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Evaluating the Teachers' Perception Index (TPI) and The Readability Index (RI) Of The Approved Mathematics Textbooks In-Use In Junior Secondary Schools In Ebonyi State

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Abstract
The need to create a mathematics literate society motivated the researchers to carry out this study to evaluate Teachers' Perception Index (TPI) and the Readability Index (RI) of approved mathematics textbooks in-use in junior secondary schools in Ebonyi State Nigeria. The study adopted evaluation design. The Instruments for data collection were theFlesch readability ease formular; the Approved Mathematics Textbook Assessment Instrument (AMAI) and 8 – point quantitative evaluation model for sciences books.Simple Random Sampling Technique was used to select four (4) approved mathematics textbooks, 7 secondary schools and 63 mathematics teachers that formed the sample of the study. Two research questions guided the study. The findings of the study revealed that the TPI of the mathematics textbooks in JSS in-use in the state ranged from 2.89 to 3.38 on a 0.00 to 5.00 rating scale. It was also seen that the readability index (RI) fall within the range of fairly difficult, fairly easy, standard and easy to read respectively.On the basis of these findings it was recommended that teachers of mathematics should combine different textbooks when preparing their mathematics lessons. Government should make public results of mathematics textbook evaluation, as it will enable literate parents to make informed choice on the purchase of mathematics textbooks for their children.

I. Introduction

Mathematics as a subject of study at all levels of education, the junior secondary school inclusive involves the manipulation of numbers. The social, economic, political, geographical, scientific, and technological aspects of man are centred on numbers (Maliki, Nghan and Ibu, 2009). Indeed what can man do without involving numbers; which by implication is mathematics?

Odili (2007) described mathematics as a fundamental science that is needed for the understanding of most fields in the sciences and technological education. It is a subject taught primarily for the development of experience for possible solution to problems (Lapan and Shiram, 1998). Therefore for any country to develop both socio-economically and scientifically, the citizenry must be knowledgeable in mathematics and the application of its basic skills to the day to day problem solving. This is because the basic skills underlying all aspect of socio-economic, scientific and technological advancement and the skills that lead to scientific breakthrough are dependent on mathematics.

Consequent upon this realization, the Federal Government of Nigeria made the study of mathematics compulsory at all levels of basic and the senior secondary school education (FRN, 2008).

Furthermore, the designation of mathematics as a compulsory subject in the basic education programme is to ensure the achievement of one of the cardinal objectives of the UBE progamme, which is the citizenry's acquisition of appropriate numeracy and manipulative skills (Popoola, Bello and Atanda, 2003). But nonetheless, the central role of mathematics in the development and survival of an individual in his/her society and in his/her further pursuits of higher education compelled the federal government to further designate a credit pass in mathematics as one of the minimum entry requirements into any tertiary institution irrespective of the individual's choice of course of study. In order for government to achieve her goal of ensuringmathematics literate citizenry government laid strong foundation for the study of mathematics at the basic education system. Basic educationsystem as we know is the nine years education programme which the junior secondary school JSS is inclusive. The JSS programme serves as a link or bridge between the first six years of basic education (primary education) and the last three years of secondary education (the senior secondary school). Hence, for a student to study mathematics in the senior secondary school and do well in it, the foundation and other background structures that promote the understanding of mathematics must have been laid at the junior

secondary school programme. This will enable the student to acquire the basic skills needed to cope with the study of the mathematics taught at the senior secondary school

Furthermore, the junior secondary school programme by design is meant to be prevocational and pre-academic (Nweke, 2021). This simply means that it is a prerequisite for the two. Therefore students who passed through the JSS programme but have no intentions of continuing with further academic studies should be equipped with the requisite skills by the JSS programme to successfully pursue carrier or vocation of their choices. This further implies that the mathematics taught to students at the JSS level should equip students with the skills to adapt and excel in the chosen vocation of interest of the individuals.

To achieve the lofty goals of mathematics education at the JSS, the curriculum was designed to succinctly capture all aspects of the goals and the areas of coverage. These were encapsulated in the objectives of the JSS mathematics curriculum used in the basic education programme. The objectives according to Olaoye (2014) were aimed at developing in the students:

- the ability to manipulate numbers;
- a positive attitude towards mathematics and the capability in appreciating the aesthetics nature and cultural aspect of mathematics; and
- ability to conceptualize, inquire, reason and communicate mathematically, and to use mathematics to formulate and solve problems in daily life as well as in mathematical context.

To achieve those objectives, Olaoye (2014) further disclosed that the mathematics objectives were stated in three domain which were;

- Knowledge domain;
- Skill domain; and
- Attitude domain.

A cursorily look or a glance at the objectives of JSS mathematics as contained in the curriculum shows the comprehensive nature of the mathematics curriculum as manifested by its objectives.

But ironically, students in Ebonyi State still display gross lack of basic skills in mathematics despite the aforementioned objectives. But objectives in themselvesalone are mere expression of intentions. They are only meaningful if they are contentiously implemented. This is achieved when factors that may be either internal and or external that militate their implementations are reduced or eliminated, in addition to making conscious efforts to translate the objectives to reality.

Hence the JSS mathematics objectives outlined in the curriculum can only enhance the understanding of mathematics in Nigeria, when such inhibiting factors are addressed and concerted efforts made to actualize them. It is obvious as had earlier been noted that students in Ebonyi State still fail to do well in mathematics at the basic education certificate examination (Ebonyi SMOE, 2019). One of the major contributory factors according to some researchers is the textbooks used in teaching mathematics (Omiko, 2011). These textbooks according to the researcher lack some features that promote reading and comprehension by students. This if it is true is a big challenge and defeats the main purpose of textbooks serving as instructional aids in effective teaching and learning. This is obvious as textbooks play vital roles in the teaching and learning process. Indeed, textbooks are the most widely used instructional materials for both teachers and learners (Tok, 2010). Textbook not only provides the framework for starting a lesson but serves as a guide when conducting and concluding a lesson. Furthermore, textbook serves as a strong instructional resource for students' independent reading. Hence the quality of textbooks is most fundamental where the informationit presented is reliable, valid, and authoritative and is easy for students to read with full comprehension. Indeed, textbooks have overarching effectson effective pedagogy. Therefore, factors that inhibit this useful purpose of textbooks in instructional delivery must be eliminated. The Ebonyi State Ministry of Education must rise up to the challenge by ensuring that the mathematics textbooks in-use in the JSS are scrutinized in order to eliminate all possible factors that inhibit their effective use. Some of such factors that militate against textbooks' effective usage may include: the readability index, teachers' perception index, content coverage, illustrations, and a host of others. The focus of this current research work is on the readability index and the teachers' perception index on sampled approved mathematics textbooks for use in JSS in Ebonyi State.

Specifically, the readability Index (RI) of a textbook refers to the ease with which people read and comprehend meaning from the textbook. It is an important factor to consider when determining the efficacy of such test book (the subject not withstanding) However, the peculiarity or nature of mathematics as a subject which is based on its rubrics makes the determination of its readability index difficult. This nature or peculiarity notwithstanding, the estimation of the RI of mathematics textbooks is very important and must always be carried out because it forms the basis for the approval of such a mathematics text book for use in schools.More so, the determination of the RI of mathematics textbooks enables the un-biased selection of such books for use in schools, since it will convince the public that the textbook will help students attain the measure of independence as a mathematics learner. Indeed, the readability of a textbook involves characteristics of the textbook that facilitate or inhibit the readers' ability to understand the book (Wiest, 2003). Based on this very important role

of RI in the use of textbook as instructional aids, Education Ministry both Federal and State should endavour to train their textbook reviewers and approval teams on techniques involved in determination of readability index of textbooks especially the mathematics textbooks. This will improve the quality of textbooksin-use in the state and in Nigeria, and also improve students' performance in the subject.

A readability formula is used to estimate a textbook readability and difficult level. Sattle(2001) suggested a formula to be used for RI estimation. This is given by RI = a +b (word length) C(sentence length). Where a, b, c are constants. Readability measure is important in education. It provides information to textbook selection team and textbook writers. It guides authors to determine the level of their textbook readability and check whether the RI conforms to their intended class and grade level.

The teachers' perception index refers to the extent to which teachers perceive or accept the textbook in use as contributing meaningfully to the instructional process. Unarguably, teachers occupy central position in the teaching and learning process. Approved mathematics textbooks are veritable tools used to support instructional delivery in the classroom. However the teachers perceive a given textbook determines its usage to support lesson delivery. Acceptability is closely linked to perception. Hence there is need to evaluate teachers' perception of approved textbooks on how such textbooks supports instructional delivery. This is done through the evaluation, of Teachers' Perception Ratio Scale (TPRS). The TPRS gives information on how a mathematics textbook used in school to support teaching and learning process provides adequate support to teachers. Although information from TPRS is usually subjective but it does not render such information completely invalid. This is because teachers' opinion on textbooks' usefulness cannot be ignored. TPRS usually covers broad areas that tend to overlap with other areas that are usually separately determined. These broad areas covered by TPRS include:

- Content coverage
- Presentation of content;
- Illustration;
- Problem solving activities;
- Experimental and investigation activities;
- Study questions and exercise at the end of chapters or sub-topics,
- Worked examples; and
- Readability (Emereole, 2008).

Respondents express their views on the textbook on a Likert- type rating scale of 0 to 10 (Emereole,2008). A score of 7 and above are considered to be acceptable index for each criterion.Indeedevaluating these factors in the mathematics textbooks used in JSS in Ebonyi State is critical at this point in time, as failure rates in BECE in mathematics in the state is high (Ebonyi MOE, 2019). This may be caused by the inability of the textbooks in-use in the schools to curb the phobia which students have developed towards the study of mathematics. It could also be as a result of the low readability index of the mathematics books or poor teachers' perception of the quality of the mathematics textbooks. Furthermore, evaluation involves determining the value or worth of a given item in a bid to collect necessary data for use to pass objective judgment. In education such evaluation should be constantly made on the quality of resource materials such as textbooks used to support instructional delivery. The outcome of such judgment guide decision making in relation to the quality of inputs and output of the system.

Therefore, this research work is aimed at evaluating the teachers' perception index and the readability index of the mathematics textbooks in-use in the junior secondary school in Ebonyi State.

Statement of the Problem

Mathematics is one of the core subjects studied in the nine years of basic education programme in Nigeria (FRN 2013). Despite the premium that government places on the study of mathematics at the basic level of education, it is disheartening to observe that students in Ebonyi State continuously perform poorly in mathematics at the Basic Education Certificate Examination (BECE) (Ebonyi SMOE, 2019). This observed abysmal performance of students in mathematics in the JSS has continued to agitate the minds of stake holders. Hence, people have continued to wonder what could have been responsible for these poor performances. Furthermore, people have asked whether the cause is due to the level of readability of the mathematics textbooks in-use in JSS in the states or teachers' perception of the quality of these mathematics textbooks. It is obvious that when the teachers perceive the textbooks as not contributing enough to improved instructional delivery, the teachers themselves will not make use of the textbook. Therefore, the major challenge of this study is to provide answer to the question which includes:

- Are the mathematics textbook approved for use in the JSS in Ebonyi State adequate in terms of readability and teachers' perception?. Hence, the problem of this study is to evaluate the readability index and teachers' perception index of mathematics textbooks in use in the JSS in Ebonyi State.

II. Methodology

This study on evaluating the teachers' perception index and the readability index of approved mathematics textbook in-use in Ebonyi State adopted evaluation design as the research design. This design is considered most appropriate to this work as it helped to make value judgment about approved mathematics textbooks in-use, in JSS in Ebonyi State. The specific value judgment focusedon were the readability and teachers' perception indices of the mathematics textbooks. The population of the study were 221 JSS schools in Ebonyi State, 17 approved mathematics textbooks and 1400 mathematics teachers. Four out of the 17 approved textbooks were sampled for the study. Also, 7 secondary schools and 63 teachers were selected through simple random sampling to form the sample for the study.

The instruments for data collection were 8-points quantitative evaluation model for science book, Approved Mathematics Textbooks, Assessment Instrument (AMTAI) and Flesch Readability formula. The instrument had earlier been validated and standardized. The researchers only adopted them. Those instruments were used to collect the data which were analyzed using mean. The Flesch Readability formula was used to analyze the question on readability index.

Research Questions

Two research questions guided the study. These were:

RQ1: What is the junior secondary school teachers' perception index of the approved mathematics textbook in-use in Ebonyi State?

RQ2: What is the readability index of approved mathematics textbooks in use in JSS in Ebonyi State?

III. Results

Research Question 1

What is the junior secondary school teachers' perception index of the approved mathematics textbook in use in Ebonyi State? To answer this question, data were collected using the teachers' perception rating scale (TPRS). The TPRS was administered on the sampled teachers to rate the sampled approved mathematics textbooks in-use in the JSS to teach mathematics. Specifically, the teachers' ratings were based on the following designated criterion; content coverage, learning activity, study questions, illustration, chapter summary and under-representation population. The results are presented on table 1 below. Table 1: Teachers Perception Rating Scale (TPRS) and indices of the rating of the Approved Mathematics Textbooks in-use in Ebonyi State Junior Secondary Schools. Mean Rating of Perception.

Mathematics Textbooks

S/N	STAN	NGM	MAN	NSM
1	4.00	4.00	3.71	3.95
2	3.95	3.95	3.05	4.00
3	4.00	3.90	3.86	4.00
4	3.90	4.00	3.05	3.86
5	3.80	3.95	3.05	3.90
6	3.00	4.00	3.00	3.79
7	2.48	2.67	2.67	2.81
8	2.43	2.38	3.00	1.86
9	2.24	2.48	2.67	1.90
10	2.19	3.90	1.95	1.86
11	2.10	2.62	2.86	2.29
12	3.95	4.00	3.05	3.95
13	2.10	2.19	2.05	2.29
14	3.90	3.71	2.90	4.00
15	3.95	3.76	2.62	3.95
16	2.24	2.52	2.90	2.05
17	3.14	3.71	2.38	2.43
18	2.43	3.48	3.62	2.57
19	3.90	3.57	3.24	4.00
20	2.24	2.86	2.24	3.81
Mean	3.10	3.38	2.89	3.13

Acceptance range = 3.00 to 5.00

Note STAN = Science Teachers' Association of Nigeria; NGM = New General Mathematics; MAN = Mathematics Association of Nigeria; NSM= New School Mathematics. As shown in table 1 above, the grand mean scores of the evaluated sampled approved mathematics textbooks are as follows: STAN Mathematics=

3.10, NGM = 3.38, MAN = 2.89; NSM = 3.13. Itshould be recalled that the acceptance range is 3.00 to 5.00. This shows that all the sampled mathematics textbooks except MAN attained the acceptance range of at least 3.00. The MAN textbook only recorded 2.89 which is lower than the acceptance range.

Research Question 2

What is the readability index (RI) of approved mathematics textbooks in use in JSS in Ebonyi State?

To answer this research question the sampled approved mathematics textbooks in-use in Ebonyi State were subjected to the Flesch Readability Ease Formula test. The scores of the sampled 12 textbooks are presented in table (2) below.

The formular is RE = 206.835- 0.846 x syll/100w- 1.01 W/sen

Where RE = Readability Ease Score on a scale of 0 to 100

Sylls/100w= The average number of syllables per 100 words and W/sen is the averagenumber of words per sentence

Table 2: Readability and Comprehensibility index (RCI)

S/N	TEXTBOOK	SCORE	READABILITY
1	STAN MATHS JSS 1	61	Standard
2	STAN MATHS JSS 2	51	Fairly difficult
3	NGM MATHS JSS 3	79	Fairly Easy
4	NGM MATHS JSS 1	73	Fairly Easy
5	NGM MATHS JSS 2	72	Fairly Easy
6	NGM MATHS JSS 3	74	Fairly Easy
7	MAN MATHS JSS 1	73	Fairly Easy
8	MAN MATHS JSS 2	72	Fairly Easy
9	MAN MATHS JSS 3	61	Standard
10	NSM MATHS JSS 1	64	Standard
11	NSM MATHS JSS 2	87	Easy
12	NSM MATHS JSS 3	79	Fairly Easy

Acceptance range = 50 to above 80

From the results on table 2 above, the RCI for the twelve (12) mathematics textbooks evaluated show that for STAN mathematics JSS1 was 61, JSS 2 = 51, JSS 3 = 79. For the NGM, JSS 1= 73, JSS 2= 72, and JSS 3 = 61. For the NSM, JSS1 = 64 JSS 2= 87 and JSS 3 = 79. This means that NSM JSS III with a score of 87 is the most readable and by implication the easiest of the twelve (12) JSS mathematics textbooks evaluated.

IV. Discussion

The findings of this study show that for the teachers' perception of the approved mathematics textbooks in JSS in Ebonyi State as an effective instructional resource material in promotion of teaching and learning, STAN mathematics textbooks was rated 3.10, NGM 3.38, MAN 2.89 and NSM 3.13. These ratings are cumulative ratings on the number of criterion considered. This included, content coverage (topics and subtopics covered in the textbook as specified by the syllables). Content presentation (the way the contents are presented in the textbooks). Study questions (All the questions and exercises in the textbooks which helped to develop thinking skills in the learners), illustrations (diagrams, graph, picture tables), worked examples (questions and solutions); problem solving activities (drawing conclusions, analyzing and manipulating data) experimental and investigative activity (scientific experiment, planning, investigation that help develop learning skills) and readability (the ease with which learners read and understand the textbook). The result of this study showed that STAN mathematics with an average score of 3.10, NGM with an average of 3.38 and NSM which had 3.13 lie within the acceptance range, while MAN with a score of 2.89 fall below the acceptance range. Although the ratings are subjective but they provided useful information to the State Ministry of Education which will serve as guide to textbook approvals. The authors of textbooks sampled will also find the information useful as it will help them review the textbooks in order to make the books relevant in term of acceptability and teachers' perception. On the readability ratings of the sampled mathematics textbooks the scores obtained which represents findings of this study showed that the most easy to read of the sampled approved mathematics textbooks was the new school mathematics with a score of 87, while the STAN mathematics for JSS 2 with a score of 51 is the most difficult to read. This shows that it falls within the range of fairly difficult to read. Moreover, all the evaluated mathematics textbooks except STAN mathematics JSS 2 has readability index that

lie between 70 to above 80. This shows that they are readable and are useful tools for students' independent academic study. These findings are consistent with that of Omebe (2014) that reported that there are little variations in the readability indices of basic science textbooks in-use in Ebonyi State.

V. Recommendations and Conclusions

This study has made some revelations which are informative and will serve as a guide to ministry of education in the approval of mathematics textbooks for the junior secondary school.From the findings it was shown that the TPRI for the JSS mathematic in-use in Ebonyi State is adequate except for STAN Mathematics JSS 2. This is because the TPI ranged from 2.89 to 3.38. This shows that teachers considered these mathematics textbook text books except the STAN JSS 2 as effective instructional materials for teaching and learning. On the readability index, it was also seen that the textbooks in-use in the state are fairly easy, fairly difficult, standard or easy to read. Since it is only one out of the evaluated mathematics textbooks that is fairly difficult, it can be seen that the mathematics textbooks in-use in JSS in Ebonyi State are readable Based on these findings, it is being recommended that-

- Ebonyi State Ministry of Education should involve experts in evaluation of mathematics textbooks before approving them as textbooks for use in schools for teaching and learning of mathematics.
- Results of mathematics textbooks or other textbooks evaluation carried out by the ministry should be made open to the general public. The techniques involved in the evaluation should be treated the same way. This will help tojustify to all education stakeholders especially the teachers and literate parents the reasons for the approval of the textbooks.
- Teachers should not make use of one textbook in preparing their lessons. They should help students to be exposed to diverse textbooks in mathematics to acquire knowledge on how mathematics problems are solved.

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