

Evaluation of Some Approved Primary Science Textbooks in Use in Public Primary Schools in Ebonyi State of Nigeria

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I. INTRODUCTION

The study was designed to evaluate the content and adequacy of primary science textbooks in public primary schools in Ebonyi State. Eight research questions guided the study. The sample of the study consisted of four recommended primary science text books. Three (3) instruments were used for data collection (1) Primary Science Readability Test (PSTRT) (2) the 8-point model by Emerola (2008), an update of Quantitative Approach to the Content. Evaluation of Science Textbooks (QACEST) by Nworgu (2001). The 8-point model of QACEST was used to answer research question 1,2,3,5 and 7. Research question 6 was answered by using cloze model of readability measurement. The result of the finding showed that the recommended primary science textbooks contained adequate contents and learning activities. It also revealed that the illustrations, study questions, in some of the textbooks were inadequate. Based on the findings, it is recommended that primary science textbooks should be revised periodically to enrich their contents of the textbooks. Primary science is a compulsory subject in state schools. The Nigeria Education Research and Development Council (NERDC) was mandated to develop curricular for use at all levels of educational system in Nigeria, science inclusive, NERDC was directed by the national Council on Education to re-structure and realign the existing primary and junior secondary school curricular to meet the targets of the 9-year basic education in the content of the National Economic Employment, and Development (NERDC, 2007). In line with these development, the modules for teaching primary science was developed and many primary science textbooks were also written. The modules break the contents of the syllabi down into the basics, they define the objectives in learner- performance terms and reduce both content and objective to classroom-learning experiences for pupils, thus making the achievement of the objectives of primary science education through a series of classroom activities over a period of time. Science modules also enable the science teacher to order instruction and work towards the realization of performance objectives. The textbooks enable science teachers teach science concepts effectively and aim at achieving the general objectives and goals of science education. The pupils themselves practice the learning activities by demonstrating commitment and assiduity in using of these science textbooks.

The aim of primary science can be broadly divided into two categories.

- To enhance pupils curiosity in the world around them and encourage critical and creative thinking.
- To create a foundation for science at secondary schools

To fulfill these aims, the use of textbooks becomes absolutely necessary. The pupils use it as learning materials to acquire both factual knowledge and skills of scientific enquiry, identifying questions that can be addressed scientifically, doing assignment, planning and carrying out experiments. While the teachers use the textbooks as instructional materials for teaching. Most teachers and pupils in different parts of the world rely heavily on textbooks including those in primary science as perhaps the only source of information (Baiyelo, 2000).

According to Altbach and Kelly (1998), textbooks stand out at the heart of educational enterprise. Teachers rely on them to set the parameters of instruction and to impact basic educational content. They argued that in schools, pupils' school work often begins (and in some schools ends) with the textbooks. Texts constitute the base of knowledge, particularly in the third world countries where there is a chronic shortage of qualified teachers, and online education services, (Niaz, 2001). Since textbooks are very important in teaching and learning processes, it needs to be critically evaluated to see whether they are meeting the expected goals of the national policy on education or that of national policy on science and technology Federal Republic of Nigeria (FRN, 1998, 2002).

Purpose of the Study

The purpose of the study was to evaluate primary science textbooks in use in public primary schools in Ebonyi State. Specifically this study sought to:

1. Determine how the contents of the primary science text books in use in the primary schools reflect the content specified in the core curriculum for primary science.
2. Determine adequacy of the learning activities of each of the primary textbooks in use in primary schools.
3. Determine the relevance of the learning activities of each of the primary science textbooks in use in the public primary science.
4. Find the appropriateness of each of the textbooks chapter summarized to the class level.
5. Determine the adequacy of the study questions in each of the textbooks.
6. Examine the readability levels of the textbooks for each of the classes.
7. Determine the under-represented population index
8. Examine the teachers' perception of the four primary science textbooks as useful instructional aid to them.

Scope of the Study

The study was delimited to the evaluation of the primary science text books currently in use in public primary schools in Ebonyi State. These textbooks are:

- Longman Primary Science pupils books 5 Edited by S.T. Bajah and C.B. Oguntonade
- Macmillan Primary Science, Newly Revised by C.B. Ogunniyi, Uzo Obede and P.A.O. Okebukola
- STAN Primary Science, Science Teachers Association of Nigeria. Second Edition.
- Basic Science and Technology for Primary Schools 5 by Nigerian Education Research and Development Council, NERDC.

The following research questions guided the study:

1. How do the contents of primary science textbooks in use in public primary schools reflect the content specified in the core curriculum?
2. How adequate are the learning activity of the primary science textbooks in use in Ebonyi State primary public schools?
3. How appropriate are the chapter summaries of the primary science textbooks in use in Ebonyi State public primary school
4. How adequate are the study questions of primary schools?
5. What is the illustration index of primary textbooks in use in Ebonyi State public primary schools?
6. What is the readability index of primary science textbooks in use in Ebonyi State public primary schools?
7. What is the under-representation population index of the primary science textbooks in use in Ebonyi State public primary schools?
8. What is the teacher perception index of the primary science textbooks in use in Ebonyi State public primary schools?

Area of the Study

The area of the study is Ebonyi State of Nigeria. Ebonyi state is located within the South East Zone of Nigeria. It was created in 1996 from both Abia and Enugu State. Specifically, the study covered all the three education zones in Ebonyi State. (Abakaliki, Afikpo and Onueke). There was carried out in these zones because no such study had been done there since the creation of the state in 1996.

Design of the Study

The study employed an evaluation design. Evaluation design is the type of design, which seeks to ascertain, or judge the value of a programme or resources by careful appraisal determined by a pre-stipulated standard (Carter, 1989). According to Ali (2006), evaluation design is the type of design that makes value judgment on programmes and projects based on certain pre-determined criteria. Specifically this study employed the naturalistic evaluation design which, according to Wolf (1991), is the act of gathering information and juxtaposing it with some set of criteria to make judgment regarding the strength and weakness, merits or worth of an education innovation, materials, programmes or products. This design is useful because the study involves making value judgment about primary science textbooks in use in primary schools in Ebonyi State.

Population of the Study

The population of the study consists of 19 approved primary science textbooks in use in Ebonyi state, and all the teachers in public primary schools in Ebonyi state of Nigeria.

Sample and Sampling Techniques

Four approved primary science textbooks using public primary schools in Ebonyi State were used in this study. In all the stream of primary, simple random sampling was used to select primary 5 textbooks.

Instrument for Data Collection

The instrument that was used for the data collection is the 8-point quantitative evaluation model for science textbooks. This was developed by Emerole (2008). The model is an update of the 5-point quantitative model for evaluation of science textbooks (QACEST) Nworgu (2001) developed. It evaluates science textbooks using the following indices:

- Topical Coverage Index (TCI)
- Learning Activity Index (LAI)
- Study Question Index (SQI)
- Illustration Index (ILI)
- Chapter Summary Index (CSI)
- Under-Representation Population Index (UPI)
- Readability and Comprehensibility Index (RCI)
- Teacher Perception Ration Index (TPI)

Topical Coverage Index (TCI): Provides an estimate of how far the content of the textbooks covers the prescribed syllabus.

Learning Activity Index (LAI): Is an estimate of the degree to which the textbook provides activities that will ensure optimal participation of the learner.

Study Question Index (SQI): Estimates the extent to which the study questions in the textbooks challenges the learners meaningfully.

Illustrations Index (ILI): Is an estimate of the extent to which illustrations (diagrams, pictures, charts, tables graphs, equations, etc) contained in the book make for better and more meaningful understanding of the ideas being referred to in the textbook.

Chapter Summary Index (CSI): Provides an estimate of the extent to which the chapter summaries promote a more permanent understanding of the content of the textbook.

Under-Represented Population Index (UPI): Estimate the extent to which the ideas, examples and illustrations that have gender or cultural/ethnic connotations. The textbooks are presented in a neutral or balanced form.

Readability and Comprehensibility Index (RCI): Provides the quantitative estimate of readability and comprehensibility of a textbook.

Validation of the Instrument

The study adopted the 8-point quantitative evaluation model for science textbooks, developed by Emerole (2008) an update of the 5-point QACEST model developed by Nworgu (2001). The instrument does not need any other validation since the model is already a validated instrument.

Reliability of the Instrument

The 8-point quantitative model for content evaluation of science textbooks, an update of the 5-point (QACEST) model was assessed for reliability using Kendall's Coefficient of Concordance (W). Four teachers were used to rate each of the four textbooks. A reliability coefficient of 0.71, 0.75, 0.79 and 0.85 were obtained for each of the textbooks using the ratings of the four teachers.

Method of Data Collection

Data was collected using the 8-point quantitative approach for content evaluation of science textbooks, an update of the 5-point QACEST using primary science textbooks. The primary science schools teachers were trained on how to use the manual of the 8-point quantitative approach for the evaluation of primary science textbooks to determine the indices of topical coverage, learning activities, study questions, chapter summaries, illustration index, under-representation population index, readability and comprehensibility index and teacher

perception rating index.

Method of Data Analysis

The 8-point model quantitative formula was used to answer the research questions. Teachers' perception rating scale (TPRS), determines teachers' perception on how a textbook provides instructional support to them.

Results of the Analysis

Research Question 1

How do the content of primary science textbooks in use in Ebonyi State public primary schools reflect the content specified in the core-curriculum? Based on the data collected, the (TCI) topical coverage index was analyzed. The scores of the four primary science textbooks were calculated and presented in table 1.

Where *Number of topics sufficiently covered by the textbooks*
Number of topics in the syllabus
Number of sub-topics sufficiently covered by the textbooks
Number of sub-topics in the syllabus

Table 1: Indices of Topical Coverage (TCI)

S/N	Textbook					Index	
1	Longman primary science book 5	8	17	26	56	0.46	Accepted
2	Macmillan Primary Science Book 5	15	17	51	56	0.89	Accepted
3	STAN Primary Science Book 5	10	17	43	56	0.38	Not Accepted
4	Basic Science and Technology for Primary School Book 5 (NERDC)	18	17	57	56	1.00	Accepted

Acceptance range = 0.75 - 1.00

The result presented in Table 1, revealed that the primary science textbooks evaluated; Macmillan and Basic Science and Technology are within the acceptance range of topical coverage. This implies that they covered the content of the coreprimary science curriculum.

Research Question 2

How adequate are the learning activities of the primary science textbooks in use in Ebonyi State primary schools. The data collected on the learning activities from each of the four primary science textbooks in use in Ebonyi State public primary schools were analyzed. Based on the results obtained the Learning Activity Index (LAI) was calculated and presented in Table 2.

Where *Number of Sentence requiring the learner to perform some activities*
Number of sentences requiring the learner only to receive information with no other activity

Table 2: Learning Activity Index

S/N	Textbook			Index	
1	Longman primary science book 5	90	69	0.13	Accepted
2	Macmillan Primary Science Book 5	50	40	0.11	Accepted
3	STAN Primary Science Book 5	30	52	-0.26	Not Accepted
4	Basic Science and Technology for Primary School Book 5 (NERDC)	19	82	-0.62	Accepted

Acceptance range = 0.50 - 1.00

The results presented in Table 2 revealed that the learning activity indices (LAI) for the four primary science textbooks evaluated. The results revealed that Longman primary science, Macmillan and Basic Science and Technology for primary school are within the acceptance range of learning activity coverage.

The result revealed that all the four primary science textbooks evaluated are within the acceptance range of learning activity coverage. It simply implies that all the four primary science textbooks contained learning activities as specified in the corecurriculum.

Research Question 3

How appropriate are the chapter summaries of the primary science textbooks in use in Ebonyi state public primary schools. Data on Chapter Summary Index (CSI) as presented in the table below.

- Where = Number of Statements in the summary which represent major points covered in the chapter
- = Number of major points covered in the chapter
- = Number of statements in the summary which represented minor points covered in the chapter
- = Number of minor points covered in the chapter

Table 3: Chapter Summaries Indices (CSI)

S/N	Textbook					Index	
1	Longman primary science book 5	52	70	65	80	0.77	Accepted
2	Macmillan Primary Science Book 5	50	66	62	60	0.89	Accepted
3	STAN Primary Science Book 5	52	58	63	65	0.92	Accepted
4	Basic Science and Technology for Primary School Book 5 (NERDC)	40	45	42	43	0.92	Accepted

Acceptance range = 0.60 - 1.00

The results revealed that all the four primary science textbook evaluated are within the acceptance range of chapter summary. This implies that they contained chapter summaries as specified in the core-curriculum of primary science.

Research Question 4

How adequate are the study questions of primary science textbooks in use in Ebonyi State public primary schools. The data obtained were used for the computation of the Study Question Index (SQI). The computation of the SQI was based on the questions found in each of the four primary text books evaluated. The results are presented in Table 4 below.

- Where T = Number of questions that require students to engage in real thinking
- R = Number of questions that require students to merely recall knowledge

Table 4: Study Questions Index (SQI)

S/N	Textbook			Index	
1	Longman primary science book 5	103	34	0.50	Accepted
2	Macmillan Primary Science Book 5	50	17	0.49	Accepted
3	STAN Primary Science Book 5	76	37	0.35	Accepted
4	Basic Science and Technology for Primary School Book 5 (NERDC)	141	42	0.54	Accepted

Acceptance range = 0.25 - 1.00

Table 4 shows that the Study Question Index for the four primary science textbooks (SQI) in use in Ebonyi State public primary schools. The results presented in table 4 reveal that all the four primary science textbooks evaluated are within the acceptance range of study question index. It implies that all the textbooks evaluated contain adequate study question.

Research Question 5

What is the Illustration Index of primary science textbooks in use in Ebonyi State public primary schools? The data obtained on illustrations found in each of the four primary science textbooks evaluated were used for the computations of the Illustration Index (ILI), the results are presented in Table 5.

- Where = Number of illustrations requiring the learner to perform some activities
- Number of illustrations requiring the learner to only view

Table 5: Illustrations Index (ILI)

S/N	Textbook			Index	
1	Longman primary science book 5	180	60	0.50	Accepted
2	Macmillan Primary Science Book 5	156	50	0.52	Accepted
3	STAN Primary Science Book 5	72	98	-0.15	Accepted
4	Basic Science and Technology for Primary School Book 5 (NERDC)	102	376	-0.57	Accepted

Acceptance range = -1.00 - +1.00

Table 5 above indicated that mean scores of the Illustration Index (ILI) in each of the four primary science textbooks evaluated the results revealed that four primary science textbooks evaluated are within the acceptance range of Illustration Index (ILI) of -1.00 - +1.00. This implies that all the textbooks evaluated contained illustrations.

Research Question 6

What is the Readability Index of the primary science textbooks in use in Ebonyi State public primary school? The data used in considering this research question were obtained from the “cloze text” of readability of science textbooks evaluated were computed and presented in Table 6.

Table 6: Readability Index

S/N	Textbook	Mean Readability	Decision
1	Longman primary science book 5	80.7%	Very Readable
2	Macmillan Primary Science Book 5	50.5%	Readable
3	STAN Primary Science Book 5	60.8%	Readable
4	Basic Science and Technology for Primary School Book 5 (NERDC)	48.3%	Readable

Acceptance range = 40% and above

Table 6 above shows the readability scores of all the four primary science textbooks. The results reveal that the Longman primary science with readability score of 80.7% is very readable. The pupils carry out 80% many activities on their own. Macmillan primary science, STAN primary science and Basic Science and Technology are all readable with mean readability scores of 50.5%, 60.8% and 48.3% respectively. The pupils understanding of these textbooks are adequate for the books to be used with the teachers assistance.

Research Question 7

What is the under-representation Population Index of the primary science textbooks in use in public primary schools in Ebonyi State? The data obtained from the four primary science textbooks on under-representation of populations were used to answer research question.

Where G = Number of illustration, examples, gender and ethnic connoted statements that are neutral.

B = Number of illustrations, example, gender and ethnic connoted statements that are biased.

Table 7: Under-represented Population Index (UPI)

S/N	Textbook	G	B	Index	Decision
1	Longman primary science book 5	220	20	0.83	Accept
2	Macmillan Primary Science Book 5	110	56	0.33	Accept
3	STAN Primary Science Book 5	200	40	0.66	Accept
4	Basic Science and Technology for Primary School Book 5 (NERDC)	245	35	0.75	Accept

Acceptance range = -1.00 - +1.00

Table 7 shows the under-represented population index for each of the primary science textbooks evaluated. The result reveals that Longman, STAN and Basic Science and Technology for primary book 5 are within the acceptance range of under-represented population index (UPI) of -1.00 to + 1.00.

Research Question 8

What is the teacher perception index of the primary science text-books in use in Ebonyi State public primary schools?

Table 8: Teachers Perception Index of the Primary Textbooks in use in Ebonyi state Primary Schools

S/N	Longman Primary Science	Macmillan Primary Science	STAN Primary Science	Basic Science and Technology
1	4.03	3.50	3.94	3.40
2	4.20	3.80	3.73	3.60
3	3.17	3.05	4.03	3.72
4	4.17	3.72	3.03	3.05
5	3.37	3.50	3.23	4.37
6	3.37	2.77	1.80	3.60
7	1.13	1.27	2.67	2.33
8	2.60	2.80	2.63	3.60
9	2.27	2.60	2.63	2.33
10	1.80	1.72	1.32	1.62
11	4.37	3.97	3.93	3.98
12	3.79	3.57	3.40	3.92
	3.27	3.02	3.03	3.24

Acceptance range = 3.00 - 5.00

Table 8 shows the mean ratings of perceptions of teachers on each of the items in each of the four primary science textbooks evaluated. The grand mean scores for the four primary science textbooks are within the acceptance range of 3.00 to 5.00.

S/N	Item	SA	A	FA	DA	SA
1	This textbook is effective in helping you teach your pupil					
2	The exercises in the textbook promote critical thinking					
3	The content is in line with the curriculum					
4	The illustration/diagrams are good, they elaborate and aid pupils understanding of the topic					
5	The text pictures, examples are within the environment of culture of the pupils					
6	Pupils background helps the pupils understand the topics					
7	The topics do not include pupils activities					
8	The vocabulary used in the text is too high for pupils understanding					
9	The texts do not give room for pupils collaborated learning					
10	Pupils find the texts uninteresting					
11	The topics in the text are treated from known to unknown					
12	The illustrations are enriching					

The major finding of the study based on the eight research questions that guided the study are:

1. Correspondence of the content of the primary science textbooks evaluated with specification of basic core-curriculum
2. Adequacy of the learning activities of primary science textbooks in use in public primary schools in Ebonyi State.
3. Appropriateness of the chapter summaries of primary science textbooks in use in public primary schools in Ebonyi State
4. Adequacy of the study questions in the primary science textbooks in use in public primary school in Ebonyi State
5. Appropriateness of the illustrations in the primary science textbooks in use in public primary school in Ebonyi State
6. The under-representation population index in the four primary science textbooks evaluated.
7. The teachers perception of the primary science textbooks in use in public primary schools in Ebonyi State.

Correspondence of the Content of Primary Science Textbooks Evaluated with the Specification of Basic Science Core-Curriculum

The results obtained indicate that the Topical Coverage Index (TCI) or Index of Topical Coverage for four basic science textbook were as follows. Longman Primary Science Book 5 (0.46), Macmillan Primary Science Book 5 (0.89), STAN Primary Science Book 5 (0.38) and Basic Science and Technology for Primary School Book 5 (1.00). The result showed that Macmillan Primary Science and Basic Science and Technology for Primary Schools with index 0.46 and 1.00 are accepted. This agreed with the work of Emereola and Rammiki (2004) who evaluated the content of Physics textbooks used in Botswana Secondary Schools and reported that the index of topical coverage (TCI) were high.

The Adequacy of the Learning Activities of Primary Science Textbooks in Use in Public Primary Schools in Ebonyi

The data obtained for the Learning Activities Index (LAI) was analyzed, the result obtained showed that the mean score for each of the four textbooks were 0.13, 0.11, -0.26 and -0.62. The results indicate that the learning activities indices in three primary science textbooks are adequate. These are Longman Primary Science, Macmillan Primary Science and Basic Science and Technology for primary schools. The finding agrees with the study of Baiyelo (2000) whose study revealed that the learning activities in Physics textbook evaluated are adequate.

Appropriateness of the Chapter Summaries of Primary Textbooks in Use in Primary Schools in Ebonyi State

The results of data analysis obtained indicate that the four primary science textbooks evaluated had the following chapter Summaries Index, Longman (0.77), Macmillan (0.89), STAN (0.92) and Basic Science and Technology (0.92). The result indicate that the four textbooks in use in Ebonyi State Public Primary Schools have chapter summaries. The finding of the study disagreed with Chawedera (1990) who evaluated the content and readability of primary science textbooks in use in Zimbabwe. The study reported that most of the primary science textbooks show slight difference in the readability of the text and chapter summaries.

Adequacy of the Study Questions in Four Primary Science Textbooks in Use in Public Primary Schools in Ebonyi State

The data collected and the results showed that the four primary textbook in use in Ebonyi State had the following mean scores on Study Questions Index (SQI). Longman (0.50), Macmillan (0.49), STAN (0.35) and Basic Science and Technology (0.54). The results indicate that the four primary science textbooks used have coverage Study Question Index (SQI). This is not in line with Omiko (2010) who reported that some chemistry textbooks contained few study questions. He recommended that chemistry textbooks in use should be reviewed so that study questions would be included in all the chapters.

Appropriateness of the Illustration Index in Four Primary Science Textbooks

The data collected and the results showed that the four primary textbooks in use in Ebonyi State public primary schools had the following mean scores. Longman (0.50), Macmillan (0.53), STAN (-0.15) and Basic Science and Technology (-0.57).

The results showed that the Illustration Index in the four textbooks is low. The result agrees with Illoakasy (1990) who reported that most of the science textbooks evaluated did not contain enough illustration and recommended the revision of these science textbooks.

Readability of Primary Science Textbooks in Use in Ebonyi State Public Primary Schools

The data collected and the results obtained showed that the four science textbooks with mean readability scores; Longman (80.7%), Macmillan (50.5%), STAN (60.8%) and Basic Science and Technology (48.3%) are all readable with Longman primary science being most readable. The finding is in agreement with Illoakasy (1990) whose work showed that most of all the science textbooks he evaluated had no reading difficulty with the students and the teachers.

The Under-Representation Population Index (UPI) in the Four Primary Textbooks Evaluated

The data collected on the (UPI) for the four primary textbooks were analyzed, the results show the mean scores of the textbooks as follows, Longman 0.83, Macmillan 0.33, STAN 0.66 and Basic Science and Technology 0.75. the finding showed that UPI for the four primary science textbooks are adequate. It implies that these science textbooks are ethnically gender biased. They contain some terms that are not acceptable to both males and females. The researcher recommends that these textbooks be reviewed to remove the terms that are ethically and gender biased.

Teachers' Perception of the Four Primary Science Textbooks in Use in Public Primary Schools in Ebonyi State

The data collected with respect to teacher's perception of primary science textbooks were analyzed. It revealed the mean rating scores of all the four primary science textbooks. The questionnaire items which the teachers rated were drawn from primary science core-curriculum. It covered the following areas:

1. Content coverage
2. Presentation of Content
3. Illustration
4. Problems-Solving activities
5. Experimental Examples and
6. Readability

The grand mean rating scores for the four texts were as follows; Longman 3.37, Macmillan 3.02, STAN 3.02 and Basic Science and Technology 3.34. It implies that the teachers agreed that these textbooks provide instructional support to them.

II. CONCLUSION

The study was on the evaluation of primary science textbooks in use in public primary schools in Ebonyi State. Based on the result the following conclusion are drawn:

1. The primary science textbook evaluated contain chapter summaries
2. All the four primary science textbooks have moderate Study Questions Index (SQI). This is seen from the computed value in table 4. The study question index ranged from 0.35 - 0.54.
3. Based on Harrison's (1980) interpretation of cloze readability of textbooks, it was found that the four primary science textbooks evaluated are readable. Longman Science Primary Science was very readable while others are readable.
4. The teacher's perception of primary science textbooks was reflected by the mean scores of all the primary textbooks evaluated. Based on this, the researcher concludes that the teachers affirmed that the textbooks are useful to them.

Recommendations

Based on the findings and conclusions of this study, the researcher made the following recommendation.

- 1 Scientific knowledge and discoveries are increasing every day, it is absolutely necessary that primary science textbooks should be revised periodically.
- 2 Specialists should be appointed to select and recommend primary science textbooks.
- 3 Students and teachers should use recommended primary science textbooks to enhance teaching and learning.

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