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# INSTRUCTIONAL PERSPECTIVES IN MATHEMATICS TEACHER EDUCATION PROGRAMME IN NIGERIA

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## ABSTRACT

*The study was designed to examine the historical perspective and chronological state of teacher education programme from pre-colonial period to the present day with more emphasis on the Mathematics education at Colleges of education in the southwestern part of Nigeria. Four instruments were developed, adapted, validated and used for the study. They included Input Questionnaire (IQ, r = 0.72), Process Questionnaire (PQ, r = 0.76), Product Questionnaire (PDQ, r = 0.86) and Inventory of Mathematics resource in the colleges in line with Standard Minimum for National Commission for Colleges of Education (NCCE). Samples to the study included 165 final year Mathematics students and 30 Mathematics lecturers in the six Colleges of education in the southwestern part of Nigeria, via a clustered sampling technique. The findings revealed that there was dismal performance of students in Mathematics with the mean scores of 44.4% and standard deviation 2.9 in the administered achievement test in mathematics. The teaching practice grade's means score was 58.4%. This translates to non-attainment of the stated objectives of the NCE Mathematics in relation to the criterion reference of the NCE scoring and grading points where 44.4% represented a lower pass. Furthermore, it was discovered that there was gross inadequate Mathematics resources to aid teaching and learning of Mathematics in the colleges as recommended numbers by the NCCE were not met by the colleges. Also, it was observed that students' centered method of teaching expected by the NCCE was not adequately used due to the low teaching effectiveness of Mathematics lecturers with mean score 49.7% as observed in the classroom. It was therefore recommended that strict compliance of course accreditation by the NCCE should be enforced in the colleges so as to bring about a meaningful development in Mathematics education.*

## INTRODUCTION

On the informal and non-formal grounds, the development of teacher education is as old as man. Competent educators like Solaru (1964), Taiwo (1980), Fafunwa (1982) and Osokoya (1997) have properly documented these historical and educational perspectives. At the non-formal level, the training of young and adult generations was based on apprenticeship system. The learners were expected to spend a considerate period at the discretion of the master in the acquisition of skills and knowledge that would lead to the mastery of such trade e.g. carpentry. However, the influx of the early missionaries with the mission of spreading the gospel sharpened the non-formal teacher education called vocational ones into formalized ones as these missionaries were in need of local men that would interpret the Bible to Africans, Nigerians in particular. This brought the training of local interpreters, lay readers and messengers to facilitate the work of evangelism (Fafunwa, 1974; 1991). The Church Missionary Society (C.M.S.) established the first teacher-training college in Abeokuta in 1859 though it was moved to Lagos in 1867, and later moved to Oyo in 1896 to become St. Andrews College, Oyo. Other denominations like Baptist founded Baptist Training College at Ogbomosho in 1897, the Wesleyan Methodist Missionary society established an institute for the training of catechists and teachers in Ibadan in 1905, the Presbyterian Church of Scotland established Hope Waddell (Training) Institute in 1892 for purpose of skills acquisition and preachers, while Nassarawa school was established in the Northern part of Nigeria by the government in 1909 under the control of Hanns Vischer.

The curriculum of the aforementioned institutes were theology and teaching methods as the would-be catechists had to teach some classes, and those trained teachers were to serve as evangelists/Catechists. The syllabus consisted of testament criticism, Christian faith, school method and management, preaching and theology, Hygiene, Geography (foreign ones), History, English, Geometry, Arithmetic, local language, carpentry and Masonry. The major weakness of those institutes was that none of them offered all the above-mentioned subjects due to lack of trained tutors, funds and equipments as each institute's requirements varied. Though the early teacher-training institutes got their students from standard IV yet the weakness identified brought into limelight in 1925 of Phelps-Stokes Report, which criticized the system, missionaries' ill-conception of the need and purpose of African education, which gave birth to 1929 merger that had two types of teacher-training institutions the Elementary Training College



(E.T.C.) and Higher Elementary Training College (H.E.T.C.) with grade III teachers certificate and Grade II teachers certificate respectively. The successful completion of Grade III course and mandatory teaching of two years led to admission into Grade II course. This was the practice until 1932 when Yaba Higher College started a three-year course for teachers till 1948 when the college was merged with University College, Ibadan in the Faculty of education, leading to a diploma certificate but the practice stopped in 1950. This was due to the reports of Elliot Commission (1945) on the need to build higher education on sound foundation so as to cater for the increasing need of primary and lower level of secondary education, and the inadequacies in these systems concerning teachers' qualities. This report recommended among others that out of every two teachers in a secondary school there should be a graduate, hence the recommendation for the production of grade I teachers referred to as qualified non-graduate teachers. These non-graduate teachers upon the completion of their study were to enjoy a two-year degree programme in the affiliated universities.

In an attempt to satisfy the existing primary and lower levels of secondary educations' population explosion in term of qualified teachers, both the federal and state governments established different colleges named Advanced Teacher Training Colleges from 1961-76 (Ichukwu, 1998). The major weakness of the system was admission discrimination to some college graduates due to the non-affiliation of their colleges to the existing universities which those graduate had chosen as choice. This anomaly brought the conferences of curriculum planners and various educational stakeholders in the early 80s where it was decided that uniformity of standard graduates of Advanced Teacher Training Colleges should be upheld. To ensure this a body like National Universities Commission, National Board for Technical Education should be established. Hence, the establishment of National Commission for Colleges of Education (NCCE) in 1989 by Decree 5 Number 3 sections (c) and (d). This body controls the academic programmes of all the Colleges of education in their various disciplines such as Arts, Sciences and Social Sciences.

In fact, the primary goal of Colleges of education as stated in the standard minimum guides was to produce professional non-graduate teachers for primary and junior secondary schools for Mathematics Teacher Education for instance, the following objectives have been spelt out upon the successful completion of the 3-year programme. Students should be able to:

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

(ii) Solve abstract problem using Mathematics functions and formulae;
(iii) Motivate pupils' interests in Mathematics by the use of appropriate strategies, particularly at the primary and junior secondary schools;
(iv) Analyze relationships in quantitative terms;
(v) Apply the computer to data processing;
(vi) Demonstrate convincing enthusiasm and intellectual ability for further studies in Mathematics (NCCE, 1996).

In order to achieve this, the programme spelt out the Mathematics curriculum and credit allocation for the students to become a professional non-graduate Mathematics teacher as shown in table 1.

**Table 1**
**NCE Mathematics Curriculum & Credit Allocation**

| Courses | Mathematics | Second teaching subject | Education | General study | Teaching practice | Total |
|---|---|---|---|---|---|---|
| Credits | 36 | 36 | 36 | 12 | 06 | 126 |
| Minimum Credit | | | Maximum Credits | | | |
| 126 | | | 130 | | | |

Source: NCCE Manual (1996)

The breakdown of the Mathematics course is as presented in table 2, having been structured by different experts in Mathematics and according to levels.

**Table 2**
**Mathematics course of NCE per levels**

| Year One | Year Two | Year Three |
|---|---|---|
| Algebra, Trigonometry | Number theory | Dynamics, Real analysis I, Static, LinearAlgebra |
| History of Mathematics | Problem solving | Real Analysis II |
| Basic concepts in Mathematics | Mathematics laboratory | Differential Equation and Abstracts Algebra |
| Differential Calculus, Coordinate Geometry | Practical Statistics and Probability | |
| Mathematics Methodology and Introduction to Computer Studies | Integral Calculus and Vector Analysis | |



The course structure in table 2 is an outcome of the NCCE syllabus review committee report (1994). This recommended that dismal performance of students in Mathematics at the college was due to the broad nature of some courses which time did not permit the lecturers to give adequate coverage for the students' understanding. Hence the breakdown, as the professional non-graduate teachers of Mathematics after the completion of their programme served as the teachers in the primary and secondary school levels.

However, students' academic performance in Mathematics in spite of this development still remains dismal. This is corroborated by the studies of Adamolekun (2002) and Olaoye (2004) with latter showing the academic performance of students in Mathematics of the six colleges of education in the southwestern part of Nigeria over the period of 1990/91 to 99/2000 as shown in table 3 and Fig I.

**Table 3**
**Percentage of students who made grade 'C' above and below 'C' in six colleges of education from 90/91-99/2000**

| Sessions | 90/91 | 91/92 | 92/93 | 93/94 | 94/95 | 95/96 | 96/97 | 97/98 | 98/99 | 99/00 |
|---|---|---|---|---|---|---|---|---|---|---|
| Below Grade C | 64.8 | 74.8 | 60.6 | 60.9 | 62.8 | 71.6 | 66.4 | 67.0 | 69.7 | 75.6 |
| Grade C & Above | 35.2 | 25.2 | 39.4 | 39.1 | 37.2 | 28.4 | 33.6 | 33.0 | 30.3 | 24.4 |
| Total Candidate | 301 | 361 | 403 | 322 | 307 | 425 | 357 | 388 | 320 | 242 |

**Source:** Academic offices of the colleges of education in the southwestern Nigeria, 2004.

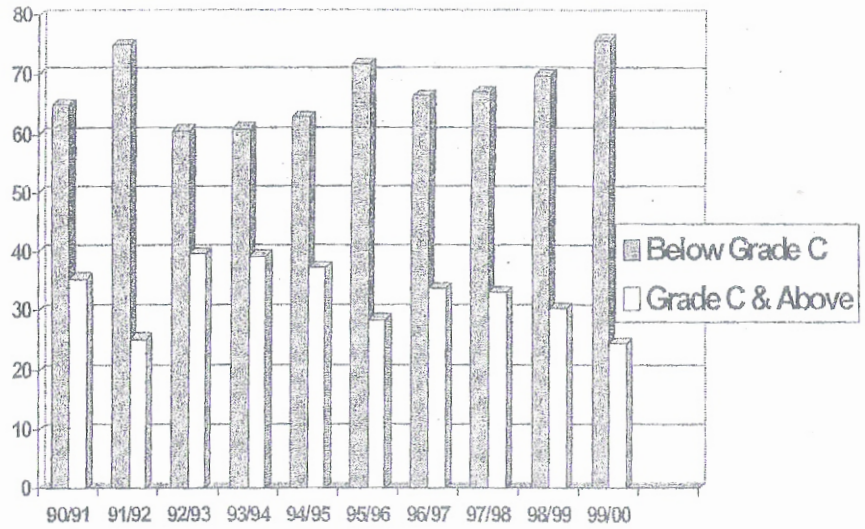


**Fig. I: Bar chart illustration of Table 3.**

As a result, the present determines the academic performance of students in Mathematics and the possible constraints in the implementation and execution of the various measures put forward by the NCCE.

## Statement of the problem

The study was designed to examine the extent to which the goal of Nigeria Certificate in Education Mathematics programme has been met in terms of students' performance in Mathematics. Specifically, the study sought answers to the following:

(a) What is the level of NCE Mathematics students'
  (i) Performance in Mathematics?
  (ii) Teaching practice grade?

(b) What are the available recommended Mathematics resources for the teaching and learning of Mathematics?

(c) Are the teaching – learning processes students - centered?





## Methods

### Research Design

The study employed expost-facto research design, where there was no manipulation of any variable of interest. Variables in the study include independent variables like teaching-learning facilities and effectiveness, and dependent variable is the students' performance.

### Population

The population to the study included all the Colleges of Education that run Mathematics Education in Nigeria.

Sample and Sampling Technique

Six Colleges of Education that run 10-subject combination of Mathematics programme out of approved 20-subject combination for all Colleges of Education were sampled via clustered sampling technique, based on logistics and Mathematics-subject combination at the NCE level. One hundred and sixty-five final year Mathematics students were selected into the study due to the course attrition rate that is minimal at 300 levels (NCCE, 1996) and also they must have been exposed to over 90% of Mathematics syllabus(Table 2,year III). 30 Mathematics lecturers were involved with 5 from each College. This is part of context provision for the accreditation of Mathematics Education programme in the Colleges of Education (NCCE, 1996).

### Instruments

Four instruments were adapted, validated and used for the study. These included: (I) Input questionnaire; (a) with coefficient of reliability = 0.72); (2) Process questionnaire; (b) coefficient of reliability = 0.76); (3) Product questionnaire; (c) coefficient of reliability = 0.86) and Inventory of Mathematics resources in the Colleges designed in line with expectation of standard minimum guide (NCCE, 1996). (a) made-up of three sections A, B and C. Section A comprised of the lecturer's bio-data that constituted five items, B contained 42 items on availability/non-availability of recommended Mathematics textbooks and facilities; and C contained 42 items of extent of utilization or otherwise of the materials mentioned in section B including school' timetable on Mathematics and workload of lecturers. (b) contained three sections A, B and C out of which A comprised of six broad-rating values that made of 30 items used in rating individual lecturer while on teaching by the trained two research assistants. These research assistants were equipped with Classroom interaction sheets and Time rating schedule

o the students of individual lecturer; who were rated in line with Flander 1970) pattern. (c) comprised of two sections namely Student's attitude owards Mathematics and lecturers including time-table. Other parts ontained 30 multiple choice objectives in Mathematics that span over all /hat students had learnt in the course of Mathematics Education rogramme. (d) spelt out 44 items expected to be on ground as well as tipulated quantities (NCCE, 19966). This was personally used by the esearcher to determine the conformity of the Colleges to the accreditation f the programme.

**alidation of instruments**

he content validities of instruments was carried with help of senior colleagues evaluation, having been presented twice in a fortnight interval to some elected personnel in one College of Education outside the selected ones r the main study. Thereafter the entire instruments were reconstructed nd administered to few students in the pilot college.

**eliability of instruments**

'ith the aid of test-retest method of reliability of instruments the Kuder-chardson formulae (KR-21) was used to compute all aforementioned rrelation coefficients. All the Mathematics courses were obtained in the andard minimum guide of NCCE (1996). As precondition for the setting Achievement, past questions in Mathematics of the pilot college was mpled for period of 5 years were used.

**ndings**

Q 1: What is the level of NCE Mathematics Students?'
Performance in Mathematics?
) Teaching practice grade?

ble 4 Mean scores and standard deviation of students' performance in athematics and teaching practice grade.

**able 4**
**udents' Achievement scores in the administered Mathematics test nd Teaching practice grades**

| ariables | Count (n) | Mean | Standard deviation |
|---|---|---|---|
| erformance in Mathematics | 165 | 44.4% | 2.90 |
| Teaching practice grade 165 | 58. | 4% | 5.50 |





**Table 5**
**Criterion referenced scores of the NCCE**

| Score (%) | 70-100 | 60-69 | 50-59 | 45-49 | 40-44 | 0-39 |
|---|---|---|---|---|---|---|
| Grade | A | B | C | D | E | F |
| A | 5.00 | 4.00 | 3.00 | 2.00 | 1.00 | 0.00 |
| PA | 4.50-5.00 | 3.50-4.49 | 2.40-3.49 | 1.50-2.39 | 1.00-1.49 | 0.00-0.99 |
| Level of Pass | Distinction | Credit | Merit | Pass | Lower Pass | Failure |
| Equivalent | 70% | 60% | 50% | 45% | 40% | 39% |
| Frequency | 0 | 2 | 20 | 36 | 38 | 69 |
| Frequency | 2 | 86 | 66 | 07 | 04 | 0 |

Tables 4 and 5 showed the academic performance of students in the achievement test in Mathematics, teaching practice scores and the reference points of grading as recommended by the NCCE. It was observed that students' mean score in Mathematics was 44.4% representing lower pass of the NCCE and teaching practice grade's mean was 58.4% representing upper merit though closer to credit level. The implication is that generally, students have not performed well in Mathematics towards the attainment of the goal of the NCCE programme. At least in the objective of NCCE Mathematics programme, it was stated that students should be able to demonstrate a convincing enthusiasm towards advancement in future Mathematical endeavours. The implication of this finding is that the set of the graduates under discussion cannot not be said to be adequately equipped to face the challenges ahead. In fact, this assertion was corroborated by Adeye-Oluwa (2003) stressing that teacher education needs reviewing.

RQ 2: (b) What are the available recommended Mathematics resources for the teaching and learning of Mathematics?

**Table 6**
**Inventory of Mathematics Resources in the Colleges**

| Items/Textbooks | Quantities available | % Short fall |
|---|---|---|
| Flannel Boards | 08 | |
| Probability instruments | 12 | (-) |
| Tracks and trolley | 03 | (-) |
| Abacus | 20 | 50% |
| Raybometer | 03 | (-) |
| Inclined plane | 07 | 50% |
| Wall charts | 08 | (-) |
| Measuring tapes | 24 | (-) |
| Double protractor | 09 | (-) |
| Meter rule | 04 | (-) |
| Fly wheel machine | 03 | 33% |
| 2 by 3 Geometric instrument | 09 | 50% |
| Instructor compass & protractor | 11 | (-) |
| Views instruments | 07 | (-) |
| Spherical globe | 05 | 17% |
| Mini-computers | 03 | 50% |
| Overhead projector | 01 | 83% |
| Graph board | 06 | (-) |
| Geo-board | 05 | 17% |
| Mathematical tables | 06 | (-) |
| MAT 111-Algebra | 35 | (-) |
| MAT 112-Trigonometry | 10 | (-) |
| MAT 113-History of Mathematics | 05 | 17% |
| MAT 114-Basic concept in Mathematics | 02 | 67% |
| MAT 121-Differential calculus | 15 | (-) |
| MAT 122-Coordinate geometry | 17 | (-) |
| MAT 123-Mathematics methods | 02 | 67% |
| MAT 124-Introduction to computers | 04 | 33% |
| MAT 211-Number theory | 04 | 33% |
| MAT 212-Problem solving | 01 | 83% |
| MAT 213-Mathematics history practical | 0 | 100% |



| | | |
|---|---|---|
| MAT 214-Statistics & probability | 18 | (-) |
| MAT 221-Intergral calculus | 05 | 17% |
| MAT 222-Vector analysis | 09 | (-) |
| MAT 311-Dynamics | 01 | 83% |
| MAT 312-Real analysis I | 07 | (-) |
| MAT 321-Static | 02 | 67% |
| MAT 322-Linear algebra | 11 | (-) |
| MAT 323-Real analysis II | 04 | 33% |
| MAT 324-Differential equation | 10 | (-) |
| MAT 325-Abstract algebra | 10 | (-) |
| Mathematics laboratory studio | 03 | 50% |

Table 6 shows the inventory of Mathematics resources in the Colleges, which were grossly inadequate to the recommended quantities by the NCCE. (-) showed the relative quantities available in terms of personnel to teach Mathematics in the Colleges while the extent of inadequacy to both Mathematics students and lecturers were identified by the corresponding percentages. The implication of this was that teaching-learning process would be skewed towards whatever lecturers said in the classroom without any further studies from the students to cross-validate the proof on one hand and the knowledge of the subject matter by the lecturers was based on the professional training. This situation called for the in-service training to improve the level of knowledge in Mathematics for the contemporary periods.

RQ 3 ( c ) Are the teaching-learning processes student-centered?

**Table 7**
**Mean & Standard deviation of Observed teaching effectiveness of Mathematics lecturers**

| College | codeCount (n) | Mean | Standard Deviation | Min | Max |
|---|---|---|---|---|---|
| 1.00 | 5 | 58.4 | 12.85 | 50 | 67.5 |
| 2.00 | 5 | 48.0 | 5.15 | 44.2 | 53.3 |
| 3.00 | 5 | 49.2 | 8.31 | 41.7 | 58.3 |
| 4.00 | 5 | 49.0 | 5.63 | 41.6 | 54.2 |
| 5.00 | 5 | 48.7 | 3.44 | 45.8 | 52.2 |
| 6.00 | 5 | 48.3 | 5.34 | 43.3 | 53.3 |
| **Total** | **30** | **49.7** | **7.66** | **41.7** | **67.5** |

Table 7 shows the mean score and standard deviation of the Mathematics lecturers of each College having been rated on the expected six roles to make the teaching student- centered. The roles were 'planner', 'introducer', 'question sustainer', 'manager', 'rewarder', and 'value-investor' using Flander

(1970) approach. On the whole, the mean score of teaching effectiveness was 49.7%, which showed that teaching was not closely related to student-centered as recommended by the NCCE, which believed that students-teacher ratio of 25:1 would bring about good teaching effectiveness to ensure student-centered teaching.

## CONCLUSION

Mathematics as a subject and by design is regarded as the most important key subject and language of science and technology in the contemporary period. If it is developed among the students appropriately it makes a better society, if it is not applied appropriately, it enslaves the society in misery, poverty and ignorance coupled with diseases. When ignored, it destroys the entire society. Unimaginable destruction of life and progress of society starts from ill-conceived and not well prepared Mathematics teachers that should the life of the young generation. From the findings, it was obvious that there was low level performance of students in Mathematics emanated from the inadequate resources as well as poor instructional delivery. The latter have contributed to the poor performance of students and consequently poor performance at primary and junior secondary schools; adjudging therefore that the state of Mathematics teachers has not improved.

## RECOMMENDATION

Based on the findings and discussion, it is hereby recommended that strict condition of course accreditation of programme should be enforced thereby discouraging the provision of interim accreditation in teacher education programme - an interim accreditation that would have produced half-baked teachers if allowed to continue. Furthermore, the provision of adequate instructional materials is imperative in order to improve the quality and quantity of Mathematics teachers to lower levels of educational sectors. The idea of abstraction which students have towards Mathematics is not unconnected to the manner of preparing their teachers, who eventually pass the same to the down-stream levels. No aspect of Mathematics is indispensable except be that those teachers entrusted with the contents of Mathematics do not understand the excellent use of the contents, hence the need to correct the identified lapses.



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