



**AVAILABILITY AND ADEQUACY OF INSTRUCTIONAL MATERIALS, FACILITIES AND EQUIPMENT FOR EFFECTIVE TEACHING AND LEARNING OF MATHEMATICS IN STATE AND FEDERAL COLLEGES OF EDUCATIONS IN SOUTH EAST GEOPOLITICAL ZONE OF NIGERIA**

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**Abstract:**

The study investigated the availability and adequacy of instructional materials, facilities and equipment for the implementation of NCE Mathematics education programme in colleges of education. Instrument used for data collection was NCE Mathematics observation checklist. The data collected was analysed using NCCE minimum requirement bench mark for availability and adequacy of instrument in colleges of education. It was observed that instructional materials for the implementation of NCE Mathematics education programme in colleges of education are available and adequate in most colleges, while in some, they are insufficient and in others, they are unavailable. On the bases of the findings, the following recommendations were made; facilities should be provided in both state and federal colleges of education where they are not as well as inadequate available and teachers should go for in-service training to get abreast with the use of these facilities.

**Keywords:** implementation, instructional material, mathematics, programme

**1. Introduction**

Teacher education is the training of individuals to equip them with necessary competencies and skills in a giving subject area that will enable them teach same to students in schools. In colleges of education, teachers are trained in different subject areas such as English, Igbo, social studies, Physics and Mathematics. Mathematics in the view of Procter (2004) is the study of science of numbers, quantity and space. Smith

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(1990) on the other hand defined mathematics as a “filter” because to enroll in mathematics course and to perform poorly will bar one from variety of careers and lifestyle associated with them. Mathematics means many and various things to different people. In view of its universality and diversity, it is referred to as the language of science and technology, queen of science, the science of counting, science of numbers, quality and space, study of abstraction and their relationship (Adedayo, 2006; Usman, 2002). Mathematics occupies a peculiar position in the life of every individual and the society in general. It plays an indispensable role in the development of art, humanities, sciences and technology. Mathematics is a science of order and numbers and is as old as mankind. The invention of mathematics by man became essential so as to enable him solve his domestic and economic problems (Iji, C.O and Harbor Peters, V. F 2005).

At the colleges of Education, focus is on the preparation of teachers of mathematics for the primary (lower and middle basic education) and junior secondary (upper basic education) levels. The objectives of NCE mathematics education according to National Commission for Colleges of Education NCCE (2012) are that by the end of NCE programme, the students should be able to:

- discuss with confidence the historical development of mathematics as a discipline.
- solve abstract problems through the use of mathematical 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 by applying principles in solving daily problems,
- make the teaching of mathematics learner friendly through games and stimulations.
- set up a mathematics laboratory.
- improvise materials for effective teaching to prepare the learners for further studies in mathematics related course.

In order to achieve the above objectives of NCE mathematics education, the National Commission for Colleges of Education (NCCE, 2012) provided minimum academic standards for implementing the NCE mathematics education programme. The minimum standard required to achieve the stipulated objectives are; admission requirements of NCE mathematics education, personnel requirements, facilities required, stipulated methods of instruction/teaching, methods of evaluation, and graduation requirement.

Iji (2005) stated that teaching should be done in such a way and manner that all pupils in the class can achieve at a high level. Since then teachers have continued to search for ways that will make teaching and learning interesting and practical at list at the lower level of education (primary and secondary schools). This lead to the introduction of instructional material in teaching and learning. Instructional material refers to the human and non- human materials and facilities that can be used to easy,

encourage, improve and promote teaching and learning activities. Instructional materials are tools used in education lessons which include active learning and assessment. Teaching is the art and science of helping others to grow in their knowledge and understanding while learning is acquisition of knowledge, skills through study, experience or being taught. In order to achieve the objectives of NCE mathematics, National Commission for Colleges of Education (NCCE,2012) provided academic requirement for instructional materials and facilities for implementing NCE mathematics education programme. Giving these minimum standard requirements for implementation of NCE mathematics education programme, which includes instructional material availability and adequacy. There is need to investigate the availability and adequacy of instructional material, facilities and equipment in colleges of education in south East geopolitical zone of Nigeria

## **2. Purpose of the study**

The purpose of the study is to evaluate the availability and adequacy of instructional materials, facilities and equipment in state and federal colleges of education in South East Nigeria.

Specifically, the study intends to:

- determine the availability of instructional materials facilities and equipment for effective teaching and learning of mathematics in state and federal colleges of education.
- determine the adequacy of instruction materials, facilities and equipment for effective teaching and learning of mathematics in state and federal colleges of education.

### **2.1 Research Questions**

These research questions were posed to guide the study.

- To what extent are instructional facilities/ material available for effective teaching and learning of NCE mathematics in state and federal colleges of education in south east geopolitical zone of Nigeria?
- How adequate are instructional facilities and materials for effective teaching and learning of NCE mathematics in state and federal colleges of education in south east geopolitical zone of Nigeria?

## **3. Method**

### **3.1 Study Area**

The area of the study was South East Nigeria, which comprises of five states via: Abia, Anambra, Ebonyi, Enugu and Imo states. There are seven colleges of education in these states (four federal and three state Colleges). The population of the study consists of all

the seven federal and state colleges of education in south East Nigeria. Therefore, no sampling was carried out as the entire population constituted the sample for the study.

### 3.2 Instrumentation

The instrument used for data collection was NCE Observation Checklist made up of instructional material availability and adequacy checklist. The observation checklist was used to document instructional materials availability and adequacy in each college. The researcher visited all federal and state colleges of education in south-east and met with the heads of department of mathematics in each college. The heads of department of each college provided the researcher information on where these materials are kept. The research question was answered using NCCE minimum standard as a bench mark.

## 4. Results and Discussion

**Table 1:** Instructional Materials Availability and Adequacy

S/N	List of Instructional Materials	NCE Required No	Colleges							Adequacy	
			A	B	C	D	E	F	G	No of Colleges with Adequate Materials	No of Colleges with Inadequate Materials
			No Available	No Available	No Available	No Available	No Available	No Available	No Available		
1.	Work benches	4	4	5	6	3	7	3	4	5	2
2.	Vice	4	4	6	5	5	5	4	5	7	-
3.	Drill machine	4	4	7	5	4	5	4	-	6	1
4.	Drill bits	4 sets	-	5	5	3	4	4	-	4	3
5.	Hand saw	6	6	4	7	10	7	6	4	5	2
6.	Solid shapes	5	20	7	4	3	10	10	6	5	2
7.	Engraving machines	2	1	3	2	1	3	3	-	4	3
8.	Cutting knives	4	10	6	7	6	8	4	4	7	-
9.	Hammer (different sizes)	6	10	9	8	6	8	3	2	5	2
10.	Screw Drivers	3 sets	10	4	4	5	6	1	4	6	1
11.	Mathematics instrument	20	21	26	16	12	24	30	21	5	2
12.	Mathematics instrument (Black board six)	5	20	6	6	3	6	5	5	6	1
13.	Weighing scale	5	2	7	5	4	6	3	3	3	4

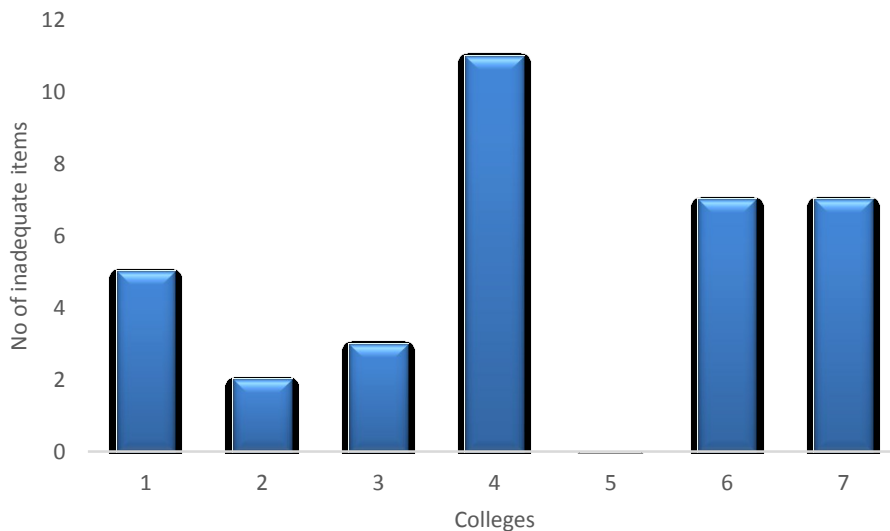
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14.	Scientific calculator	<b>20</b>	3	24	18	13	24	10	24	<b>3</b>	<b>4</b>
15.	Scissors	<b>10</b>	10	9	12	7	15	12	21	<b>5</b>	<b>2</b>
16.	Pincers (big and small)	<b>4</b>	10	4	5	2	8	4	13	<b>6</b>	<b>1</b>
17.	Jack and plane	<b>4</b>	5	5	6	3	5	3	7	<b>5</b>	<b>2</b>
18.	Electric organizers	<b>4</b>	-	5	5	3	6	-	-	<b>3</b>	<b>4</b>

Where,

- A = Federal College of Education Eha-Amufu,
- B = Federal College of Education (Technical) Umunze,
- C = Abia State College of Education (Technical) Arochukwu,
- D = Nwafor Orize College of Education Nsugbe,
- E = Alvan Ikoku Federal College of Education Owerri,
- F = Enugu State College of Education (Technical),
- G = Ebonyi State of Education Ikwo.

The functionality of an instructional material is the proper indication of its availability. Any un-functional material/equipment is an unavailable material/equipment. Table 1 above shows availability and adequacy of instructional facilities/materials in the colleges located in south East zone. The number of colleges that had the instructional facilities/instructional material for teaching and learning of NCE mathematics according to the NCCE requirement are above average. It is only three items as listed in the table were insufficient, weighing balance, scientific calculator and electric organizer.



**Figure 1:** Variations of inadequate items in South East Colleges of Education

In Figure 1 show the variations of inadequate items in South East Colleges of Education. These are the number of items that are not up to the NCCE requirement in the seven colleges as listed above. In college A, drilling bits, engraving machine, weighing scale, scientific calculator, and electric organizers were not up to the required minimum

standard. In college B the instructional facilities/ material for teaching and learning of NCE mathematics are available and adequate except hand saw and scissor. Out of the seventeen instructional materials, only two are not available, so it is above average. In college C only three out of the seventeen instructional materials are not up to the required minimum standard, the materials are solid shape, mathematics instrument and scientific calculators. so the three are not adequate. In college D, eleven out of the seventeen instructional facilities/ materials required are not up to the required minimum standard, these materials are working bench, drill bits, solid shapes, engraving machine, mathematics instruments, mathematics instrument (black board set), weighing scale, scientific calculator, scissors pincers, jack plane and electric organizer. The materials not available is more than 50% of the minimum required instruments needed so the materials are not adequate. In college E all the instructional materials needed for NCE Mathematics are available and up to the required number, so these materials are available and adequate. In college F, six materials are not available in the required number; these materials are work bench, hammer, screw, weighing scale, scientific calculator and jack plane while electric organizer is not available at all.

These seven instructional materials are not up to 50% of the required materials and so are available. In college G three materials are not up to the minimum requirement Hand saw, hammer, weighing scale while materials like drill machine, drill bits, engraving machine and electric organizer are not available at all.

This indicates that the materials are inadequate. In all the colleges of education, most of the instructional facilities/instructional material for teaching and learning of NCE mathematics are available and adequate whereas in some they are available and inadequate or completely not available.

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**Table 2:** Percentage of Adequate and Inadequate Items in South East Colleges of Educations

Items	% No of schools with adequate items	% No of school with inadequate items	% of items required NCCE minimum requirement.
1	71.43	28.57	100
	100	–	100
2	85.71	14.29	100
	57.14	42.86	100
3	100	–	100
	85.71	14.29	100
4	57.14	42.86	100
	100	–	100
5	71.43	28.57	100
	85.71	14.28	100
6	100	–	100
	85.71	14.28	100
7	57.14	42.86	100
	85.7	14.28	100
8	100	–	100
	85.7	14.28	100
9	71.43	28.75	100
	42.86	57.14	100
10			
11			
12			
13			
14			
15			
16			
17			
18			

From Table 2 the % calculated show the adequacy of different item in the schools, items 2, 5, 8, 11, and 15 are adequate in all the colleges of educative according to NCCE minimum.

## **5. Discussions of findings**

### **5.1 Level of Adequacy of Instructional Facilities/Materials Available for Teaching and Learning of NCE Mathematics in State and Federal Colleges of Education**

The finding of this study in the figure 1 show that college 5 (E) has the best instructional facilities / materials for teaching NCE Mathematics Education followed by college 2 (B) and college 3(C) respectively. College 1(A) is on the average while colleges 6(F), 7(G) and 4(D) are below average and should improve on instructional facilities / material for teaching and learning of NCE Mathematics.

Furthermore, in table 2 all the instructional facilities/ material for teaching and learning of NCE mathematics are available and adequate except item 18(Electric organisers) so electric organizer is inadequate in all the schools and should improve on it.

The finding supports the early findings of Akale (1991) who reported that there are grossly inadequate of facilities in some colleges of education and these facilities need to be provided to ensure proper running of the programme especially in content coverage. This finding is also in agreement with the findings of Atu (2010) whose study revealed that infrastructural facilities in colleges of education are fairly available. According Lassa (2005) that physics education in Nigeria is in sorry situation as there is a dearth of instructional materials, equipment and facilities for teaching the subject.

### **5.2 Conclusion**

In all the colleges of education, most of the instructional facilities/ material for teaching and learning of NCE mathematics are available and adequate whereas in some colleges, instructional facilities/ materials are inadequate or completely not available.

### **5.3 Recommendation**

The following recommendations are made based as the findings of this study.

1. Facilities should be adequately provided in State and Federal Colleges of Education to enhance the implementation of mathematics education programme. Facilities like classrooms and materials like workbench, electric organizer and others.
2. Mathematics education teachers in colleges of education should be encourage to go for in-service training, workshops, seminar and conference to update their knowledge in the use of these facilities and equipment.
3. Government should employ qualified and competent teachers that can make, use of these facilities and equipment



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