

# ASSESSMENT OF THE AVAILABILITY OF TEACHING FACILITIES AND PERSONNEL IN THE DEPARTMENTS OF MATHEMATICS IN COLLEGES OF EDUCATION OF NORTH EAST, NIGERIA

By

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## Abstract

The Nigeria Certificate in Education Mathematics (NCE) Programme is designed to produce Basic Education Mathematics teachers with appropriate knowledge and good understanding of teaching Mathematics at the Basic Education level. However, despite the good objective of the programme, there is a wide criticism of the NCE Mathematics teachers in recent times. There is a general lack of achievement in Mathematics at the Basic Education level, which many attribute to Mathematics teachers lack of competence. Although a programme may be good, it must be implemented properly to achieve its desired objectives. It is against this backdrop that this research was conducted on the availability of facilities and personnel required for the proper implementation of the programme in the North Eastern States Colleges of Education in Nigeria. A sample of eight out of fifteen Colleges that offer Mathematics from the region were selected based on convenience. Data was collected using a checklist, developed from National Commission for Colleges of Education (NCCE) departmental requirements and a Focus Group Discussion. Analysis of the result shows that most of the departments have the minimum required number of lecturers. However, none of the departments has adequate number of the required facilities. It is recommended among others that, in order to improve the performance of the pre-service Mathematics teachers, it is necessary to equip the departments with the required teaching facilities so that Mathematics learning can be more meaningful and free from abstraction.

**Keywords:** Teaching-facilities, Personnel, Availability, NCE, Mathematics

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## Introduction

The goal of Nigeria Certificate in Education (NCE) Mathematics teacher education programme, as stipulated in the National Policy on Education (FRN, 2004), is to train mathematics teachers with appropriate knowledge and good understanding; teachers that possess professional skills and techniques of teaching and have commitment to the teaching profession. Mathematics teacher education programme is one of the programmes run by most Colleges of Education in Nigeria. The programme is designed to equip the pre-service Mathematics teachers with necessary knowledge and skills to teach Mathematics at the Basic Education Level (Primary and JSS).

However, despite this noble objective of the programme, many people are not satisfied with the quality of teachers being produced by the Colleges of Education. For example, the National Commission for Colleges of Education (NCCE) which is the commission charged with responsibility of ensuring production of quality NCE teachers has admitted that there are inadequacies in the quality of NCE teachers turned out by the Colleges of Education in the country (NCCE, 2008b). There are some general students' lack of achievement and poor performance in Mathematics in public examinations. In comparison with some other subjects, Mathematics recorded the worst result in Junior School Certificate Examination, as depicted on the table below.

Subjects	Year		
	2016	2017	2018
English	30.1	27.4	32.1
Mathematics	18.8	15.6	19.7
Integrated Science	27.5	33.2	36.1
Social Studies	43.2	50.3	51.6
Hausa	49.6	52.1	50.1

Many scholars showed that, despite the fact that Mathematics is one of the most important subjects in the school curriculum, the performance of primary school and secondary school students in Mathematics over the years has not been encouraging (Foin, 1997; Eunice, 2001 and Mukhtar, 2003 & NCCE, 2010).

This consistent poor performance is a clear indication that the students are failing to learn the concepts, principles and ideas they are expected to learn. Some scholars doubt the competency of the average Nigerian primary and secondary school Mathematics teachers, particularly in teaching some aspects of the subject such as geometric concepts (Godwin, 1990; Inekwe, 2002). For instance, Inekwe (2002) pointed out that in Nigeria Geometry is the area where Mathematics learners demonstrate lowest achievement compared to other topics. Since the amount and quality of Mathematics learning that takes place in any school depend to a great extent on the competence and effectiveness of Mathematics teachers, it is therefore necessary that great effort be focused on the preparation of Mathematics teachers (Onwuapka and Ben, 2000). The consistent poor performance and criticism of the quality of NCE Mathematics teachers shows the need to appraise some aspects of the programme with view a to providing information that can improve the quality of NCE Mathematics teachers and consequently, the quality of instruction that can lead to better students' achievement in the subject.

The curriculum of NCE was designed by the National Commission of Colleges of

Education (NCCE), to produce well-groomed and qualified professional teachers of Mathematics for our primary schools and junior secondary schools" (NCCE, 2008a). The programme therefore is based on sound philosophy and desirable goals. However, according to Asebiomo (2015), a curriculum may be well designed, but in order to achieve its objective it must be well implemented. Curriculum implementation is a process of putting in place the required personnel and facilities as stipulated in the document (Abdullrahim, Musbahu, Gimba, Hassan & Jiya, 2019). The quality of product of any educational programme has a direct bearing with implementation of the designed curriculum. The NCE curriculum has clearly indicated the facilities and personnel required for the successful implementation of the NCE Mathematics teacher education programme. These facilities make teaching and learning more meaningful by concretizing otherwise abstract concepts (Mbagha, Sambo & Tijjani, 2018). The provision and utilization of this facilities play a vital role in the achievement of the objectives of the programme. This study therefore makes a survey of the facilities and personnel in the Colleges of Education in the North East Nigeria with a view to identifying the gap.

### Purpose of the Study

1. Investigation on the adequacy of teaching facilities in the Departments of Mathematics in the Colleges as per the minimum requirement in the NCCE Minimum Standard.
2. Investigation on the availability and adequacy of teaching personnel (lecturers) in the NCE Mathematics teacher education programmes.

### Research Questions

The study is guided by the following research questions:

1. Are there adequate teaching facilities in the Departments of Mathematics in the colleges?
2. Are there adequate teaching personnel in the NCE Mathematics programmes of the Colleges?

## Research Design

The design of the study was a mixed design. Mixed design research is a type of research design in which the researcher uses quantitative and qualitative research techniques together, in a systematic manner and combine them into a single study in order to investigate a particular problem (Robert, 2006). This approach to evaluation can increase both the validity and reliability of the evaluation data. This is due to the fact that by using different sources of data and methods at various points in the evaluation process, the weaknesses of the single-approach can be overcome or at least minimized. Lazaro and Marcos (2006) have identified three most frequent techniques for combining qualitative and quantitative research methods: complementation, combination and cross-validation. In this study, cross validation was used and combined the data obtained from different sources in order to gain better understanding of the situation.

## Population of the Study

The population of the study consist of all the Colleges of Education in the North Eastern region of Nigeria. There are fifteen Colleges of Education in the region that offer Mathematics. It is from these fifteen NCE awarding institutions that the sampled eight colleges were selected for the study based on convenience.

## Instrument for Data Collection

The instrument used for data collection was a Checklist. Guided by the NCCE Minimum Standard, a Checklist was developed. The Minimum Standard has indicated the minimum requirements of Departments of Mathematics in terms of teaching facilities and staffing. These requirements must be met before any department is accredited to produce NCE graduates. The list of the required facilities for a class of 25 students is indicated. Guided by the minimum requirements and the number of students in each of the colleges,

information about the current facilities of the Departments of Mathematics were collected.

## Results

The purpose of the study was to investigate the availability of facilities and personnel in the Colleges of Education in the North Eastern region of Nigeria. Analysis of the result is presented below based on the Research Questions. The quantitative data is presented first followed by qualitative data obtained during focus group discussion and later cross validation results.

**Research Question 1:** Are there adequate teaching facilities in the Departments of Mathematics of the Colleges?

This research question was formulated to attain the first purpose of the study which sought to investigate if there are adequate teaching facilities in the Departments of Mathematics of the Colleges as per the minimum requirement in the NCCE Minimum Standard. A Checklist was designed and used to obtained data about the teaching facilities in the departments.

## Quantitative Analysis of Teaching Facilities in the Departments of Mathematics in the Colleges

The result of the analysis showed that generally speaking, the Colleges do not have adequate teaching facilities, as shown on Table 1. Areas of particular interest are Mathematics laboratory, computers and overhead or multimedia projectors where more than 50% of the Colleges indicated that they do not have such facilities in adequate quantities. Similarly, all the Colleges do not have adequate text books in all the Mathematics content areas. From the table, there are adequate facilities in only 7 out of 28 items identified from the Minimum Standards.

**Table 1: Total Number of Required, Available and the Percentage Shortfall of Facilities of the Departments of Mathematics of the Eight Colleges**

	Facilities/Equipment	No. of It Required	Number Availabl	shortfall	% Shortf	Decision	Rating
1	Mathematics laboratory	8	5	3	38	Adequate	4
2	Computers	231	120	111	48	Not adequate	3
3	Overhead projector/Multimedia projectors	8	4	4	50	Not adequate	3
4	Work benches	139	76	63	45	Not adequate	3
5	Vice	139	89	50	36	Adequate	4
6	Drill bit ( of various sizes)	139	45	94	68	Not adequate	2
7	Hand saw (of various sizes)	210	117	93	44	Not adequate	3
8	Solid shapes (prisms, cubes cuboids cylinders	174	189	0	0	Adequate	5
9	Engraving machine	69	34	35	51	Not adequate	2
10	Cutting knives	139	112	27	19	Adequate	5
11	Hammer (different sizes)	210	171	39	19	Adequate	5
12	Screw drivers	99	81	18	18	Adequate	5
13	Mathematical sets	694	387	307	44	Not adequate	3
14	Mathematical set (BB size)	139	51	88	63	Not adequate	2
15	Weighing scale	174	30	144	83	Not adequate	1
16	Scientific calculators	694	212	482	69	Not adequate	2
17	Scissors (different size)	347	211	136	39	Adequate	4
18	Pinchers (big and small )	139	67	72	52	Not adequate	2
19	Jack and plane	139	53	86	62	Not adequate	2
20	Electronic organizers	139	42	97	70	Not adequate	2
21	Consumables					Not adequate	
	i. Card board,	8 re	3				
	ii. Glue, (wood)	174	13				
	iii. Plywood (assorted)	174	25				
	iv. Gum Liquid	174	24				
	v. Sallotapes	174	41				
	vi. Metal sheet	174	24				
	vii. Tranparencies	174	103				
	mean	174	38	136	78		1
22	Graph sheets, beads, and threads.	694	745	161	0	Adequate	5
23	Text books in all areas	6940	1853	5087	73	Not adequate	1
24	Staff offices	109	41	150	86	Not adequate	1
25	Departmental library	8	2	6	75	Not adequate	1
26	Workshop	8	8	0	0	Adequate	1
27	Supporting staff	48	24	24	50	Not adequate	3
28	Computer room	8	2	6	75	Not adequate	1
	Average						2.67

The National Commission for Colleges of Education (NCCE) has, in its minimum standard, stipulated the required facilities of

the Mathematics department for a class of twenty-five students. To determine the availability of facilities therefore, the total

number of required facilities, based on the minimum standard, was first calculated on the basis of population of the department of a college. For instance, the minimum standard required that the computer-student ratio should be 1:3. A Department of Mathematics with 100 students should therefore have 33 or

more computers. The available facilities are then compared against the required facilities to determine shortfall and percentage of the shortfall. In order to rate the facilities of the departments the following criterion was used:

% short fall	71 - 100	51 -70	41 - 50	21 - 40	0 - 20
Rating	5	4	3	2	1

Guided by the above criterion, the mean and standard deviation of the availability of the facilities in the departments was calculated. The researcher is of the opinion that if the availability of facilities were up to 60%, it could be considered adequate. The result of the analysis shows that none of the colleges has all the required teaching facilities in adequate quantity. Table 2 indicated the mean rating of all the colleges. The mean rating is less than the criterion reference point (3.0).

**Table 2: The Mean Availability of Teaching Facilities in the Mathematics Department of Each College**

Colleges	Mean	SD	Remark
A	2.82	0.77	Not adequate
B	2.65	0.79	Not adequate
C	2.64	0.61	Not adequate
D	2.41	1.10	Not adequate
E	2.58	0.87	Not adequate
F	2.62	0.72	Not adequate
G	2.58	0.65	Not adequate
H	2.66	0.70	Not adequate

### Qualitative Analysis of the Teaching Facilities

A Focus Group discussion, while reviewing the Checklist, considered and discussed the availability of facilities in the Departments of Mathematics of the Colleges. All the participants agreed that many important required facilities may not be found in the departments. They opined that in most cases departments are only provided

with the required facilities when accreditation is imminent. Some opined that in most cases the lecturers do not use the facilities. The teachings follow the traditional chalk and talk method.

### Triangulation of Teaching Facilities

Data collected with aid of the Checklist showed that the mean availability of teaching facilities in all the Colleges is less than the scale mean which showed that none of the colleges has all the required facilities in adequate number. A summary of all the facilities of the Colleges indicated that only seven out of 28 items were found in adequate number. This is in line with the Focus Group Discussion where members agreed that many facilities may not be found in the departments, because in most cases they acquire the facilities in the face of imminent accreditation exercise.

**Research Question 2:** How adequate are the personnel in the NCE Mathematics departments of the colleges?

This research question was formulated to attain the second purpose of the study. It aims at investigating the availability and adequacy of personnel in the departments. The research question was answered using the data obtained from the Mathematics department of the colleges.

### Quantitative Result of Adequacy of Teaching Personnel

From Table 3, the lecturer-student ratio ranges from 1:28 to 1:63, while the minimum standard indicated 1:25 as the minimum requirement. If room for adjustment is made, a reasonable ratio of 1:30 could be accepted. This showed that only 2 out of the 8 colleges

met the minimum requirement. In addition to the departmental courses, Mathematics departments also handle Pre-NCE General Mathematics Courses. This put additional workload on the lecturers. Similarly, most of the Colleges run degree programmes in addition to the NCE programmes. The degree

courses are also handled by the same lecturers and in most cases, by the most experienced lecturers, at the expense of the NCE programme. This shows that most of the departments do not have adequate number of lecturers. Most of the departments have between eight and twelve lecturers.

**Table 3: Lecturers-Students Ratio in the Various Colleges**

Colleges	Pre -NCE	100L	200L	300L	Total	No. Lects	Ratio
A	257	127	113	74	571	13	1:44
B	98	72	65	45	280	10	1:28
C	107	88	75	63	333	12	1:28
D	113	44	59	41	257	8	1:32
E	271	137	115	77	600	16	1:38
F	137	94	80	51	362	8	1:45
G	212	116	135	102	565	9	1:63
H	173	159	142	125	599	14	1:43
Total	1368	837	784	578	3567	90	1:39

In addition to the number, experience and qualification of the lecturers also matters. In terms of qualification, the NCCE minimum standard has stipulated the minimum qualification for teaching in the departments as second class lower degree from a recognized university or higher national diploma from a recognized polytechnic. From Table 4, it is clear that all the lecturers have the minimum teaching requirements in

the colleges. A total of 52% of the lecturers have higher degrees. In terms of experience, there are very few lecturers with more than ten years of teaching experience (32.0%). While many lecturers do not have to teach for many hours per week (Table 6), the number of students per class might be higher than the stipulated teacher-student ratio. In some instances, there are over 200 students per class.

**Table 4: Lecturers Teaching Experience in the Various Colleges**

Colleges	Years of Teaching Experience				Total
	1-5	6-10	11-15	Above 16	
A	3	5	1	2	11
B	4	3	2	1	10
C	3	2	-	1	6
D	2	4	0	2	8
E	2	3	1	2	8
F	4	5	2	1	12
G	2	2	2	3	9
H	3	4	2	2	11
Total	23 (30.7)	28(37.3)	10 (13.3)	14 (18.7)	75

**Table 5: Lecturers' Qualification**

Qualification	B.Ed./B.Sc.(Ed.)	HND	Masters	Ph. D
No.	38 (50.7)	11 (14.6)	23 (30.7)	3 (4.0)

**Table 6: Lecturers' Work Load**

Hours per week	2-6	7-10	12-15	16 and above
No. of Lecturers	10 (13.3)	47 (62.7)	18 (24.0)	0 (0.00)

### Qualitative Analysis of Adequacy of Lecturers

The Focus Group Discussion was organized and reviewed the instrument used for the data collection. While doing so, qualitative data was generated to cross validate the quantitative data. When the issue of lecturers' adequacy and qualification was raised, all the participants agreed that all the lecturers possess the relevant minimum qualification. However, it was opined that the problem lies more with the attitude of the lecturers than with their qualification. The issue of mass exodus of lecturers that acquired higher degree to universities was also raised, though no exact statistics was mentioned.

On teaching experience, the Focus Group discussion agreed that it is important to include the item that seeks to determine average number of students per class and the number of lessons handled by each lecturer in a week. The members opined that lecturers are underutilized. A member compared the present time with the time he did his NCE in the same college he is now teaching. He said in general courses such as education, they were put into eight groups even though their number was less than 300. Some classes in education now contain more than 500 students and handled by a single lecturer at a time. This makes attendance record and CA administration rather difficult. Such classes should be split into manageable size or groups.

### Triangulation of Lecturers' Adequacy and Qualification

Analysis of the quantitative data showed that 6 out of 8 Mathematics departments do not meet the NCCE minimum requirements of teacher-students'

ratio. Over 60% of the lecturers had 6 or more years of teaching experience in the college system and all of them had the minimum required teaching qualification. This is similar to the qualitative result where all the participants agreed that all the lecturers have the required qualification and that there are enough experienced lecturers in the departments. They also reported underutilization of the lecturers. From the two findings, it could be concluded that all the lecturers meet the minimum requirements in terms of qualification and experience. However, in terms of number, over 70% of the colleges do not meet the required teacher-students' ratio. This, coupled with the degree programme run by most of the Mathematics departments, affects the NCE programme negatively.

### Discussion of Findings

The major findings of the study are:

- (i) None of the Mathematics departments of the colleges has adequate teaching facilities such as laboratories and text books in all areas of Mathematics
- (ii) All the lecturers have the required minimum qualification. Over 30% of the lecturers have higher degrees. There are very few experienced lecturers in the Mathematics departments of the colleges with more than 10 years teaching experience. Although most of the lecturers teach few hours per week, they teach the students in congested classes. This arises due to the lack of lecture venues to split the classes into manageable groups.

On teaching facilities, this study found that all the colleges lack adequate teaching facilities such as Mathematics laboratories and workshops as well as appropriate and relevant text books in all areas. The study also established that there is

a strong and significant positive relation between the availability of teaching facilities in the colleges and the pre-service teachers' content and pedagogical knowledge. This finding agreed with Olaoye (2004) who found that one of the causes of dismal performance among the pre-service teachers is lack of teaching facilities in Mathematics departments of the Colleges of Education to make learning meaningful. When he investigated the availability of teaching facilities in the Mathematics department in some sampled colleges in the southwestern Nigeria, he found that all the colleges do not have adequate facilities, with about 70% shortfall of the required facilities in all the colleges. This is further supported by Kazeem (2010) who posited that some of the Departments Mathematics do not measure up to standard, because basic infrastructures and teaching and learning materials are grossly inadequate.

Akinsola (1999) also showed that the preparation of NCE Mathematics teachers failed to make use of instructional facilities to have direct impact on the learning. This situation, he said, will definitely be repeated transitively by the pre-service Mathematics teachers in the cause of their teaching. The finding is further supported by Okodoko and Samuel (2010) who evaluated the NTI distance learning Mathematics programme and found that significant relation exists between the college facilities, quality of lecturers and pre-service teachers' performance. Other studies (Alaka, 2008 and Sidney, 2005) also identified significant relation between school facilities and curriculum implementation. Learning materials are not adequately and consistently available in the Mathematics departments. Where such learning materials are not available, written material cannot play a coherent and pervasive role in the provision of strong cognitive structure that gives basis for the development of the required professional knowledge, skills and attitude of an effective teacher (Adesola, 2012).

Another study that lends support to this finding is Adolphus (2011), who opined that the non-availability and adequacy of

facilities in the colleges has been a focus of concern for long. Non-availability of facilities such as textbooks, slides films, computers etc., poses a threat to teaching and learning of Mathematics. For areas like geometry, the issue of teaching materials is very crucial. Physical facilities such as models help students to grasp ideas which seem so abstract. It is these concrete materials that help the students acquire the required knowledge. When there are no sufficient teaching facilities in the Colleges, the pre-service teachers are taught in abstraction and they are likely to transfer same to their classes.

In view of the above findings and the fact that facilities play very significant role in any teaching learning process, particularly in teacher training, one can easily conclude that part of the cause of NCE pre-service Mathematics teachers' poor performance may be associated with lack of adequate teaching facilities in the Departments of Mathematics of the colleges.

## Conclusion

Based on the findings of the study, the following conclusions can be drawn:

1. All the lecturers have the required minimum qualification for teaching at that level. However, in terms of experience and adequacy there is need for improvement
2. None of the Departments of Mathematics of the Colleges has adequate teaching facilities

## Recommendations

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

1. The colleges should ensure that Mathematics departments are provided with adequate facilities, competent lecturers and relevant textbooks. It was found that there is a high correlation between the availability of facilities and the pre-service Mathematic teachers' content and pedagogical knowledge.
2. Mathematics laboratories should be equipped so that learning can be more practical and meaningful and the pre-service Mathematics teachers can transfer same to

their classes. Equally important is the Mathematics workshop where the pre-service teachers are trained in the art of creation of instructional materials. The NCCE has stipulated the minimum requirements for the departments. However, the findings of the study revealed that all the colleges do not meet the minimum requirements in many

areas, particularly in the area of textbooks.

3. In order to improve the performance of the pre-service Mathematics teachers, it is important that all Departments Mathematics be equipped with the necessary teaching facilities so that Mathematics learning can be more meaningful and free from abstraction.

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