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Constraints in the Preparation of Mathematics Teachers: the Way Forward

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Abstract

The study investigated the constraints in the preparation of Mathematics teachers in the colleges of education and the possible way forward. It used an ex-post facto research design in the colleges of education in Nigeria. 165 final year students of Mathematics and 30 Mathematics lecturers were selected samples from the 6 colleges of education in the southwestern part of Nigeria. Four instruments were developed, validated and employed to collect data: input questionnaire, process questionnaire, product questionnaire, inventories of Mathematics resources in the colleges and Mathematics laboratory studios. The study lasted for two semesters and in line with the National Commission for Colleges of Education's guide, data analysis involved the use of mean, standard deviation and percentages. The findings revealed that there was poor performance of students in Mathematics with mean scores of 44.4% and standard deviation of 2.9. Gross inadequate instructional facilities in the colleges and poor teaching effectiveness of the trainers of Mathematics teachers with mean scores of 49.73%. The implication of these findings was that inadequately prepared Mathematics teachers would likely produce half-baked students. This has been found to be the bane of students' dismal performance in Mathematics at the primary and secondary school levels of education.

Introduction

Modern development is now conceptualized in terms of science that determines the level of technological development. But the sustenance of science depends on the understanding of the language in which it is written. Mathematics has a language in which it is written, and it is an important subject due to its applicability in all area of science and technology. Infact, the federal and state governments in Nigeria recognized its unique position as acknowledged in the National policy on Education (1981), that without Mathematics there could hardly be science as we know it today. As a result more emphasis is placed on its teaching and learning, funding and even its admission into tertiary institution.

Inspite of these premium positions accorded Mathematics in the school system it is painful to observe that Mathematics often recorded dismal performance of students among other subjects as acknowledged by WAEC chief examiner report (1981) and Adamolekun (1986).

Thus, it seemed that premium emphasis being placed on the subject coupled with its higher funding relatively to other subjects in terms of teaching and learning have not justified its outcome.

Considerable research energy has been expended in finding solutions to this dismal performance of students in Mathematics which included the studies of Adetula (1987), Oyedeji (1992), Onocha and Okpala (1995), Olaoye (1998) and Adesoji (1999). These studies had identified different factors to have contributed to the dismal performance of students in Mathematics which ranged from the attitudes of students towards the subject, towards some topics perceived to be difficult to learn, teachers' attributes, environment

and examination tendency. In another study as acknowledged by Olaoye (1998), students dismal performance in Mathematics was caused by over 50% of the attitudinal factor from students to Mathematics or teachers, or to the poor analytical pattern of teaching Mathematical ideas to the students by the teachers. Corroborating this view Akinsola (1999) opined that lack of instructional facilities to enriched the teaching and learning of Mathematics had contributed greatly to the poor performance of the students.

Since no educational system can rise more than the quality of its teacher, it is therefore doubtful whether the Nigerian certificate in Education Mathematics programme has helped students to attain enough understanding of Mathematics in particular and to serve effectively in the primary and lower secondary schools in general.

A critical study of the guides for the preparation of teachers (Mathematics inclusive) revealed different requirement that must be on ground to prepare efficient teachers in the colleges of education (NCCE, 1990; NCCE, 1996). These guides often reviewed the contents and bring in innovations.

Table 1: NCE Mathematics courses over the period of three years

Year One	Year Two	Year Three
Algebra & Trigonometry (3C)	Number Theory (2E)	Dynamic and static (3C)
Calculus (2C)	Mathematics Methodology II (3C)	Linear Algebra (3R)
History of Mathematics (2R)	Problem Solving (2E)	Real Analysis (3C)
Basic Concept in Mathematics (2R)	Statistics & Probability (3C)	Differential Equation (3R)
Vectors and Coordinate geometry (3C)	Vector Analysis (2R)	Abstract Algebra (3R)
Mathematics Methodology 1 (2C)		
Introduction to Computer Studies (2R)		

Source: NCCE Manual 1990

In the 1993 /94 accreditation exercise according to Isyaku (1994), it was discovered that the programme had not met its goal. Various reasons advanced for this included overloaded of some course contents in Mathematics (NCCE report,1994) and the context of course accreditation. In effect, the affected courses were broken down into two courses to ensure adequate coverage of contents and teacher preparation. These led to 21 courses in Mathematics as shown in table 2.

Table 2: Revised NCE Mathematics Course over the period of three years

Year One	Year Two	Year Three
Algebra (2C)	Number Theory (2E)	Dynamic (2C)
Trigonometry (1C)	Problem Solving (2C)	Real Analysis (2C)
History of Mathematics (2C)	Mathematics Laboratory Practical (1C)	Static (2C)
Basic Concept in Mathematics (2C)	Statistics & Probability (3C)	Linear Algebra (2E)
Differential Calculus (2C)	Integral Calculus (2C)	Real Algebra II (2C)
Mathematics Methodology 1 (2C)	Vector Analysis (2C)	Differential Equation (2E)
Introduction to Computer Studies (1C)		Abstract Algebra (2E)

Source: NCCE manual 1996

The break down courses remained the same in term of contents with the old curriculum in Mathematics course content, but changed in status. This was to ensure adequate preparation of Mathematics teachers for our school. In contrast, according to a research study conducted by Adeye-Oluwa (2003) it was reported that there was a deficient in the teachers education programme due to their low performance in the schools. She therefore recommended that teachers' education programme among which is Mathematics education in the colleges needed review in order to ensure efficient teacher preparation.

Problem

The study investigated the constraints in the preparation of Mathematics teachers in education programme. Specifically, it identified different shortcomings to the preparation of Mathematics teachers at the colleges of education. As a result, the study provided answer to the following questions.

1. What is the level of NCE students performance in Mathematics?
2. Are the available resources toward Mathematics teachers' preparation enoug as stated in the NCCE guide?
3. Are the teaching-learning process students centred as recommended by the NCCE?

Population

The final year (NCE part III) Mathematic

students and their lecturers of the approved colleges of education that ran Mathematics were population for the study.

Sample and Sampling Procedure

165 final year students of Mathematics were purposively drawn as students' sample and 30 Mathematics lecturers from 6 colleges of education into the study.

Instruments

Four (4) instruments were used to collect the data. These included input questionnaire, process questionnaire, product questionnaire, Inventory of Mathematics resources in the colleges (IMRC) and inventory of resources on Mathematics in Mathematics laboratory studio.

Validation and Reliability of Instruments

Input questionnaire was developed by researchers for the Mathematics lecturers, and it contained 3 sections. Section A was respondent's biodata, section B contained 2 was based on (availability or otherwise) mathematical resources and section C contained 4 scales of very often, often, rare and not at all of using the listed Mathematics resources by lecturers. A test-retest of this instrument yielded reliability of 0.75.

Process questionnaire contained 30 items on classroom observation teaching and learning of mathematics, prepared on a 4-point Likert format. It was developed by researcher through an adaptation from Massialas (1969) and Olakulehin (1995), though patterned towards Flander (1970) that stated the conditions of effective teaching in the classroom. The internal consistency of items through KR – formula 20 was found to be 0.69. A test-test of two weeks interval by 2 trained research assistants showed reliability of (cronbach alpha-value) 0.72. These values were considered better for the study.

Product questionnaire contained 30 items multiple choice questions tagged Achievement Test in Mathematics and methodology (ATIM), used to measure 6 objectives area of NCE Mathematics curriculum. It was developed by researcher and administered to 20 final year NCE Mathematics students for trial tested with observed reliability of. 0.86 using KR-formula 21.

Inventory of Mathematics Resources in the colleges (IMRC) and Inventory of Mathematics Laboratory studio were suggested relevant inventories by the NCCE (1990) and NCCE (1996). Each available relevant Mathematics textbooks/resources was scored 1mk and irrelevant/not available scored 0 mk. A test-retest reliability of these instruments was O.82.

Data Collection and Analyses

Researcher collected the administered instruments personally and with the assistance of the 12 trained research assistants who observed Mathematics lecturers in the course of lecturing Mathematics. Each of these instruments was scored appropriately, and in accordance with the standard minimum guide criterion. Meanwhile, simple statistics like mean, standard deviation and percentages were used to analyse the collected data.

Findings

Table 1: Mean scores and standard deviation of students' performance

Count (n)	Mean	Standard deviation	Instrument rating	
			Minimum	Maximum
165	44.4%	2.90	0%	100%

3.335% for each correct answer and 0% for wrong answer.

Table 2: criterion referenced scores of NCCE

Scores in %	70-100	60-69	50-59	45-49	40-44	0-39
Level of Pass	Distinction	credit	Merit	pass	Lower Pass	failure

From tables 1 and 2 the mean score of students' performance in mathematics was 44.4% which fell in the category of lower pass. By inference, there was dismal performance of students in mathematics in the administered test.

Table 3: Academic and Professional Qualifications of Lecturers

Qualification	Academic	Academic and Professional
Frequencies	11	19
Percentages	36.67%	63.33%

Table 4: Available and direct relevant Mathematics items

Items/textbooks	Quantities available	% of shortfall by NCCE
MAT 111 – Algebra	35	41.67
MAT 112 – Trigonometry	10	83.33
MAT 113 – History of Mathematics	05	91.66
MAT 114 – Basic Concepts in Maths	02	96.67
MAT 121 – Differential Calculus	15	75.00
MAT 122 – Coordinate Geometry	17	71.67
MAT 123 – Mathematics Methods	02	96.67
MAT 124 – Introduction to Computer studies	04	93.33
MAT 211 – Number Theory	04	93.33
MAT 212 – Problem solving	01	98.33
MAT 213 – Mathematics Lab. Practical	0	100.00
MAT 214 – Statistics & Probability	18	70.00
MAT 221– Integral Calculus	05	91.67
MAT 222 – Vector Analysis	09	85.00
MAT 311 – Dynamics	01	98.33
MAT 312 – Real Analysis	07	88.33
MAT 321 – Static	02	96.67
MAT 322 – Linear Algebra	11	81.67
MAT 323 – Real Analysis II	04	93.33
MAT 324 – Differential Equation	23	61.67
MAT 325 – Abstract Algebra	10	83.33
Mathematics Laboratory Studies	3	50.00

Table 5: Inventory of resources in the Mathematics Laboratory studios

S/N	Items	Quantities available	Average % of shortfall by colleges
1	Flannel Boards	08	-
2	Games –Ludo, Draft & Opon-Ayo	05	16.67
3	Probability instruments	12	-
4	Tracks and Trolley	03	50.00
5	Abacus	20	-
6	Raybometer	03	50.00
7	Inclined planes	07	-
8	Wall – charts	08	-
9	Measuring Tape	24	-
10	Double Protractor	09	-
11	Meter Rule	04	33.33
12	Fly wheel Machine/tool	03	50.00
13	2 by 3 Geometrical Instruments	09	-
14	Instructor Compass & Protractors	11	-
15	Views Instruments	07	-
16	Spherical Globe	05	16.67
17	Mini – Computer	03	50.00
18	Overhead Projector	01	83.33
19	Graph Board	06	-
20	Geo- Board	05	16.67
21	Mathematical Tables	06	-

By the standard minimum guides' directives any of the accredited colleges of education must provide a minimum of 5 Mathematics lecturers with education-baised, and the number of textbooks on Mathematics should be in the ratio 1:10. From table 3 only 63.33% of the academic staff were professionally trained and teach in the colleges while the remaining 36.33% were academically trained and teach in the colleges.

Also, table 4 showed different available and direct relevant textbooks on Mathematics with different percentage short fall as recommended by the NCCE. Table 5 confirmed the quantities of instruments in the available laboratory studios of Mathematics with the appropriate percentages of short fall by the colleges stated and adequate provision with (-)

Table 6: observed classroom interaction teaching and learning toward students' centred

Lecturer's rate	50-54	55-59	60-69	65-69	70-74	75-79	80-84
Frequency	9	8	8	1	2	1	1

Mean = 59.67, n = 30 Standard deviation = 7.72
Minimum rating = 30 pts maximum rating = 120 pts
% Mean = 49.73%

Table 6 showed the observed rating scores of the Mathematics lecturers while in their classrooms with the least and highest scorer of 50 and 81 points respectively, though a frequency interval of 5 was used. The percentage mean scores of 49.73% was obtained and this figure was less than 50% average. The implication was that teaching and learning situation in the classroom was not totally students' centred as recommended by the minimum standard. In summary, the overall classroom observation of teaching and learning was traditional (i.e. teacher's oriented).

DISCUSSION

Studies have confirmed the causes of dismal performance of students in Mathematics along the topics perceived to be difficult to learn (Oyedeji, 1992); lack of instructional facilities to make teaching and learning meaningful (Akinsola, 1999). This study has also confirmed the dismal performance of students in Mathematics at the colleges of education level, even though they were prepared teachers of Mathematics. What could be inferred from this is that the quality of these Mathematics teachers, going by the finding, might not help the country education system. On the other hand, it might be a fruitless effort to all the stakeholders in education unless concrete solution as identified by the study was done.

Secondly, it was observed that the available and direct relevant resources for the preparation of the Mathematics teachers were inadequate as stated by the minimum standard. It should be noted here that the quality of any nation educational system depends on the quality of its teachers whose preparation depends on the available relevant resources. In a situation whereby Mathematics teacher did not recognized some instructional facilities to have direct impact on learning not to talk of using them to teach means that his mode of preparation would be repeated transitively in nature. 'The way I was taught would be the way to teach young ones'.

CONCLUSION

The primary goal of teaching and learning is to ensure students' performance in a given task. Meanwhile, a strict compliance to the condition of accreditation of the colleges' programme with constant monitoring in order to correct shortcomings should be done. Infact, the implementation of the programme should take a premium position and this could be done through the cancellation of interim accreditation.

REFERENCES

Adamolekun, A. A. (1986). Causes of students' under achievement in science, *keynote address delivered at the 27th annual conference of STAN* from 25th –30th August, Owerri, Nigeria.

Adetula, L. O. (1987). Teaching Mathematics in primary and secondary schools in Nigeria. *Nigeria education forum* 10 (1), 87-92.

Adesoji, F. A. (1999). Mock examination results and students' gender as correlate performance in the senior secondary schools certificate examinations in Mathematics. *African Journal of Education Research* 5 (1), 101 – 107.

Akinsola, M. K. (1999). Effects of instrument on students' performance in knowledge, comprehension, and Application tasks in Mathematics. *African Journal of Educational Research* 5 (1), 94 – 100.

Adeoye –Oluwa, M. (2003). 'The teacher education needs reviewing' Nigeria Tribune, November 7, Friday. Pg. 14.

Flanders, Ned. A. (1970). *Analyzing teaching behaviour*. Addison-Wesley Publishing company. Inc.

Federal Republic of Nigeria (1981). *National policy on Education* (reviewed) Lagos. NERDC Press.

Isyaku, K. (1994) The NCCE experience in curriculum development *curriculum development in Nigeria*. 1st edition. Ibadan. Sam Bookman educational and communication services. 277 – 284.

Massialas, B. G. (1969). Social studies versus social science: The end of an era. *The social studies.*

NCCE (1990). *Standard minimum guides for the NCE teachers (science)* NCCE, Kaduna, 1st Edition.

NCCE (1996). *Standard minimum guides for the NCE teachers (science)* NCCE, Kaduna. Revised Edition.

Olakulehin, J. O. (1995) Evaluation of junior secondary school social studies curriculum in Oyo and Osun State. *Unpublished Ph.D. Thesis*. Obafemi Awolowo University.

Oyedeji, O. A. (1992). Areas of difficulties in primary Mathematics curriculum as perceived by In-service mathematics teacher. *Journal of the science Teacher Association of Nigeria* 27 (2) 66-70.

Oyedeji, O. A. (1996). Perceived causes of under-achievement in mathematics among Nigerian secondary school students *Journal of educational discussion and research* 2 (1). 101-106.

Onocha, C. O and Okpala, P. N. (1995). Effects of systematic assessment procedures on students' achievement in mathematics and science subjects. *ISSN* 10 (11).

Olaoye, L. A. A. (1998). Learners' difficulties in Mathematics A case study of secondary schools in Ibadan, Oyo State of Nigeria. *Unpublished M.Ed. Dissertation.* University of Ibadan.

J. A. M. B. (2000). *Polytechnic and colleges of education brochure* guidelines for admission to programmes in polytechnics and course in colleges of education.