



Assessment and the Implementation of the Curriculum Content of Mathematics Education among Colleges of Education in North-Central, Nigeria

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Abstract

This research paper specifically examine the assessment and the implementation of the curriculum content of mathematics education in selected colleges of education in North-Central, Nigeria. Two research questions and corresponding hypothesis was formulated to be tested. The study adopted a descriptive cross-sectional survey design. Convenient sampling technique was used to select 116 Mathematics lecturers consisting 100% of the total population as the number can be controlled from twelve (12) Colleges of Education within the North- Central, Nigeria. The instrument used was the structured questionnaire and it was validated by experts in the field. The reliability of the instrument was determined using the result from the pilot study and Cronbach Alpha formula yielded a reliability coefficient of 0.79. The data collected were analyzed using the mean, standard deviation and Mann-Whitney U-test statistics. Some of the findings include NCE Mathematics lecturers agreed about the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives. It was observed that respondents were in agreement with the knowledge and attitude towards the implementation of NCE Mathematics programme agreed about the cognitive knowledge of NCE Mathematics programme. One of the major recommendations was that Mathematics curriculum contents should be reviewed to reflect on the modern methods of teaching and internationally approved practices

Keywords: Mathematics Education, Assessment techniques and Curriculum

Introduction

In Nigeria, education is categorized into three levels namely; Basic, Secondary and Tertiary Education. The place of Mathematics in the realization of the objectives of these three levels of education cannot be overemphasized. However, these could be achieved through adequate teaching and learning of Mathematics. Meanwhile, Mathematics is a core subject in Nigerian secondary school curricular. Its inclusion justifies the recognition of Mathematics as being essential tool for national development

as it is used by scientists and industrialist. More so, Mathematics is the foundation of all sciences, technology and modern development, and for any nation to survive and develop, that nation has to improve its technology which could be achieved through the effective teaching and learning of Mathematics (Agwagah & Gimba, 2013). In addition, Mathematics is a pre-requisite subject for courses like medicine, pharmacy, nursing, architecture, engineering, land survey, banking, tailoring and creative art. The importance of studying Mathematics to man and the society at large cannot be over emphasized, Emmanuel and Daniel (2016) viewed Mathematics as an exciting and challenging subject which continues to develop at a rapid rate across many research areas. Taking a real world problem and creating and applying Mathematical models to aid understanding is often hugely satisfying and rewarding.

As society becomes more globally dependent on technology, there is an increasing demand for people with a high level of Mathematical knowledge. For instance, a degree in Mathematics provides you with a broad range of skills in problem solving, logical reasoning and flexible thinking which leads to careers that are exciting, challenging and diverse in nature (Okafor & Anaduaka, 2013). To this end, students need to be encouraged to know the importance of Mathematics in national development as the quality teaching personnel should be employed to teach the subject. The contents to be learnt are well spelt in curriculum.

Curriculum is a particular form of specification about the practice of teaching; it is a way of translating any educational idea into hypothesis testable in practice (Blenkin, 2012). In Nigeria, secondary school curriculum is designed to encourage all students to achieve their spiritual, intellectual and social potential as well as to understand the relevance of learning in their daily lives (Ali & Ajibola, 2015). It is important to note

that, it is one thing to design curriculum, it is another thing to implement it effectively. Thus, the objectives of education cannot be achieved if the planned programmed for such level of education is not well implemented (Asebiomo, 2015) no matter how well a curriculum of any subject is planned, designed and documented, implementation is important.

Curriculum implementation therefore refers to how the planned or officially designed course of study is translated by the teacher into syllabus, scheme of work and lessons to be delivered to students (Ali & Ajibola, 2015). From the definitions of curriculum implementation it shows that effective curriculum implementation involves interaction within the teachers, learners and other stakeholders in education which is geared towards achieving the objectives of education. The implementation of the curriculum documents is to a great extent dependent on the teachers who are expected to translate policies into practice in the classrooms (Asebiomo, 2015). Therefore, their perceptions on the implementation of the curriculum need examination as scholars have identified factors that influence curriculum implementation.

Orafi (2013) and Mohammad (2017) affirmed that curriculum could influence the teaching and learning in our institutions of learning, in terms of number of enrollment in science classes, the number of credit needed for admission, staff strength, training and retraining of staff and their awareness of the curriculum and its implementation, availability of resource, and guidance and support systems.

On the other hand, factors such as absence of finance, insufficient supply of materials and equipment, lack of cooperative work relationships and insufficient time seriously influencing the implementation (Tom-Lawyer, 2014). The Poor implementation of curriculum contents results in learner poor academic performance in examination as well as

formation of negative attitude to learning. In view of the stakeholder in education and relevant examination bodies such as National Teachers Institutes (NTI) and National Training Information Centre (NTIC) have been showing great concern on the assessment and prevalent social realities relating to learners' academic incompetence in Mathematics, poor attitude to learning and massive students failure are imparts to the study of this nature (Abdu, 2014).

Constructivist curriculum content

According to Abdu (2014) constructivist curriculum contents lead to interdisciplinary studies, while learners are made to focus on a problem. Contents are not specifically designed but general, thus limits are not set. Contents are derived from the common interest of learners as well as their psychological needs. In addition, selected topics are created to serve as instructional units. All activities are related to primary goal and developed in an engaging meaningful context. As for Mathematics curriculum, contents are designed in such a way that learners are encouraged to investigate rich and complex problems situation, conjecture, explore ideas, make connections between Mathematical ideas and generalized their findings. Furthermore, curriculum units are recommended to focus on large assignments, open ended problems and exercises which lead to the development of main idea in the unit (Abdu, 2014). Constructivist curriculum contents are also designed from simple to complex, from known to unknown and are based on learners' experience.

Arising from the revolution in objectives, some radical changes were made in the content. At the primary, secondary and tertiary institution, the contents of subjects studied were reviewed so that they would gear toward achieving the set objectives. In addition, subjects like social studies, introductory technology, and moral philosophy were introduced into the school curriculum and given a core status in their relevant levels of education.

The level of dissatisfaction on the quality of training being received by pre-service NCE teachers makes it to recall and suggested bringing back the old Teacher Colleges to replace the current Nigeria's Colleges of Education, (Kperogi, 2013). Under the current colleges of education curriculum, it prepares pre-service teachers to teach at secondary school levels which is a waste of efforts since our Universities faculties of Education already do this and the courses offer, are of higher levels to change the current colleges of education into institutions that train students to teach in the elementary schools, (Dambatta, 2013). Thus, shows a serious mismatch between the NCE curriculum content and the principal intent of the program which is training of teachers for the Basic schools. All these can only be ascertain through assessment and the implementation of the curriculum content of mathematics education among colleges of education in North-Central, Nigeria.

Statement of the Research Problem

In spite of Nigerian government's desire to promote science education programme in the country, submissions have been made by individuals and organizations through reports on the level of dissatisfaction with the quality of teachers trained through pre-service training or the processes adopted in the pre-service teacher program (Maureen, 2010). In the case of Mathematics, it was observed that despite the importance of Mathematics as a core subject in lower and upper Basic (Primary and Junior Secondary) Education in Nigeria, evidence has shown that teachers are not doing well in the teaching of this subject (Cecilia *et al.*, 2013). Lim (2011) evaluated the America's grade 4-8 mathematics teachers preparation programme at a large state institution in Texas and found out that the pre-service teachers had low confidence in content knowledge as this could also be one of the factors that could lead to the pre- service mathematics in North- Central States of Nigeria to have low confidence in teaching mathematics in basic level of education that gives low performance

in students grades at final examination most especially in mathematics is what lead to empirically assessed the implementation of the national curriculum for Colleges of Education in Mathematics.

there is need to focus on evaluation of quality of education being imparted, is what prompts the researcher to carry out a study on assessment and the implementation of the curriculum content of mathematics education among colleges of education in North-Central, Nigeria.

Aim and Objectives of the Study

The aim of the study was to assess and examine the implementation of the curriculum content of Mathematics education among Colleges of Education in North- Central Nigeria.

The objectives of the study were to

- i. To determine if the NCE Mathematics curriculum contents is adequate for the achievement of philosophy and objectives for teaching NCE Mathematics programme.
- ii. To investigate if NCE Mathematics lecturers possess cognitive knowledge of Mathematics curriculum and attitudes towards implementation of NCE Mathematics programme.

Research Questions

The following questions were raised for this study:

- i. Are the NCE Mathematics lecturers' assessments of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives suitable the adequacy?

- ii. To what extent NCE Mathematics lecturers' assessments about the cognitive knowledge of mathematics curriculum and attitudes towards implementation of NCE Mathematics programme?

Null Hypotheses

HO₁: There is no significant difference between the assessments of less experienced and experienced NCE Mathematics lecturers about the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives.

HO₂: There is no significant difference between the assessment of less experienced and experienced NCE Mathematics lecturers about cognitive knowledge of Mathematics curriculum and attitudes towards implementation of NCE Mathematics programme.

METHODOLOGY

Research Design

The researcher adopted a descriptive cross-sectional survey design. The cross-sectional survey design allows for data to be collected from uniform subjects at different places within a uniform time (Burden & Bayliss, 2008) which involve collecting information from lecturers who are in charge of the implementation of the curriculum and the observation of Mathematics Education classroom teachers.

Population of the Study

The target population of this study comprised of one hundred and thirty-one (131) Mathematics lecturers' in Colleges of Education in North-Central, Nigeria. Thirty-four (34) Mathematics lecturers' were from Federal Colleges of Education while Ninety-seven (97)

Mathematics lecturers' were from State Colleges of Education in North – Central, Nigeria. There are thirteen (13) colleges of education in North Central, Nigeria; out of which three (3) are Federal Colleges of Education and ten (10) are State Colleges of Education in North-central states of Nigeria

Sample and Sampling Technique

The researcher used the entire one hundred and sixteen (116) Mathematics Lecturers in the Colleges of Education in the North-Central zone of Nigeria to solicit responses to the questionnaire.

Research Instrument

The instrument used in this study was the structured questionnaire. The questionnaire was organized into two sections – A and B. Section A contains items on lecturers' personal data. Section B contains nine items on modified assessment techniques. In sections B, a rating scale of Section B concerned with Assessment of NCE Mathematics Programme structured in four points rating scale: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2 and Strongly Disagree (SD) = 1 was used. Twelve (12) of the Colleges of Education in North- Central State were used in the study and convenient sampling technique were used on lecturers as the number can be control (Charles, 2009) which consist of one hundred and sixteen (116) Mathematics Lecturers in the Colleges of Education, constituting 100% of the total population of the Mathematics lecturers in the study area.

Validity of the Instrument

The instruments for data collection was subjected to face and content validity by experts in Mathematics Education, curriculum lecturers as well as senior lecturers in Science Education department, at Federal University of Technology, Minna, Niger state college of

Education, Minna and Federal college of Education, Kontagora who made useful inputs and this was eventually incorporated into the final questionnaire.

Reliability of the Instrument

To determine the reliability of the instruments, a pilot study was carried out. The lecturers' questionnaire was administered to fifteen (15) Mathematics lecturers at colleges of education in Niger State college of education, Minna Niger State Ondo and Ekiti States. The Cronbach Alpha technique was used to obtain a reliability coefficient of 0.79. The reliability shows the appropriateness of the measurement instruments.

Method of Data Collection

The researcher with the help of research assistants administered the instrument to the concerned respondents and collected same from them.

Data Analysis

The data collated were analysed using both the descriptive and inferential statistics. The descriptive statistics used was the mean and standard deviation while the inferential statistics used was Mann-Whitney U-test statistics. The grand mean of 2.50 and above was considered as decision point.

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

Research question one

What is the Mean of NCE Mathematics lecturers' assessment about the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives?

Table 1: Mean and standard deviation of NCE mathematics lecturers' assessments about the adequacy of the mathematics curriculum contents towards the achievement of the NCE mathematics programme philosophy and objectives

S/N	Items Statement	SA	A	D	SD	Mean	SD	Remarks
1.	The NCE Mathematics curriculum contents is adequate towards the achievement of the NCE Mathematics programme's philosophy and objectives	10	34	57	15	3.20	.59	Agree
2.	The NCE Mathematics curriculum contents is suitable towards the achievement of the NCE Mathematics programme's philosophy and objectives	2	17	71	26	2.99	.80	Agree
3.	The NCE Mathematics curriculum contents is not adequate towards the achievement of the NCE Mathematics programme's philosophy and objectives	8	20	63	25	2.97	.85	Agree
4.	The NCE Mathematics curriculum contents is not suitable towards the achievement of the NCE Mathematics programme's philosophy and objectives	11	67	25	12	3.10	.69	Agree
Grand Mean and Standard Deviation						3.07	.73	Agree

Table 1 Shows NCE Mathematics lecturers' assessment about the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives. All the respondents were in agreement with the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives. This is because the mean value was 3.20 is greater than the decision mean 2.50.

Research Question Two

What is the Mean of NCE Mathematics lecturers' assessment about the cognitive knowledge of Mathematics curriculum and attitudes towards implementation of NCE Mathematics programme?

Table 2: Mean and standard deviation of NCE mathematics lecturers' assessments about the cognitive knowledge of mathematics curriculum and attitudes towards implementation of NCE mathematics programme.

S/N	Item Statement	SA	A	D	SD	Mean	SD	Remarks
5.	NCE Mathematics lecturers acquired adequate laboratory skills in Mathematics	14	55	36	9	2.40	.85	Disagree
6.	NCE Mathematics lecturers acquired functional scientific attitudes	15	71	20	9	3.15	.81	Agree
7.	NCE Mathematics lecturers acquired ability to apply Mathematics knowledge to everyday life	27	81	6	2	3.60	.86	Agree
8.	NCE Mathematics lecturers acquired meaningful knowledge in Mathematics	13	52	38	12	4.21	.83	Agree
9.	NCE Mathematics lecturers acquired relevant knowledge in Mathematics	12	63	30	10	4.32	.76	Agree
Grand Mean and Standard Deviation						3.54	.82	Agree

Table 2 Shows NCE Mathematics lecturers' assessment about the cognitive knowledge of Mathematics curriculum and attitudes towards implementation of NCE Mathematics programme. It was observed that respondents were in agreement with the knowledge and attitude towards the implementation of NCE Mathematics programme. This is because the mean value of 4.32 was greater than the decision mean 2.50.

Testing of Null Hypothesis

HO₁: There is no significant difference between the assessments of less experienced and experienced NCE Mathematics lecturers about the suitability and adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives.

Table 3: Shows summary of Mann-Whitney U-test of less experienced and experienced NCE mathematics lecturers' about the suitability and adequacy of the mathematics curriculum contents towards the achievement of the NCE mathematics programme philosophy and objectives.

Lecturer	N	Mean Rank	SD	df	U-value	p-value
Less Experience	49	63.72	5.67	114	1385.50	.14
Experience	67	54.68	6.06			
Total	116					

Not Significant $p > 0.05$

Table 3 revealed the Mean Rank of 63.72 and Standard Deviation of 5.67 for less experienced and Mean Rank of 54.68 and standard deviation of 6.06 for experienced with Mann-Whitney U-test 1385.50, $df = 114$, $p > 0.05$. Hence, HO₁ was not rejected. Therefore,

there was no significant difference between the assessments of less experienced and experienced NCE Mathematics lecturers' about the suitability and adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives.

HO₂: There is no significant difference between the assessments of less experienced and experienced NCE Mathematics lecturers about the cognitive knowledge of Mathematics curriculum and attitudes towards implementation of NCE Mathematics programme.

Table 4: Shows summary of Mann-Whitney U-test of less experienced and experienced NCE mathematics lecturers' about the cognitive knowledge of NCE mathematics curriculum and attitudes towards implementation of NCE mathematics programme.

Lecturer	N	Mean Rank	SD	df	U-value	p-value
Less Experience	49	59.06	5.01	114	1614.00	.87
Experience	67	58.09	4.46			
Total	116					

Not Significant $p > 0.05$

Table 4 revealed the Mean Rank of 59.06 and Standard Deviation of 5.01 for less experienced and Mean Rank of 58.09 and standard deviation of 4.46 for experienced with Mann-Whitney U-test 1614.00, $df = 114$, $p > 0.05$. Hence, H_{O6} was retained. Therefore, there was no significant difference between the assessments of less experienced and experienced

NCE Mathematics lecturers about the cognitive knowledge of Mathematics curriculum and attitudes towards implementation NCE Mathematics programme.

Discussion of Findings

NCE Mathematics lecturers agreed about the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives. Null Hypothesis one revealed there was no significant difference between the assessment of less experienced NCE Mathematics lecturers about the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives. The findings of Lim (2011) revealed that the mathematics courses met state standard covering about 83% of mathematics related texas examination of educators standard learning outcomes and mathematics education courses met standard scores for memorized/factual knowledge. Ayonike *et al.* (2009) were of the opinion that among other things the content of PES curriculum was adequate for the NCE programme. Eraikhuemen and Oteze (2010) disagreed with Lim (2011) whose findings revealed that the content of the NCE mathematics modules is not significantly adequate for the realization of the objectives of the programme. Supporting this result Abdu (2014) revealed that mathematics curriculum contents in senior secondary school were not fully implemented. In a similar finding by Bello (2010) in Dambatta (2013) result shows that there was significant difference in the assessment of the course objectives and content by qualified and unqualified integrated science lecturers, thus the former found it suitable while the later found it unsuitable. Akanbi (2011) finding revealed that 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.

It was observed that respondents were in agreement with the knowledge and attitude towards the implementation of NCE Mathematics programme agreed about the cognitive knowledge of NCE Mathematics programme. As the null hypothesis two revealed that there was no significant difference in the assessment of NCE Mathematics lecturers about the cognitive knowledge of mathematics curriculum and attitudes towards implementation of NCE Mathematics programme. Lim (2011) affirmed that pre-service teachers over all content knowledge was not strong. In the same study it was revealed that pre-service teachers had low confidence in content knowledge also the programme is having difficulty of building a pedagogical prowess upon low confidence and knowledge in mathematical content. According to Alper (2011) despite all, teaching profession has created an intense feeling of “excitement” amidst prospective teachers. This finding may be indicative of the fact prospective teachers’ attitude towards teaching profession has developed in the desired way because regardless of all negations the profession itself achieved to create such intense feeling of “excitement” amidst prospective teachers. Additionally hope, assistance, curiosity, happiness, pride and responsibility are the rest of feelings created by teaching profession amidst prospective teachers. It has been underlined by prospective teachers that as a teacher one must particularly possess the feature of “role modeling” in addition to responsibilities such as “self-improvement”, “gaining self-trust”, “being useful” he prediction of pre-service mathematics teachers’ computer anxiety.

Conclusions

Based on the findings of this study:

NCE Mathematics lecturers agreed about the adequacy of the Mathematics curriculum contents towards the achievement of the NCE Mathematics programme philosophy and objectives.

It was observed that respondents were in agreement with the knowledge and attitude towards the implementation of NCE Mathematics programme agreed about the cognitive knowledge of NCE Mathematics programme.

Recommendations

The following recommendations are based on the findings and conclusions of this study:

1. Mathematics curriculum contents should be reviewed to reflect on the modern methods of teaching and internationally approved practices
2. Mathematics teachers and their respective schools can design various mechanism to develop better attitudes on students' to learning of mathematics subjects. For instance, besides improving the classroom practice, students need to be aware of the role of mathematics club's activities to bring the desirable attitudinal changes and make use of these clubs intensively.

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