher designed instruments were used to collect data using Stufflebeam’s 2000 CIPP Model. Data gathered were analysed using descriptive and Chi-square statistics. Findings from the study revealed that (1) 76% of the lecturers were of the view that physics curriculum objectives were adequate for teacher training and prepared them to operate at the higher level. (2) 85% of the lecturers were of the view that the current content of NCE physics curriculum was adequate and appropriate for the attainment of the physics curriculum objectives. 64% of
students from Federal and State Colleges of Education in favour of Federal Colleges of Education with a percentage score of 53% higher than the percentage score of 47% of the State Colleges of Education. The researcher recommended among others provision of specially equipped laboratories for State Colleges of Education as obtained in Federal Colleges of Education.

Eraikhuemen & Oteze (2010) evaluated the National Teachers’ Institute’s NCE by Distance Learning System (NTI/DLS) Mathematics Programme in Edo state Nigeria. The study focused on the content of the Mathematics modules, the Educational qualifications of Mathematics Course Tutors, the adequacy of the materials and facilities for Programme implementation and the way the entire Programme has been coordinated. A total of fifty five subjects (2 centre managers, 7 Mathematics Course Tutors and 46 Students) from five NTI study centres in Edo State, Nigeria participated in the study. Three questionnaires (questionnaire for students, questionnaire for Mathematics Course Tutors and questionnaire for centre Managers) were used to collect data for the study; and, percentage, pie-chart, Kendal co-efficient of concordance (W) and Friedman (T), as well as also t-test statistics were used to analyse the data. Findings from the study revealed that:

1. The NCE Mathematics Programme has adequate number of qualified course tutors.

2. The content of the NCE Mathematics Modules is not significantly adequate for the realisation of the objectives of the Programme.

3. There are adequate facilities and materials for the implementation of the Mathematics Education component of the NCE Programme.
was the descriptive survey. The population comprised of 322 Mathematics students during the 2009/2010 academic year and 15 course tutors in six NTI study centres in Bayelsa state of Nigeria. The sample was made up of 158 students and 7 course tutors, which was drawn from the population using the proportionate random sampling technique. The instrument used for the study was Mathematics Curriculum Evaluation Questionnaire (MCEQ) the instrument was validated by experts and has a reliability index of 0.82 established using Cronbach alpha technique. Data collected was analyzed using Pearson product moment correlation coefficient. Findings from the study revealed a significant relationship between structural facilities, teacher’s qualification and evaluation on the implementation of the NTI/NCE Mathematics curriculum by distance learning system. The researchers therefore suggested among others the provision of adequate facilities and the training and retraining of teachers for the effective implementation of the curriculum.

Odili & Asuru (2011) carried out a survey study to determine whether the goals of Further Mathematics Curriculum (FMC) are being achieved at the Senior Secondary School level. The sample for the study consisted of 240 Further Mathematics (FM) final year students, 45 FM teachers and 180 undergraduates who were selected by a multi-stage stratified random sampling technique from Rivers and Imo States of Nigeria. One research question was posed and three hypotheses formulated. Data for the study was gathered using three questionnaires. Analysis was done using descriptive and inferential statistics. Findings of the study showed that the respondents scored the instructional strategies of the FMC implementation below average. The results further revealed that students have a poor perception on the mode of evaluation practices in FM classrooms and that 57.8% of the students expressed doubt on good content coverage of the FM. One encouraging result, however, is that the respondents agree that the goals of the FMC are being achieved.
authors recommended that a special monitoring unit be set by governments to ensure strict adherence to all the instructional strategies advocated in FMC implementation guidelines.

Other assessments include that of Ajayi & Emoruwa (2012) who assessed the academic achievement scores of students with the new curriculum of National Commission for Colleges of Education in College of Education, with particular reference to the Department of Primary Education Studies in College of Education, Ikere-Ekiti. The research design was descriptive survey design with 120 samples drawn through purposive sampling techniques. The research instruments were a questionnaire and the approved academic results. The findings showed that the academic achievements of students were poor which called for re-assessment of NCCE curriculum for Colleges of Education in Nigeria.

Salman, Ogunlade & Ogundele (2012) examined Upper Basic Mathematics teachers’ assessment of Teacher Professional Development (TPD) components, which is under Teacher Quality Improvement Programme, a sub-component of Education Reform Agenda of Kwara state Education sector. The key aspects of Teacher Professional Development include: Learner-centred approach; learning for all and from each other; Learning Management; Assessment; Facilitating the professional development of mentor teachers among others. The assessment was carried out at the Teacher Professional Development workshops organized for Upper Basic Mathematics and Science teachers in Kwara State. The study is a descriptive survey method. A purposive sampling technique was employed to select 300 (58 females and 242 males) Mathematics teachers from eight local government areas of Kwara state that participated in the workshops. Researchers-designed questionnaire, validated by two experts
opportunity for learners to brainstorm among others are important in teaching and learning Mathematics. The researchers therefore recommended that all teachers should be given adequate training on the components identified as important.

Lim (2011) evaluated the America’s grades 4 – 8 Mathematics Teacher Preparation Programme at a Large State Institution in Texas. The study was guided by three research questions namely: (1) To what extent is the 4-8 Mathematics teacher preparation Programme consistent with state standards for Mathematics teacher preparation? (2) What content and pedagogical content knowledge can 4-8 Mathematics pre-service teachers demonstrate at their respective points in the Programme? (3) What are the pre-service teachers’ perceptions of preparedness for teaching Mathematics? The subject of the study consisted of twenty nine pre-service teachers who participated and completed a paper/pencil assessment test called Diagnostic Mathematics Assessments for Middle School Teachers (DTAMS). Twenty three pre-service teachers completed the anonymous survey.

The first research question was addressed by conducting a document analysis of course syllabi and learning resources available on the course websites. A Texas Examinations of Educator Standards (TExES) matrix was developed and used to examine how well the courses in the Programme aligned with the state standards. (DTAMS) was used to answer the second research question. The third research question was addressed by examining students’ written responses from an anonymous web-based survey. Findings from the study revealed that the Mathematics courses met state standards covering about 83% of the Mathematics-related TExES learning outcomes and Mathematics Education courses met standards
scores for Memorized/Factual Knowledge, followed by Conceptual Understanding, Reasoning/Problem Solving, and Pedagogical Content Knowledge. Pre-service teachers had higher Memorized/Factual Knowledge than Pedagogical Content Knowledge. The pre-service teachers’ overall content knowledge was not strong, and the two lowest performing content knowledge areas were Geometry/Measurement and Probability/Statistics. Thirdly, the study found that pre-service teachers did not feel that they were well prepared in Probability/Statistics and Geometry/Measurement, and that pre-service teachers did not demonstrate a clear pattern for the Programme’s coverage of the other strands. Pre-service teachers’ written responses provided the following themes: (1) Pre-service teachers had low confidence in content knowledge, (2) Pre-service teachers wanted early exposure to pedagogy in the Programme coursework, and (3) Pre-service teachers wanted to learn to connect theory with practice. Overall, the picture emerging from this study was that (1) pre-service teachers dedicated to teaching yet demonstrating low knowledge of content and pedagogy. (2) The Programme is having difficulty of building a pedagogical prowess upon low confidence and knowledge in mathematical content. The study recommends future studies about how the intended curriculum is being implemented and about the process of pre-service teachers’ learning of College Mathematics.

**Theoretical Framework for the Study**

Several evaluation models have been proposed, developed and used by seasoned Educational evaluators since around 1945 to date. Of special recognition is the Context, Input, Process and Product (CIPP) evaluation model which was developed and used by...
Stufflebeam (2007) contended that the CIPP Evaluation Model is a comprehensive framework for guiding evaluations of programs, projects, personnel, products, institutions, and systems. The model makes use of checklist to guide the evaluator on what is expected of him/her at each stage of the evaluation process. This checklist is generally consistent with a wide range of program evaluations conducted by Western Michigan University Evaluation Centre in areas among which are science and Mathematics Education. He explained further that Corresponding to the letters in the acronym CIPP, this model’s core parts are context, input, process, and product evaluation. In general, these four parts of an evaluation respectively ask, what needs to be done? How should it be done? Is it being done? Did it succeed?

One of the main functions of the checklist is to help evaluators review and assess a program’s history and issue a summative evaluation report on its merit, worth, probity, and significance, and the lessons learned. The CIPP components in the checklist may be employed selectively and in different sequences and often simultaneously, depending on the needs of particular evaluations. The concept of evaluation underlying the CIPP Model and this checklist is that evaluations should assess and report a Programme’s merit (i.e., its quality), worth (in meeting needs of targeted beneficiaries), probity (its integrity, honesty, and freedom from graft, fraud, and abuse), and significance (its importance beyond the Programme’s setting or time frame), and should also present lessons learned. The model’s main theme is that evaluation’s most important purpose is not to prove, but to improve. The checklist shows that to conduct an evaluation using the CIPP Model, the evaluator need to
ii. Clarify what quantitative and qualitative analyses will be needed to make a full assessment of the program.

iii. Clarify the nature, general contents, and approximate required timing of the final summative evaluation report.

2. Know that Context evaluation assesses needs, assets, and problems within a defined environment. The Evaluator should:

   i. Compile and assess background information on the intended beneficiaries’ needs.

   ii. Interview program leaders to review and discuss their perspectives on beneficiaries’ needs and to identify any problems (political or otherwise) the program will need to solve.

   iii. Interview other stakeholders to gain further insight into the needs and assets of intended beneficiaries and potential problems for the program.

   iv. Collect data on the program’s environment, including related programs, area resources, area needs and problems, and political dynamics.

   v. Request that program staff regularly make available to the evaluation team information they collect on the program’s beneficiaries and environment.

3. Know that Input evaluation assesses competing strategies and the work plans and budgets of the selected approach. The Evaluator should:

   i. Assess the program’s proposed strategy for responsiveness to assessed needs and feasibility.
iv. Assess the program’s work plan and schedule for sufficiency, feasibility, and political viability.

4. Know that Process evaluations monitor, document, and assess program activities. The Evaluator should:
   i. In collaboration with the program’s staff, maintain a record of program events, problems, costs, and allocations.
   ii. Use the process evaluation findings to maintain a record of the program’s progress.
   iii. Interview beneficiaries, program leaders, and staff to obtain their assessments of the program’s progress.
   iv. Use the process evaluation findings to help maintain a record of the program’s costs.
   v. Maintain an up-to-date profile of the program.

5. Know that Product evaluation assesses a program’s reach to the target audience and the quality and significance of outcomes. The Evaluator should:
   i. Engage the program’s staff to maintain a directory of persons and groups served.
   ii. Record program services they received.
   iii. Assess whether the program is reaching or did reach inappropriate beneficiaries.
   iv. Assess and make a judgment of the extent to which the served individuals and
vi. Assess the extent to which the program addressed or is addressing important community needs.

vii. Assess the program’s success in reaching the intended beneficiaries.

viii. Include the obtained information and the evaluator’s judgments in a periodically updated program profile.

ix. **Determine the extent to which the program reached an appropriate group of beneficiaries.**

x. Assess the extent to which the program inappropriately provided services to a non targeted group.

xi. **Use product evaluation findings to gauge the program’s positive and negative effects on beneficiaries.**

xii. Interview key stakeholders, such as community leaders, beneficiaries, program leaders and staff, and other interested parties, to determine their assessments of the program’s positive and negative outcomes.

xiii. As relevant, use the findings to gauge the program’s positive and negative effects on the community/pertinent environment.

xiv. Use the findings to sort out and judge important side effects.

xv. Engage an evaluation team member and program staff to supply documentation needed to identify and confirm the range, depth, quality, and significance of the program’s effects on beneficiaries.

xvi. **Use the product evaluation findings to examine whether program plans and**
xviii. Use the effectiveness evaluation findings to make a bottom-line assessment of the program’s success.

xix. Obtain information on the nature, cost, and success of similar programs conducted elsewhere and judge the subject program’s effectiveness in contrast to the identified “critical competitors.”

xx. Use needs assessment data (from the context evaluation findings), effectiveness evaluation findings, and contrasts with similar programs elsewhere to make a bottom-line assessment of the program’s significance.

The process of evaluating a Programme such as NCE Mathematics being offered by Nigerian Colleges of Education needs to be hinged on a certain theoretical framework. Such framework must give room for a thorough assessment of all aspect of the Programme, to warrant a sound decision making on either maintenance of its existing curriculum content or effect some changes to improve it based on the result of formative and summative evaluation. Such evaluation attributes are inherent in the CIPP evaluation model. For this reason, this study makes use of the model by way of constructing the research questions and research instruments in line with the provisions of the CIPP Model checklist as contained in the theoretical framework to evaluate the NCE Mathematics Programme in North-West, Nigeria.

CIPP evaluation model proved to be effective in evaluating Educational Programmes. This is as contained in the empirical studies conducted by researchers who used the model, detail of which is in the next sub-section. These researchers include: Sule (1991), Momoh (1993), Babatunde (1998), Ajidagba (2002), Komolafe (2005), Sucheera, Jariya, Wilasinee, Kirati, Soisuda, Thanayot, & Natchaphon (2009) and Akanbi (2010).
related to this study, a level of dissatisfaction has been shown from different individuals, organisations as well as through reports on the quality of teachers produced through pre-service training or the processes adopted in the pre-service NCE teacher program (Daily Trust Newspaper of 30th September 2010; THIS DAY newspaper of Wednesday 25th April 2012, Kwara state ministry of Education and human development (2011), the Federal Capital Territory Education Secretariat, Abuja (2011), Ikeotuonye (2011), Kperogi (2013) and Salman (2003). Although most of these submissions are without a formal research backing, they represent a public outcry too significant to be ignored. This position makes it necessary to evaluate the entire NCE Programme in order to affirm the assertions, in which case corrective measures would be taken by the stake holders; or debunk them to set people’s mind at peace. However, due to the limitations of time and resources, this study will be limited to an evaluation of an NCE Mathematics Programme in North-West, Nigeria.

Empirical Studies reviewed showed that efforts were made to evaluate portions of NCE Programme. However such efforts were mostly in other areas other than NCE Mathematics Programme [Ibikunle (1999), Mustapha (2001), Ogunlade (2002), Muhammad (2008), Oyenike, Adesoji, Adebayo & Yakasai (2009), Akanbi (2010), Bello (2010), and Ajayi & Emoruwa (2012)]. These are in areas of integrated science, facilities for Educational Technology, Physics and Primary Education. These call for the need to evaluate NCE Mathematics Programme so as to close the apparent gap. Part of the review is the study by Salman (2003) which indicated a mismatch between the NCE Mathematics Curriculum content and that of Basic Education. Such study need to be renewed, since the NCE
Other researches that relate to Mathematics are that of Eraikuemen & Oteze (2010) and that of Diepreye & Jeremiah (2011) who both evaluated the Mathematics Programme of National Teachers’ Institute’s NCE by Distance Learning System (NCE/DLS). These researches though in the area of NCE Mathematics Programme, their findings cannot be generalized over regular NCE Mathematics Programme hence the need to undertake the study in a wider scope, of which this study intends to close this gap. The need of undertaking the study in a wider scope was satisfied by Sule (1991) who evaluated the effectiveness of the components of the Nigeria Certificate in Education (NCE) Mathematics Programme of some randomly selected Colleges of Education in Nigeria in line with the academic contents and pedagogical demands of the then secondary school Mathematics curricula. The study was however conducted more than two decades ago and as such requires replication with some modifications since the basis of the evaluation in Sule’s (1991) study was the input component of the CIPP evaluation model of (Stufflebeam, 1971). However, Input component alone will not give a comprehensive evaluation of an NCE Mathematics Programme without due consideration for the Process of utilising the Input, since providing the required resources may not necessarily ensures their usage. Also the main focus of Sule’s (1991) study was academic contents and pedagogical demands of the then secondary school Mathematics curricula. Now the mandates of NCE Programme generally and NCE Mathematics Programme in particular is the production of teachers for Basic level of Nigeria’s Education system. Thus there is a marked difference between the intention of the NCE program of 1991 and that of nowadays. Similarly as a result of reforms in the Educational sector from 1991 to
Mathematics Programme as well as curricular of Basic level of Education system is what the present study intends to fill.

Various evaluation models, approaches and designs were used in conducting the aforementioned researches. They include Stufflebeam CIPP evaluation model, Antecedents, Transactions and Outcomes (ATO) model Kaufman organizational element model. The most applied among these is the Stufflebeam CIPP evaluation model. While the instruments used for data collection were observation technique, researcher-designed questionnaire, interview protocol, and achievement as well as performance test instruments. Data collected from the researches were mostly analysed using one or two statistical techniques which include: descriptive statistics, analysis of variance, Phi-correlation coefficient, Point-Biserial correlation coefficient and the Pearson Product Moment Correlation Coefficient. Others were Chi-Square test, Student t-test and Duncan Multiple Range Tests.

The most glaring similarities of the present study with others reviewed is in the usage of the Stufflebeam CIPP evaluation model which most of them used in their studies, and so also the intent of this study; and the Programme since most of the studies were on NCE Programme so is this study. Another similarity is in the usage of statistical tools for data analysis since this study intends to use frequency counts, percentages, chi-square and t-test for its analysis just like some of the researches reviewed.

However, the essential difference between this study and others reviewed is that none of them evaluated the contemporary NCE Mathematics Programme; others are in areas
Based on all these the researcher intends to evaluate the NCE Mathematics Programme in North-West, Nigeria using CIPP evaluation Model as a theoretical framework of the study. Data will be collected through questionnaires and students’ performance test. The data collected will be subjected to frequency count, percentages, mean, chi-square and t-test statistical analysis.
CHAPTER THREE
RESEARCH METHODOLOGY

This chapter is concerned with the Research Methodology. It comprises of the Research Type, Sample and Sampling Techniques, Research Instrument, Procedure for Data Collection and Data Analysis Techniques.

Research Type

This study is a descriptive study using the survey method. It involves the use of researcher designed questionnaires and students performance test.

Sample and Sampling Technique

The target population for this study include all Mathematics Lecturers, NCE I and NCE III Mathematics students in the Colleges of Education in the North-west, Nigeria. The Colleges are thirteen (13) in number, out of which five (5) are Federal Colleges of Education [Federal College of Education Kano, Federal College of Education Katsina, Federal College of Education Zaria, Federal College of Education (Tech.) Bichi and Federal Girls’ College of Education (Tech.) Gusau], and eight (8) are State Colleges of Education [Adamu Augie College of Education Argungu, Isa Kaita College of Education, Dutsinma, Jigawa State College of Education Gumel, College of Education Kafanchan, College of Education Gidan-Waya, Sa’adatu Rimi College of Education Kumbotso, Zamfara State College of Education Maru and Shehu Shagari College of Education Sokoto]. Also in the target population are all the Basic School Supervisors in the North-western states of Nigeria. The Sample for the study will comprise of the entire Mathematics Lecturers in the Colleges, forty (40) students...
need of seeing the effect of the NCE Mathematics Programme’s training on learning about the content of Basic school Mathematics Curriculum and the necessary pedagogical skills of teaching the content. The sample will also include five (5) experienced, five (5) moderately experienced and five (5) less experienced Basic School Supervisors from each of the seven states in the North-west, Nigeria also to be sampled using stratified sampling technique based on experience level of the supervisors. Thus the sample for the study will comprise of a total of one thousand two hundred and five (1225) subjects, of which one hundred and twelve (121) are Mathematics Lecturers, eight hundred and forty (894) are NCE III and NCE I students and one hundred and five (105) are Basic School Supervisors. 

Research Instrument

Three research instruments will be used for this study. These are: Two researcher designed questionnaires prepared based on Shufflebeam’s 2002 CIPP Evaluation Model checklist and a researcher designed Basic Mathematics Performance Test (BMPT) developed based on the content of Kano State Basic Education Certificate Examination and Mathematics methodology course in the NCE Mathematics Programme. The questionnaires are College of Education Mathematics Lecturers’ Questionnaire (MLQ) and Basic School Supervisors’ Questionnaire (BSSQ) to be administered to sampled College of Education Mathematics lecturers and the sampled Basic School Supervisors in the selected states respectively. The third instrument, Basic Mathematics Performance Test (BMPT) is to be administered to the selected NCE I and NCE III Mathematics students in Colleges of Education in North-west, Nigeria. (See appendices C & D).
Reliability of Research Instrument

The reliability of the instruments would be determined by administering the instruments to a group of Mathematics lecturers, NCE I and NCE III students as well as fifteen (15) selected Basic School Supervisors in a non participating College of Education and State Universal Basic Education Board respectively. After two weeks the same instruments will be re-administered on the same sample using test-re-test method. The scores obtained from the two administrations will be correlated using Pearson Product Moment Correlation Coefficient.

Procedure for Data Collection

The researcher will, with the help of two (2) research assistants administer the instruments on selected sample drawn from selected Colleges of Education and the State Universal Basic Education Boards in the North-west, Nigeria. The filled questionnaires and answer scripts of the attempted questions will be collected for data analysis.

Data Analysis Techniques

The collected data will be analysed using descriptive and inferential statistics. Specifically data collected from the administered instruments will be converted in to mean and percentages to help in answering the posed research questions. The corresponding null hypotheses will be tested for acceptance or rejection using chi-square and t-test statistics.
References


Federal Capital Territory Education Secretariat, Abuja. (2011). Need to admit quality Entrants in to Teacher Education Programmes. A memorandum submitted to joint consultative committee on Education (JCCE) meeting, held at Dutse Jigawa state 19th–23rd of September 2011


*Mathematics Education Research Journal, 15*(1), 59-69


Appendix A

(NCE MATHEMATICS CURRICULUM)

1.0 PHILOSOPHY

The philosophy of the NCE Mathematics is inspired by:

The desire to help students become intellectually informed in mathematical ideas, notations and skills for logical reasoning, scientific enquiry and for the pursuit of techno-scientific Education.

The need to produce non-graduates but well-groomed and qualified professional teachers of Mathematics for the Basic Education Levels.

2.0 OBJECTIVES

By the end of the Programme the students should be able to:

a) Discuss with confidence the historical development of Mathematics as a discipline

b) Solve abstract problems through the use of mathematic skills and ideas

c) Stimulate pupils’ interests in Mathematics by the use of appropriate teaching/learning strategies particularly at the Basic Education levels

d) Make learners appreciate the use of computers in solving mathematical problems

e) Use Mathematics to solve day to day problems

f) Teach Mathematics in a way that learners can apply Mathematics principles in solving daily problems

g) Make the teaching of Mathematics learner friendly through games and simulations

h) Set up a Mathematics laboratory
same sitting or four credits at two sittings. Two of the credits must be relevant to the course the candidate wishes to offer; Mathematics and any other subject combinations.

b) A Grade II Teacher’s Certificate (TC II) with credit or merit in three subjects, two of which must be relevant to the course the candidate wishes to offer i.e.; Mathematics and any other subject combination.

c) Associateship Certificate in Education awarded by an approved Institution in Nigeria or abroad, is also acceptable qualification if assessed by the institution to meet the minimum requirement to read NCE Mathematics.

d) All candidates wishing to be considered for admission must enrol for and write the selection examination organized by an accredited body such as JAMB.

e) Successful candidates in the Pre-NCE final examinations or IJMB who also take and succeed in a selected examination organized by an accredited body would also be qualified for admission provided they meet the minimum requirements i.e credit in Mathematics at 0’level.

f) It should be noted that some Colleges may in addition to all the above, administer their own elimination tests and/or interviews for some courses.

g) A credit pass in IJMB with credit in Mathematics at the O’level.

3.2 SUMMARY OF ADMISSION REQUIREMENTS INTO NCE MATHEMATICS

Candidates seeking admission to NCE Mathematics should obtain a credit pass in Mathematics at SSCE (WAEC or NECO) or GCE ‘O’ Level or merit or a credit pass in Pre NCE or a credit pass in Interim Joint Matriculation Board (IJMB) examinations.
There must be a fully air-conditioned mathematic laboratory with mini micro computers of not more than ten students per one, an overhead projector or multimedia projectors.

c) Workshop: There must be a Mathematics workshop where students can make their own instructional materials.

i) Equipment Required in the Workshop

<table>
<thead>
<tr>
<th>S/ No.</th>
<th>Description</th>
<th>Quantity Required</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Work benches</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Vice</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Drilling Machine (manual/electric</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Drill bit (various sizes)</td>
<td>4 sets</td>
</tr>
<tr>
<td>5</td>
<td>Hand saw (various sizes)</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Solid shapes (Prisms, Cube, Cuboids, Cylinders, etc)</td>
<td>5 each</td>
</tr>
<tr>
<td>7</td>
<td>Engraving machine</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Cutting knives</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Hammer (different sizes)</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Screwdrivers</td>
<td>3 sets</td>
</tr>
<tr>
<td>11</td>
<td>Mathematical sets</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>Mathematical sets (black board size)</td>
<td>5 sets</td>
</tr>
<tr>
<td>13</td>
<td>Weighing scale</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>Scientific Calculators</td>
<td>20</td>
</tr>
<tr>
<td>15</td>
<td>Scissors (different sizes)</td>
<td>10</td>
</tr>
</tbody>
</table>
ii) **Consumables**

Cardboard papers 1 ream

Plywood (assorted ¼”, ½” ¾”) 10 sheets Nails (assorted) as required

Binding wire 5

Glue (wood) 5

**Gum (liquid) 5**

Celotapes 5

Metal sheets 5

Transparencies 5

Graph sheets 20

Beads (assorted sizes and colours) 20

Thread etc. 2 Rolls

d) **Staff Offices**

The comfort of teaching staff must be taken into consideration. Ideally, there should be an office per Lecturer, equipped with bulletin boards, book shelves, visitors’ seat and standard furniture.

e) The Head of Department should have an office, furnished with other conveniences and file cabinets. There should also be an office for the support staff i.e. typists and clerks.

f) **Books in the Library**

There must be current and relevant textbooks and journals to cover all the areas of the subjects to the ratio of one student to ten books. A Departmental library is needed.
Programme. (The Department services other Departments). All the academic staff must have an Educational background with a minimum of second class lower Bachelor of Education degree in Mathematics or Post Graduate Diploma in Education and a Second Class Lower (Honours) Degree in Mathematics.

Non-Academic

i) A Computer Technical Data Operator

ii) 2 Library Assistant/Attendant

iii) 1 Laboratory Assistant/Attendant

iv) 1 Typist/Secretary

v) 1 office assistant

6. MODE OF TEACHING

i) Lectures

ii) Tutorials

iii) Problem-solving

iv) Seminar

v) Demonstration

vi) Drill

vii) Experimentation

viii) Excursion

ix) Discovery Method

x) Laboratory Method and etc..
Mathematics – 36 Credits

Second Teaching subjects – 36 Credits

Education – 36 Credits

General Study – 14 Credits

Teaching Practice – 06 Credits

Total = 128 Credits

8. TEACHING PRACTICE

Teaching Practice is compulsory for every student before graduation

Teaching Practice earns 6 credits under (EDU 324).

9. PROJECT

The Final Year Project is compulsory for all students. The Project may be written and supervised in any of the student’s chosen subject areas and the grade for Project must be credited to EDU 323. Project carries 2 credits.

10. ASSESSMENT AND CERTIFICATION

Continuous Assessment, CA = 30%, Exam 70%
<table>
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<tr>
<th>Year</th>
<th>Semester</th>
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<th>Course Title</th>
<th>Credit</th>
<th>Status</th>
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<td></td>
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<td>MAT 111</td>
<td>Algebra</td>
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<td>C</td>
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<td></td>
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<td>Trigonometry</td>
<td>2</td>
<td>C</td>
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<td></td>
<td></td>
<td>MAT 113</td>
<td>History of Mathematics</td>
<td>2</td>
<td>C</td>
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<tr>
<td></td>
<td></td>
<td>MAT 114</td>
<td>Dynamics</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td>NCE I</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>MAT 121</td>
<td>Different Calculus</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MAT 122</td>
<td>Co-ordinate Geometry</td>
<td>2</td>
<td>C</td>
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<tr>
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<td></td>
<td>MAT 123</td>
<td>Maths. Methodology</td>
<td>2</td>
<td>C</td>
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<td></td>
<td></td>
<td>MAT 124</td>
<td>Maths Lab. Practical</td>
<td>1</td>
<td>C</td>
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<td></td>
<td>MAT 115</td>
<td>Complex number</td>
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<tr>
<td></td>
<td>Second Semester</td>
<td>MAT 211</td>
<td>Number Theory</td>
<td>2</td>
<td>C</td>
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<td></td>
<td></td>
<td>MAT 212</td>
<td>Problem solving</td>
<td>2</td>
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<td></td>
<td>MAT 213</td>
<td>Intro to Computer Science</td>
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<td>NCE II</td>
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<td>Integrated Calculus</td>
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<td>Vector Analysis</td>
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<td>MAT 223</td>
<td>Probability Theory</td>
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<td>C</td>
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<td>MAT 224</td>
<td>Real Analysis I</td>
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<td></td>
<td>MAT 225</td>
<td>Research Method</td>
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<th>TEACHING PRACTICE</th>
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<td>Static</td>
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<td></td>
<td>MAT 322</td>
<td>Linear Algebra</td>
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<td></td>
<td>MAT 323</td>
<td>Real Analysis II</td>
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<td></td>
<td>MAT 324</td>
<td>Abstract Algebra</td>
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<tr>
<td></td>
<td>MAT 313</td>
<td>Differential Equations</td>
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<tr>
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<td><strong>Total</strong></td>
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</tbody>
</table>

*Note: Students should be advised to take at least 2 (two) elective courses.

NCE I FIRST SEMESTER

COURSE CODES, TITLES CREDIT UNITS AND STATUS

MAT 111 ALGEBRA 2 Credits Compulsory

- Real number system
- Integers, rational and irrational numbers
Partial fractions

Theory of quadratic equations

Permutations and Combinations

Binomial Theorem

Mathematical Induction

 Remainder and Factor Theorems

Arithmetic progression

Geometric Progression

MAT 112 TRIGONOMETRIC 2 Credits Compulsory

 Angle and its measurements

 Basic trigonometric functions and equations

 Trigonometric ratios in each of the 4 quadrants. Applications to bearing, angle of elevation, depression and projectile

 Graphs of trigonometric functions and their applications

 Inverse trigonometric functions

 Half angle formulae

 Addition of factor formulae

 Solution of triangles

 Hyperbolic functions and their identities

MAT 113 HISTORY OF MATHEMATICS 2 Credits Compulsory

 Pre-history Mathematics
Development of Mathematics in the middle Ages and prominent Mathematicians of the period

The Renaissance and Mathematics (16th to 20th Centuries) and prominent mathematicians and their contributions (Napier, Fermat, Euler, Riemann, Lebesque, Lagrange, Hilbert, Bannach, Cauchy)

The use of Mathematics in everyday life including its place in Natural and Applied Science

History of African and Nigerian Mathematics

MAT 114 DYNAMICS 2 Credits Compulsory

Displacement, Speed, Velocity and acceleration in Cartesian and Polar co-ordinates

Velocity and acceleration along the tangent and normal to it

Relative velocity, motion of particles in straight lines

Vertical motion under gravity (laws of motion)

Projectiles: Time of flight, range on a horizontal plane, greatest height reached, the part of a projectile as parabola.

The momentum equation and derivation of the impulse

Angular momentum principles

Impact of two small spheres (direct and oblique)

The principle of conservation of energy.

MAT 115 COMPLEX NUMBERS 1 Credit Compulsory

Complex Numbers

Algebra of Complex numbers
NCE 1 SECOND SEMESTER

Mat 121 DIFFERENTIAL CALCULUS 2 Credits Compulsory

- Set Theory: Union, Intersection, Complement of sets and Venn diagram Algebra of sets

- Basic Geometry: Point, line segment, line, angle, closed curves, etc

- Logic: Binary logic, compound statement-logic relations, methods of proofs, binary operations.

- Fundamental operations in Mathematical Structures

- Group—Group properties

- Number bases other than 10

- Matrices: definition, equality of matrices, addition, scalar multiplication, multiplication of matrices, inverse matrices, adjoint transpose, row equivalence and elementary row operations.

- Determinants: up to 2 x 2 matrices. Application of matrices, to solutions of linear equations.

- Functions

- Limit of a function at a point

- Continuity of a function at a point

- Gradient of a function

- The differential coefficient as a gradient of a function at a point

- Differential product and quotient

- The chain rule and the function of a function
MAT 122 CO-ORDINATE GEOMETRY 2 Credits Compulsory

- Straight lines and circles
- Parabola, Ellipse and Hyperbola in Cartesian, parametric and polar co-ordinates
- Tangents and Normal to the circle, parabola, eclipse and hyperbola (the use of differentiation is acceptable)

MAT 123 MATHEMATICS METHODOLOGY 2 Credit Compulsory

- History of Mathematics teaching in Nigeria and the philosophy of current Nigerian Mathematics curricula
- Teaching and learning Mathematics, including works of Bruner, Gagne, Piaget and Dienes
- Teaching of concepts, principles, skills and proofs: strategies, nature, definitions and types.
- Inductive, deductive, analytic and synthetic approaches in Mathematics teaching
- Content analysis of upper basic Education (JSS 1-3) curriculum
- Work tools (scheme of work, Lesson plan, lesson presentation and Assessment)
- Item construction and development of marking scheme
- Diagnosis and remediation of difficult concepts and topics in teaching and learning of Upper basic Mathematics curriculum
- Problems and prospects of Mathematics Education in Nigeria

MAT 124 MATHS LABORATORY PRACTICAL 1 Credit Compulsory

Construction, design and improvisation of some basic mathematical teaching aids, in relation
Further properties of Integers

Well ordering principle

Mathematical Induction

Laws of tracheotomy

Divisibility (Basic definitions, divisions, primes god)

Basic theorems on god

(proofs may be required)

Relatively prime integers (unique factorization)

The fundamental theorem of arithmetic (proof may be required)

Congruencies

Basic definitions and examples

Properties of Congruencies (reflexive symmetric and transitive: the equivalence relation)

Residue classes

Linear Congruencies

Basic theorems and solutions of linear Congruencies

Proofs of the main theorem may be required

Fermat’s theorem and applications, the proof of Fermat’s theorem may be required

Euler function and number (proof not required)

Application to linear Congruencies

MAT 212 PROBLEM-SOLVING (JSS & SSS) 2 Credits Compulsory
Discovery and expository approaches to problem solving techniques

Functions of questions in the Mathematics class

Characteristics of a good problem solver

Polya’s problem solving heuristics and application to solving topics in J.S.S. and S.S.S. Mathematics

Problem solving of selected difficult topics in Mathematics and further

Mathematics e.g. solid figures, great cycles, application of the cosine rule to triangles (acute and obtuse angle) e.t.c.

MAT 213 INTRODUCTIONS TO COMPUTER STUDIES 1 Credit Elective

Historical development of the Computer

Essential components of the Computer and their functions

Number presentation in a Computer

Data structure and their uses in a Computer

Computer software and types of software, Basic Programming

Illustration and the application of simple techniques to Data processing plus-

Operating systems: Dos, Windows etc.

MAT 214 STATISTICS 2 Credits Compulsory

Frequency distribution

Measures of location

Measures of dispersion
Skewness

Standardized Normal Curve

t-scores and Z-scores

Test of Hypothesis and significance

NCE II SECOND SEMESTER

MAT 221 INTEGRAL CALCULUS 2 credits Compulsory

- Integration as a reverse process of differentiation
- Integration as area under the curve
- Integration of algebraic functions using different methods, like partial fractions, substitution, etc.
- Integration of non-algebraic functions e.g. logarithmic functions, exponential functions, trigonometric functions, etc.
- Special methods of integrations; substitution and transformation, the reduction formula and other types of systematic integration.
- Integration by parts. Approximate integration by Trapezoidal rule and Simpson’s Rule
- Application of integration in determining volumes of solids of revolution and solution to other problems

MAT 222 VECTOR ANALYSIS 2 Credits Compulsory

- Representation of vectors in 1-3 Dimensions
- Equality of vectors, position vectors (explain using the model of space co-ordinate)
- Triangular, parallelogram and polygon laws of vector addition
Commutative and distribution laws of vectors, Scalar or dot product of vectors

The vector or cross product of two vectors

The cosine of angles between two vectors

Direction cosines

Relations between dot product and component of work done in a force field

**Triple product of vectors**

Plane and space curves and their vector equations

Vector differentiation

The grad notation

The del (or vector operator notation)

The divergence of a curve vector and the divergence theorem

Frener...Serret formulae for solution of problems

**MAT 223 PROBABILITY THEORY 1 Credit Compulsory**

Concept of probability

Sampling and sampling techniques

Types of probability

The concept of expectation

Mutually exclusive and non-mutually exclusive events

Addition law of probability

Independent events and dependent events

Multiplication law of probability
The Binomial Poisson and normal distribution with various properties;

Permutations and combination

MAT 224 REAL ANALYSIS I 2 Credits Compulsory

- Basic properties of real number system including boundedness and completeness
- Concept of neighbourhood
- Open and close sets
- Basic theorems on open and closed sets
- De Morgan laws
- Function and functional notation
- Rigorous treatment of limits and continuity
- L’Hospital’s rule (proof may be required)
- Consequences of differentiation
- Rolle’s Theorem
- Mean value theorem and Taylor’s theorem (proof may be required)
- Successive differentiation
- Leibnitz’s formula for nth derivative (proof not required)
- Functions of several variables
- Partial differentiation
- Lagrange’s multipliers

MAT 225 RESEARCH METHODOLOGY 2 Credits/1 Hour per Week Compulsory

(Note: - This course should be taken by students wishing to write their project in Mathematics Education.)

Aim: - The teaching of this course is aimed at preparing students to learn how to carry out research works in Mathematics Education without much difficulty.
1. Research Study
   a) Background of the study
   b) Statement of problem
   c) Purpose of the study
   d) Scope of the study
   e) Area of the study
   f) Significance of the study

2. Literature Review
   The relevance of the review to the background of study must be clearly shown to the students.

3. Method of date organization
   a) Techniques of getting the sample from sample population such as
      i) Simple ballot system
      ii) Use of table of random numbers and any other
      iii) Stating the population and the sample
   b) Instrument for data collection
   c) Validation of instrument
   d) Analysis of data – Frequency table, percentages, t-test and z-test statistics,
   e) Correlation coefficient

4. Results and Interpretation

5. Recommendation.
General conditions of equilibrium

Resolution of forces acting at a point

Equilibrium conditions of moments

Coplanar forces (centroids)

Centre of gravity: centre of mass, simple forms, general formula for centre of gravity

Compound bodies, centre of gravity by integration

Friction: laws of friction and resistance, angle of friction, the least force problem involving sliding only

**MAT 322 LINEAR ALGEBRA 2 Credits Compulsory**

- Determinants
- Vector space over the real field, sub-space, linear independence, basis and dimension
- Linear transformations and their representational matrices; range, null space, rank, singular and non-singular transformation and matrices.
- System of linear equations, change of basis, equivalence and similarities
- Eigen values (latent roots) and given vectors (latent vectors)
- Minimum and characteristic polynomials of a linear transformation (matrix)
- Cayley –Hamilton theorem

**MAT 323 REAL ANALYSIS II 2 Credits Elective**

- Anti-derivative (Integration)
- Definition of Riemann integral
- Properties of Integrals and basic theorems (proof of the fundamental theorems of calculus
Absolute and conditional convergence

Radius of convergence

Power series

Uniform convergence

MAT 324 ABSTRACT ALGEBRA 2 Credits Elective

ALGEBRAIC STRUCTURES

- Grouped, semi group, monoid and group, subgroup
- Lagrange theorem, cyclic group, ring, integral domain, division, ring and field
- Polynomials: H.C.F and L.C.M of polynomials
- Factorisation

MAT 325 DIFFERENTIAL EQUATIONS 2 Credits Compulsory

- First–order differential equations
- Existence and Uniqueness of solution
- Example to be limited to equations of the types
  \[ \frac{dy}{dx} = f(x), \quad \frac{dy}{dx} = f(y) \]
- Use of boundary separation restricted only to easy integral
- Homogeneous Equations.
- Exact equations and integrating factor for non-exact equations
- Solution of \( n \)-th order differential equation. Example to be restricted to the equations of the type \( \frac{d^2y}{dx^2} = f(x) \)

Equations with constant co-efficient and Cauchy-Euler types should be treated.
Appendix B

(Primary Education Studies, Mathematics Contents)

PES 113: Mathematics in Primary Education Studies I (2 Credits) C

Objectives

By the end of the course, students should be able to:

Apply basic mathematical operations to solve elementary problems in Mathematics.

Demonstrate competence in the use of variety of methods and strategies for facilitating the learning of the primary school Mathematics curriculum.

Topics

Counting and place value and strategies for teaching place value.

Basic operation - addition and subtraction using these strategies: counting on, partial sum method, column-addition method, short algorithm, trade first method, counting up, left to right and partial difference, using number line and mental strategies.


PES 122: Mathematics in Primary Education Studies II (2 Credits) C

Objectives

At the end of the course, students should be able to:
school Mathematics curriculum. Apply Identified strategies of measuring Shapes, Space and Objects.

**Course Content**


**PES 222: Mathematics in Primary Education Studies (2 Credits)**

**Objectives**

By the end of this course, students will be able to:

Demonstrate skills in teaching primary Mathematics curriculum using child-centred strategies
design, produce and utilize relevant instructional materials (including locally sourced) for
effective teaching of the primary school Mathematics curriculum. Develop scheme of work
and lesson plans in accordance with National Primary School Mathematics Curriculum.

**Course Content**

Rationale for teaching Mathematics in Primary Schools. Child- centred strategies for teaching
e.g. number stories and word problems, Mathematics games, use of graphic organizers.

Development of syllabus, Schemes of Work and lesson plans in accordance with the National
Primary School Curriculum. (This should be linked with PES EDU 224 Micro-Teaching practice)
PES 324 Mathematics in Primary Education Studies III (2 credits) C

Objectives

At the end of the course, the student should be able to:

Demonstrate competence in different methods and strategies in teaching Algebra, Geometry and Statistics in the primary school Mathematics. Solve problems in Algebra, Geometry and Statistics from the primary school Mathematics curriculum.

Collect, organise, represent and interpret data in all forms that are relevant to the primary school Mathematics curriculum.

Course content

Open sentence and evaluation of simple algebraic expressions.

Collection of terms and removing brackets. Formation of words problems.

Simple equations and methods of their solution. Simultaneous equations using substitution method, elimination and graphical method. Word problems leading to simultaneous equation.

Simple problems in Geometry

Statistics: Methods of data collection. Data organisation: frequency distribution tables.

Data representation relevant to primary schools: pictogram, bar chart, pie chart, histogram, and line graph. Statistics: measures of central tendency (mean, mode, median)
Appendix C

DEPARTMENT OF SCIENCE EDUCATION

FACULTY OF EDUCATION

UNIVERSITY OF ILORIN

MATHEMATICS PROGRAM in NORTH-WESTERN NIGERIA

Dear Sir/Madam,

This questionnaire is designed to elicit honest response on Evaluation of the subject matter content of the NCE Mathematics Programme. All information given will be used purely for the purpose of this research and will be treated confidentially.

Thank you

Dambatta, B. U.

SECTION A: PERSONAL DATA

1. Sex: Male ( ) Female ( )

2. Highest academic Qualification: BSc. only ( ), BSc. With PGDE/NCE ( ) BSc. Ed/ B.Ed ( ), MSc. ( ), MSc. Ed/ M. Ed ( ), PhD. ( )

Others (Please specify)...........................................................................................................................

3. Class of your first degree: First class ( ), 2:1 ( ), 2:2 ( ), third class ( ), pass ( )

4. Rank: (i) Assist. Lecturer ( ) (ii) Lecturer III ( ) (iii) Lecturer II ( )

(iv) Lecturer I ( ) (v) Senior Lecturer ( ) (vi) Principal Lecturer ( )

(Vii) Chief Lecturer ( )
SECTION B

Instruction: kindly read each statement and put a tick (√) in the column provided that best represents your assessment of the NCE Mathematics Programme, using the following response scales

Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD)

<table>
<thead>
<tr>
<th>S/NO</th>
<th>STATEMENT</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
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<tbody>
<tr>
<td>1</td>
<td>The NCE Mathematics Programme’s philosophy is adequately suitable for satisfying the societal demand of qualified professional Basic School Mathematics teachers.</td>
<td></td>
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<tr>
<td>2</td>
<td>The NCE Mathematics Programme’s objectives are adequately suitable for satisfying the societal demand of qualified professional Basic School Mathematics teachers.</td>
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<td>3</td>
<td>The NCE Mathematics Curriculum content is suitable towards the achievement of the NCE Mathematics Programme’s philosophy and objectives</td>
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<tr>
<td>4</td>
<td>The NCE Mathematics Curriculum content is adequate towards the achievement of the NCE Mathematics Programme’s philosophy and objectives</td>
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<tr>
<td>5</td>
<td>The credit hours of teaching allocated to the courses in the NCE Mathematics Curriculum content are adequate.</td>
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<td>6</td>
<td>You were at least once involved in the development and/or periodic review of the NCCE Mathematics minimum standard.</td>
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</table>

II. Availability of facilities, for an NCE Mathematics Program (Input)

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<tr>
<th>S/NO</th>
<th>STATEMENT</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>The required facilities to run an NCE Mathematics Programme in your College are available.</td>
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<td>S/NO</td>
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<tr>
<td>11</td>
<td>There is at least a Mathematics Workshop in your College.</td>
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<tr>
<td>12</td>
<td>The resources in the Mathematics Workshop of your College are adequate.</td>
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<tr>
<td>13</td>
<td>There are at least three (3) lecture rooms and a lecture theatre in Mathematics department</td>
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<td>14</td>
<td>The Mathematics Department in your College has a Departmental library.</td>
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<td>15</td>
<td>The Departmental library has adequate number of current and relevant Mathematics textbooks, at least in the ratio of one student to ten books as stipulated in the NCCE minimum standard.</td>
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<td></td>
<td><strong>III. Availability of human resources, for an NCE Mathematics Program (Input)</strong></td>
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<td>16</td>
<td>The Mathematics department in your College has at least eight (8) academic staff as enshrined in NCCE minimum standard</td>
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<td>17</td>
<td>You have attended at least a conference, a seminar or a workshop that relates to Mathematics content or Mathematics teaching, within the last three (3) years</td>
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<td>18</td>
<td>You have facilitated at least a conference, a seminar or a workshop that relates to Mathematics content or Mathematics teaching, within the last three (3) years</td>
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<td>19</td>
<td>You can operate a computer</td>
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<td>20</td>
<td>You can browse an internet</td>
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<td>21</td>
<td>You browse an internet at least once a week</td>
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<td>22</td>
<td>The department has at least one of each of the following category of non-academic staff:</td>
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<td>Computer Operator</td>
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<td></td>
<td>Library Assistant/Attendant</td>
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<td></td>
<td>Laboratory Assistant/Attendant</td>
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<td></td>
<td>Typist/Secretary</td>
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<td></td>
<td>Office assistant</td>
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<td><strong>IV. Implementing the curriculum (Process)</strong></td>
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<td>23</td>
<td>You are always conscious of the philosophy of NCE Mathematics Programme while preparing and/or teaching any of the NCE Mathematics courses</td>
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<td>26</td>
<td>The admission of student in to an NCE Mathematics Programme is based on</td>
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<td></td>
<td>SSCE/NECO or TC II results only.</td>
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<td>27</td>
<td>The admission of student in to an NCE Mathematics Programme is based on</td>
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<td></td>
<td>SSCE/NECO or TC II results and points obtained in JAMB Examination only.</td>
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<td>28</td>
<td>The admission of student in to an NCE Mathematics Programme is based on</td>
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<tr>
<td></td>
<td>SSCE/NECO or TC II results and points obtained in an internally arranged qualifying examination within the College only.</td>
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<tr>
<td>29</td>
<td>In addition to SSCE or TC II and JAMB results, there is a need for another internally arranged qualifying examination within the College to select candidates for admission in to an NCE Mathematics Programme</td>
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<tr>
<td>30</td>
<td>There is a quality assurance unit/directorate in your College.</td>
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<tr>
<td>31</td>
<td>You are being supervised or monitored to ensure that you do your lectures as and when due.</td>
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<tr>
<td>32</td>
<td>Examinations in your College are being conducted in an adequate space that will not allow for examination malpractice.</td>
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<td></td>
<td>Examinations in your College is being conducted with adequate supervision in terms of invigilator student ratio.</td>
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<td>Examinations in your College is being conducted absolutely within the College examination’s rules and regulations.</td>
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<td>33</td>
<td>For a proper conduct of continuous assessments of your students, you use to have tutorials with your students.</td>
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<tr>
<td>34</td>
<td>You use to give exercises and/or assignments to your students at least once in every week.</td>
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<td>35</td>
<td>You use to mark all the exercises and assignments given to your students.</td>
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<tr>
<td>36</td>
<td>You use to give back to your students the marked exercises and assignments promptly.</td>
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<tr>
<td>37</td>
<td>You use to discuss the marked exercises and assignments with your students.</td>
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<td>38</td>
<td>You use to give test at least twice in a semester.</td>
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<td>39</td>
<td>Mathematics students on teaching practice are being supervised by</td>
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<tr>
<td></td>
<td>Mathematics lecturers only.</td>
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<td>40</td>
<td>Mathematics students on teaching practice are being supervised by</td>
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<tr>
<td></td>
<td>Mathematics lecturers and other lecturers in other departments.</td>
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<td>41</td>
<td>The quality of teaching practice of Mathematics students will be more enhanced if supervised by Mathematics lecturers only</td>
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<tr>
<td>42</td>
<td>The quality of teaching practice of Mathematics students will be the same irrespective of whether they are supervised by Mathematics lecturers only or by other lecturers in other departments</td>
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<tr>
<td>43</td>
<td>You employ Lecture method in teaching your students</td>
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<td>44</td>
<td>You employ Problem-solving approach in teaching your students</td>
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<tr>
<td>45</td>
<td>You make use of Demonstration in teaching your students</td>
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<td>46</td>
<td>You employ Experimentation in teaching your students</td>
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<tr>
<td>47</td>
<td>You employ Laboratory Method in teaching your students</td>
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<tr>
<td>48</td>
<td>You employ Discovery Method in teaching your students</td>
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<tr>
<td>49</td>
<td>You make use of Tutorials in teaching your students</td>
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<tr>
<td>50</td>
<td>You make use of Seminar in teaching your students</td>
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<tr>
<td>51</td>
<td>You make use of Drill in teaching your students</td>
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</tbody>
</table>
Appendix D

DEPARTMENT OF SCIENCE EDUCATION

FACULTY OF EDUCATION

UNIVERSITY OF ILORIN

BASIC SCHOOL SUPERVISORS’ QUESTIONNAIRE ON EVALUATION OF THE NCE MATHEMATICS PROGRAM IN THE NORTH-WEST, NIGERIA

Dear Sir/Madam,

This questionnaire is designed to elicit honest response on Evaluation of the subject matter content of the NCE Mathematics Programme. All information given will be used purely for the purpose of this research and will be treated confidentially.

Thank you

Dambatta, B. U.

SECTION A: PERSONAL DATA

1. Age: (i) 20-29 ( ) (ii) 30-39 ( ) (iii) 40-49 ( ) (iv) 50-59 ( )

2. Highest academic Qualification:  TC II Certificate ( ), SSCE Certificate ( ), NCE ( ), BSc. Ed/ B.Ed ( ), MSc. ( ), MSc. Ed/ M. Ed ( ), PhD. ( )

Others (Please specify)........................................................................................................................................................................

3. Supervision Experience at Basic School level: (i) 0-6 years ( ) (ii) 7-9 years ( ) (iii) Above 9 years ( )

SECTION B

Instruction: kindly read each statement and put a tick (✓) in the column provided that
## I. Objectives and Philosophy of NCE Mathematics Programme (Context)

<table>
<thead>
<tr>
<th>S/NO</th>
<th>STATEMENT</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NCE Mathematics Programme is suitable for the production of the needed Basic School Mathematics teachers, no need for bringing back the former Teacher Grade II Training Colleges Programme to replace the present Colleges of Education NCE Programme.</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>There is a need for bringing back the former Teacher Grade II Training Colleges Programme to replace the present Colleges of Education NCE Programme.</td>
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<tr>
<td>3</td>
<td>There is a need for bringing back the former Teacher Grade II Training Colleges Programme and be made the only way through which one can be admitted in to NCE Mathematics Programme.</td>
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## II. Category of Teachers in the Basic school (Input)

<table>
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<tr>
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<th>SA</th>
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<th>D</th>
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<tbody>
<tr>
<td>4</td>
<td>You have only NCE holders as Mathematics teachers in the Basic schools of the state.</td>
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<td>5</td>
<td>Majority of Mathematics teachers in the Basic schools of the state are NCE holders.</td>
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<tr>
<td>6</td>
<td>Majority of Mathematics teachers in the Basic schools of the state are not NCE holders.</td>
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## III. Implementing the curriculum (Process)

<table>
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<tr>
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<th>SA</th>
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<th>SD</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>NCE Mathematics Programme is satisfactorily producing the needed qualified and professionally trained pre-service Mathematics teachers for Basic School.</td>
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<tr>
<td>8</td>
<td>The trained pre-service Mathematics teachers through NCE Mathematics Programme are being satisfactorily trained in both Mathematics content and Mathematics methodology.</td>
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<tr>
<td>9</td>
<td>The trained pre-service Mathematics teachers through NCE Mathematics Programme are being more trained in Mathematics content than in Mathematics methodology.</td>
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<tr>
<td>10</td>
<td>The trained pre-service Mathematics teachers through NCE Mathematics Programme are being more trained in Mathematics methodology than in Mathematics content.</td>
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<tr>
<td>11</td>
<td>There exist a feedback process between State Primary Education Boards and the Colleges of Education about the productivity of the NCE graduates.</td>
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<tr>
<td>12</td>
<td>As Basic School supervisor you use to share your reports and findings with Colleges of Education on matters that affect NCE products for the purpose of improvement.</td>
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</table>
The state Universal Basic Education Board (SUBEB) use to share its annual reports with Colleges of Education on matters that affect NCE Mathematics teachers' productivity for the purpose of improvement as well as areas of need.

### IV. Product of Basic schools (Product)

- NCE Mathematics teachers produce qualitative pupils of Mathematics in the Basic schools in the state.
- NCE Mathematics teachers handle their pupils with professional expertise better than non-NCE holders.
Appendix E

TEST INSTRUMENTS

Time: 1 hr, 30 minutes

Instructions: This paper has two (2) sections (A & B), answer all question in section “A” and any four (4) questions in section “B”.

SECTION A OBJECTIVE ITEMS

1. Solve the equation: \( \frac{6}{x-4} = \frac{5}{x-2} \)
   
   a) -32  
   b) 8  
   c) 32  
   d) 16

2. Simplify: \( \left( \frac{7}{3} - \frac{2}{3} \right) \div \left( \frac{7}{3} + \frac{2}{3} \right) \)
   
   a) \( \frac{7}{180} \)  
   b) \( \frac{16}{85} \)  
   c) \( \frac{22}{165} \)  
   d) \( \frac{12}{85} \)

3. Convert 37\text{ten} to binary number
   
   a) 101001_2  
   b) 101100_2  
   c) 100110_2  
   d) 100101_2

4. The angle of elevation of the top of a building is 25° from a point 70 m away on ground level. Calculate the height of the building correct to 2 significant figures.
   
   a) 30 m  
   b) 33 m  
   c) 45 m  
   d) 32 m

5. Arrange the following in the order in which you will teach them: Multiplication of numbers, counting of numbers, Addition of numbers.
   
   a) Counting of numbers, Addition of numbers then Multiplication of numbers
   
   b) Multiplication of numbers, counting of numbers then Addition of numbers
   
   c) Addition of numbers, Multiplication of numbers then Counting of numbers
   
   d) Counting of numbers, Multiplication of numbers then Addition of numbers
7. If 3 is added to three quarter of a certain number, the result is 30. Find the original number.
   a) 36  b) 27  c) 108  d) 16

8. If the cost price of an article is \( \text{₦}1.50 \) and a profit of 40% is made. Find the selling price.
   a) \( \text{₦}1.80 \)  b) \( \text{₦}2.00 \)  c) \( \text{₦}2.40 \)  d) \( \text{₦}2.10 \)

9. Which of these expressions is a factor of \( x^2 + 3x - 54 \)
   a) \( x - 6 \)  b) \( x + 6 \)  c) \( x - 9 \)  d) \( x - 18 \)

10. An Isosceles triangle has a vertical angle of 116° and its base is 8 cm long. Calculate its height.
    a) 4 cm  b) 1.5 cm  c) 3.5 cm  d) 2.5 cm

11. Write 256 in Roman Numerals
    a) XXLVI  b) CCLVI  c) LLXC  d) XCIV

12. Which of the shapes below is/are 3-dimensional shape(s)?

   ![Shapes]

   a) 1 only  b) 1 and 2 only  c) 2 and 3 only  d) 1 and 3 only

13. A cone is 8 cm high and has a base diameter of 12 cm, its slant height is
    a) 6 cm  b) 8 cm  c) 10 cm  d) 12 cm

14. How much interest does \( \text{₦}40000 \) make in 5 years at 7% per annum?
16. Learning aids in a Mathematics lesson are those materials that help the learner to learn
   a) Abstract and nice  b) Physical and abstract
   c) Concrete and abstract  d) Physical and concrete

A bag contains 5 red balls, 3 white balls, 2 green balls and 4 blue balls. (Use this information to answer questions 35-38)

17. If a ball is picked at random from the bag. What is the probability that it is blue?
   a) $\frac{5}{14}$  b) $\frac{3}{14}$  c) $\frac{2}{7}$  d) $\frac{3}{7}$

18. What is the probability of not picking a white ball?
   a) $\frac{9}{14}$  b) $\frac{12}{14}$  c) $\frac{11}{14}$  d) $\frac{13}{14}$

19. What is the size of the angle that the diagonal of a square makes with its sides?
   a) $180^0$  b) $45^0$  c) $360^0$  d) $60^0$

20. A line which crosses two or more parallel lines is called:
   a) Diagonal line  b) Symmetry line  c) Transversal line  d) Perpendicular line

21. Three boys shared 54 oranges in the ratio 2:3:4. How many oranges has the boy with the largest share?
   a) 12  b) 24  c) 24  d) 48

22. Calculate the length of the hypotenuse of the triangle below, to 2 significant figures
23. If the area of a square is 49 cm$^2$, find its perimeter.
   a) 49 cm  b) 28 cm  c) 7 cm  d) 14 cm

24. Which of these teachers is NOT arousing students' interest in Mathematics?
   a) Mr. A always engage his students with challenging mathematical activities and appropriately guides them
   b) Mr. B always stresses the relation of Mathematics to other disciplines and things in the environment
   c) Mr. C introduced a Mathematics club and encourages students to join and actively participate in the activities of the club.
   d) Mr. D always gives assignment but do not give feedback for students to know their errors or mistakes.

25. In the figure below, if $x = 35^\circ$ and $y = 105^\circ$, find the sum of $z$ and $w$
   a) $220^\circ$  b) $280^\circ$  c) $360^\circ$  d) $190^\circ$
SECTION B ESSAY

Instructions: Answer any four (5) questions in this section

1. Six pencils and three erasers cost ₦234

   Five pencils and two erasers cost ₦184

   How much does each cost?

2. The question below was given to one of your pupils, and the answer is marked as indicated:

   Which of the following is not a quadrilateral?
   a. Parallelogram
   b. Rhombus
   c. Pentagon
   d. Rectangle

   (i) Is it correct?
   (ii) If it is not correct, what is the correct answer and if it is correct, what makes it correct?
   (iii) Sketch a quadrilateral

3. A sector of a circle of radius 10 cm and angle 216° is bent to form a cone. Find the following:
   (i) The radius of the base of the cone.
   (ii) The curved surface area of the cone

4. A student was given two fractions $\frac{3}{4}$ and $\frac{2}{3}$ to add. The solution is given as: $\frac{3}{4} + \frac{1}{5} = \frac{4}{9}$
5. Given the data in the figure below

a) Find AC and

b) Hence find the value of Cos C

6. The distance covered by a car travelling at a constant speed is given by the formula
\[ d = tv \]
where \( d \) km is the distance travelled, \( t \) is the time taken and \( v \) km/h is the speed.

a) What is the distance covered when the speed is 120 km/h and the time is 4 hours

b) What time is taken for a journey of 45 km at a speed of 70 km/h?

7. One of your pupils was to add \( \text{£}32 \) and \( \text{£}18 \) together and he presented the solution thus:

\[
\begin{array}{ccc}
& K \\
3 & 2 \\
1 & 8 \\
\hline
5 & 0
\end{array}
\]

(i) Is it correct?
Appendix F

Solution and Marking Scheme

Section (A). Each question in this section carries 2 marks (total = 50 marks)

1. b
2. b
3. d
4. b
5. a
6. c
7. a
8. d
9. a
10. d
11. a
12. c
13. c
14. a
15. c
16. d
17. c
18. c
23. d

24. d

25. a

Section B. Each question in this section carries 10 marks (total = 50 marks)

1. Six pencils and three erasers cost ₦234

   Five pencils and two erasers cost ₦184

   How much does each cost?

   Solution:

   Let a pencil be \( p \) and let an eraser be \( e \). Then the question is now written as: (2 mks)

   \[
   6p + 3e = 234 \quad \text{(I)}
   \]

   \[
   5p + 2e = 184 \quad \text{(II)}
   \]

   Then dividing (I) by 3 changes (I) to become: \( 2p + e = 78 \) (1 Mark)

   Thus: \( e = 78 - 2p \) (III). (1 Mark)

   \( \therefore \) Substituting (III) in (II) gives:

   \[
   5p + 2(78 - 2p) = 184 \quad \text{(1 Mark)}
   \]

   \[
   5p - 4p = 184 - 156 \quad \text{(1 Mark)}
   \]

   \( p = 28 \) (1 Mark)

   Now substituting \( p = 28 \) in (III) gives:

   \( e = 78 - 56 \) (1 Mark)

   \( e = 22 \) (1 Mark)
2. The question below was given to one of your pupils, and the answer is marked as indicated:

Which of the following is not a quadrilateral?

- e. Parallelogram
- f. Rhombus
- g. Pentagon
- h. Rectangle

(i) Is it correct?

(ii) If it is not correct, what is the correct answer and if it is correct, what makes it correct?

(iii) Sketch a quadrilateral

Solution:

(i) No, it is not correct. (2mks)

(ii) The correct answer is (g), pentagon. (3mks)

(iii) Any four sided figure is required e.g. (2mks)

3. A sector of a circle of radius 10 cm and angle 216° is bent to form a cone. Find the following:

   (i) The radius of the base of the cone.
   
   (ii) The curved surface area of the cone
Base of the cone is the same as the length of the arc of the sector

Thus \( 2\pi r = \frac{\theta}{360} \times 2\pi R \) where \( \theta \) = angle of the sector (1 Mark)

(i) \( \therefore \) The radius of the base of the cone is

\[
r = \frac{\theta}{360} \times 2\pi R \times \frac{r}{2\pi}
\]

\[
\therefore r = \frac{216}{360} \times 10
\]

\( \therefore r = 6 \text{ cm} \) (1 Mark)

(ii) Let the curved surface area of the cone be \( S \).

Thus \( S = \) the area of the sector from which the cone is formed. (1 Mark)

\[
\leftarrow S = \frac{\theta}{360} \times \pi r^2
\]

\[
\leftarrow S = \frac{216}{360} \times \frac{22}{7} \times 10^2
\]

\( = 188.57 \text{ cm}^2 \) (1 Mark)

4. A student was given two fractions \( \frac{3}{4} \) and \( \frac{2}{3} \) to add. The solution is given as: \( \frac{3}{4} + \frac{1}{5} = \frac{4}{9} \)

Is it correct?
Solution:

(i) No, it is not correct (2 Mark)

(ii) The correct answer is 19/20 (2 Mark)

(iii) such a student can be helped to add up correctly through the following steps:

- The teacher will help the student to have a conceptual understanding of fractions generally and particularly the fractions \( \frac{3}{4} \) and \( \frac{1}{5} \) using concrete materials like strips of papers, oranges etc cut in to appropriate portions. (2 mark)
- Then the additions will be shown using the strips. (1 Mark)
- Next the fractions will be converted into their equivalent forms. (2 Mark)
- Then the equivalent forms can now be easily added. (1 Mark)

5. Given the data in the figure below

a) Find AC and

b) Hence find the value of \( \cos C \)

Solution:

a) Find AC

Let AC be \( b \).

Then by Pythagoras theorem:

\[ b^2 = 8^2 + 6^2 \] (2 Mark)
6. The distance covered by a car travelling at a constant speed is given by the formula
\[ d = tv \] where \( d \) km is the distance travelled, \( t \) is the time taken and \( v \) km/h is the speed.

a) What is the distance covered when the speed is 120 km/h and the time is 4 hour?

b) What time is taken for a journey of 45 km at a speed of 70 km/h?

Solution:

a) \[ d = tv \]

\[ t = 4, \ v = 120 \ \text{km/h} \]  

\[
\therefore \ d = 4 \times 120 \]

\[ = 480 \ \text{km} \]

\[ (1 \ \text{Mark}) \]

b) Since \( d = tv \)

Then \[ t = \frac{d}{v} \]  

\[ \text{But } d = 45 \ \text{km} \]

\[ v = 70 \ \text{km/h} \]

\[ \therefore \ t = \frac{45}{70} \]  

\[ (1 \ \text{Mark}) \]
7. One of your pupils was to add \( \text{₦}32 \) and \( \text{₦}18 \) together and he presented the solution thus:

\[
\begin{array}{c}
\text{₦} \\
32 \\
18 \\
\hline
50 \\
\end{array}
\]

(i) Is it correct?

(ii) If it is not correct, what makes it not correct and if it is correct, what makes it correct?

(iii) If it is not correct, how can you help such a student to add up correctly?

Solution:

(i) No, it is not correct (2 Mark)

(ii) It is not correct, because of wrong arrangement. (2 Mark)

(iii) such a pupil can be helped to add up correctly through the following steps: (1 Mark)

- The teacher will help the student to have a conceptual understanding of correct place value of Naira and kobo based on their understanding of tens and unit (assuming there is such a background). (1 Mark)

- Examples will be shown as to how to arrange all the Naira under the Naira column, and all the kobo under kobo column. (1 Mark)

- That kobo can only come under naira column when there is as much as hundred of them (1 Mark)

- That any Naira that comes under kobo column is in multiple of hundred. (1 Mark)

- Ones proper arrangement is made then addition takes its natural way. (1 Mark)