

Content Evaluation Of Approved Biology Textbooks In Senior Secondary Schools In Anambra State

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Abstract: The study investigated on the content evaluation of Approved Biology textbooks for Senior Secondary Schools in Anambra State. Five research questions guided the study. The design of the study was evaluation research design. The population of the study comprised of thirteen approved Biology textbooks for Senior Secondary Schools in Anambra State. The sample of the study was five approved Biology textbooks. This sample was drawn using purposive random sampling technique in selecting the five Biology textbooks for Senior Secondary Schools in the study. Quantitative Approach to the content Evaluation of Science Textbooks (QACEST) was the instrument for data collection. The data obtained from five criteria of QACEST were used to answer the five research questions. The findings showed that all the five approved Biology textbooks covered the content of the curriculum but one of the five approved Biology textbooks covers all the topics and sub-topics specified in the curriculum or syllabus. The study found that one of the five approved Biology textbooks has the highest learning activity which indicates a balance in the number of sentences requiring the learner to perform some activity and those, which simply require the learner to accept or receive ideas, facts, principles and generalization. The study further revealed that two of the five approved Biology textbooks have the highest study questions which present challenges to be learner and also engage the learner in real thinking. The study also revealed that the illustration indices of the five approved Biology textbooks evaluated are approximately zero. This implies that there is a balance between the number of illustrations requiring the learner to perform some activity and number of illustration which call for only viewing of what has been written in the textbooks. For chapter summary, one of the approved Biology textbooks has the highest chapter summary indices. This makes it adequate in the sense that it contains statements in the summary that link the materials of the chapter with new materials to facilitate more permanent learning and transfer. Two books of the five approved Biology textbooks had no chapter summary (NCS). One of the approved Biology textbooks appear to be the best textbook among the five recommends textbooks because it has the highest topical coverage, highest number of study questions and also adequate in learning activities and illustration. Based on the findings, the researcher recommended that the Ministry of Education should approve only those textbooks which are evaluated and found adequate in content for use in the school system. This will help textbook authors to publish books with high topical coverage, learning activities, study questions, illustrations and chapter summary indices.

Keywords: Biology, Content, Evaluation, QACEST, Textbooks

I. INTRODUCTION

A. BACKGROUND TO THE STUDY

Science is a systematic study of nature involving experimentation and observation leading to accumulation of a body of knowledge useful for problem solving. It is a process

of discovery that allows individuals to link isolated facts into coherent and comprehensive understanding of the natural world. The knowledge generated by science is powerful and reliable because it can be used to develop new technologies, treat diseases and deal with many problems. Science is the bedrock on which modern day technological breakthrough is hinged. Ezeudu, (2011) defined science as a body of

knowledge acquired through observation and systematic experimentation. Ezeudu maintained that science holds a great potential for mankind in terms of providing him with the means of reducing life's burden on earth and enhancing both individual and national development. Therefore, science helps to improve the quality of life of the average individual and the economic, health and security of a nation and serves as a tool for industrialization and national development. Science comprises the basic disciplines such as Biology, chemistry, physics, mathematics; integrated science etc among these science subjects, Biology is and remains the ultimate because it is the only life science and also a science subject that has the highest enrolment figure in secondary school.

The term biology is coined from two Greek words "bios" meaning life and "Logos" meaning to study, and this simply defined as the study of life or the study of plants and animals.

Biology as pointed by Nakano (2017) is the science that deals with the study of living things, since it is the study of living things, there are certain recognizable characteristics of living things which includes; movement, respiration, growth, excretion, irritability, reproduction and nutrition. Chukunyeremuwa (2013) asserted that biology remains one of the basic sciences whose teaching and learning is universally known to be efficient and successful, if only undertaken simultaneously with the help of adequate instructional resources and facilities. Biology education is important to any growing economy like Nigeria. (Aina,2013). Many graduates of biology education are self employed and employers of labour, many own schools for themselves where people work and earn their living while some are into fish farming business. Biology is an interesting subject that has been intriguing scientific minds for several centuries despite exponential developments in technology over the past few centuries. Biology has an endless array of species. Every creation which is a part of nature is so adorable and unique in its own way. Biology exists every second – when we inhale and exhale each time, set aside other species, we haven't yet understand our own bodies completely! How is it that our hearts work so tirelessly throughout our life span, how is it that we are able to interpret even minute emotions and gestures without even understanding the mechanism behind it. How is it that each one of us is able to perceive things differently? The list of questions seeking their answers is endless! Biology helps us to sort things out and find answers to such question. It also tells us all about plants and animals – how they live, what they're made up of, and how they interact with mankind and each other. This enables us to make the most of our planet's natural resources while trying to minimize the impact we have on the environment. Biology is part and parcel of any life form on earth because there is so much to seek and find.

Femi (2011) argued that these objectives are not fully achieved since students' performance in Biology external examinations like the West African Examination Council is persistently poor. Most candidates who sat for WAEC examination failed (Chief Examiners report 2015-2018). The poor performance in biology among other factors implies that students lack understanding and mastery of content hence could not confidently write these external examinations and pass. Many factors could cause students poor performance in

the examination. Studies noted that factors such as textbooks, teachers, poor planning, poor monitoring and supervision and poor evaluation could equally be responsible for poor performance in examination. Hence to achieve these objectives; the curriculum in Biology is expected to reflect contents and methods, which will provide meaningful and relevant knowledge in Biology also, many interested authors should embark on the development of teaching and learning materials to help teachers in teaching the subject, which results to the use of different biology textbooks.

Textbooks are the oldest, most widely used material for curriculum implementation at all levels of education and are identified as a systematically organized material designed to provide a specific level of instruction in a subject matter. In the statement of Goslin (2013), a textbook is a printed and bound artifact for a course of study and contains facts and ideas around a certain subject. The author noted that textbooks are not like other books, because they are made to follow a set standard curriculum for a school system. Biology textbook is therefore a teaching tool or material that presents the curriculum content of Biology. It therefore means that the content of a textbook is a generally accepted criterion for its selection.

Content of a textbook is the total knowledge, skills, attitudes and values to be learnt in a subject by the learners, which are presented by the author(s) in the book. The contents are relevant to the aims and objectives of the course. This is because the content of an appropriate textbook encompasses in detail the major learning experiences meant for the learner to acquire within a specified time frame. The content of the textbooks according to Nworgu (1988) is viewed in terms of its Topical coverage, learning activity, chapter summary, illustration and study question. The value of each indicator of content of a textbook need to be determined to give an index of the content of the entire textbook. Such index obtained on a textbook can be used to judge the worth of a textbook, and this is evaluation.

Evaluation is the estimation of the worth of a thing, process or programme in order to reach meaningful decisions about that thing, process or programme (National Teachers' Institute NTI, 2009). Content evaluation therefore, refers to the determination of qualities or worth of a textbook with reference to topical coverage index, chapter summary index, illustration index, study question index and learning activity index (Nworgu, 2001). Based on the above descriptions of the content of a textbook, presented in the previous paragraphs by Nworgu (1988), one can consider the content of a textbook to mainly concern the issues of Index of Topical Coverage (ITC), Learning Activity Index (LAI), Chapter Summary Index (CSI), Illustration Index (ILI) and Study Question Index (SQI) contained in the book, all of which can be evaluated.

Topical coverage in the submission of Nworgu (2001), means the extent the content of a text covers the prescribed curriculum or syllabus. Topical coverage according to Nworgu consists of "surface coverage" and "depth coverage". Surface coverage is the proportion of topics in the curriculum or syllabus covered by a textbook while depth coverage is the level of treatment given to those topics covered. Topical coverage in the context of the study is the proportion of the main topics and the sub topics in the curriculum/syllabus that

are treated in a textbook. Learning activities in the context of the study are things presented in textbooks demanding intellectual or physical actions from the learners with a view to promoting optimal participations of the learners in the materials to be learnt. There are other ways of evaluating textbooks; Readability is one of the ways of evaluating a textbook. Readability of a text refers to how well a reader is able to comprehend the content of the text through reading. Some of the widely used readability formulas are cloze procedure, flesch readability, gunning fog readability etc. But Quantitative Approach to Content Evaluation of Science Textbook (QACEST) which has five criteria to guide the evaluation namely: Topical coverage, learning activities, study questions illustrations and chapter summaries is more effective and comprehensive, and it deals with total contents of a textbook which is facts, ideas and model of science and is also a crucial factor in determining the appropriateness or adequacy of a textbook. This study will therefore adopt content parameter, which is quantitative approach to evaluation of textbooks. The content will be determined using Quantitative Approach to Evaluation of Science Textbook (QACEST). Further justification for the present study focuses on content of textbooks, in that content of a textbook is the total knowledge, skills and attitudes and values to be learnt in a subject, this indicates that the three domains of learning (cognitive, affective and psychomotor) depend on the content of a textbook. This implies that adequate content of textbooks on Biology for Senior Secondary Schools will address or provide for all the objectives of the Biology Curriculum which are at the three domains of learning. The need to ensure that good textbooks are used by the students necessitates that the Ministry of Education should approve only those textbooks which are evaluated and found adequate in content for use in our school system. Publishers of textbooks should insist on the provision of evidence of having been evaluated and found adequate in most of the five criteria before publication of any textbook for school use. Authors of biology textbooks should always review and improve on their textbooks in line with any new Biology Curriculum to mention just a few. There are so many biology textbooks in use in secondary schools in Nigeria, some of these may be deficient in content wise and could mislead the students if allowed to operate. Also biology teachers appear to be faced with the problem of what criteria to adopt in selecting textbooks for effective teaching and learning. The problem of evaluating textbooks for selection and use in senior secondary schools is not peculiar to Anambra state, or Nigeria alone, but also cuts across the globe. Nworgu in Okafor (2008), noted that the level of academic exposure of the approving committee and the procedures for approval of textbooks in Nigeria may bring obvious doubt on the content of some approved textbooks. The author reported that "publishers who provide the best wine and cheese, free consumable materials, or free samples copies of the books and accompanying give-away items, have many of their books selected". Inappropriate evaluation, selection and recommendation of textbooks as reported above have some implications on the students' achievement in external examination.

Adenipekun (2009) noted that factors such as textbooks, teachers, poor planning, poor monitoring and supervision and

poor evaluation could equally be responsible for students' poor performance in examinations. Therefore, it is necessary that other factors be held constant while investigation is carried out on the approved biology textbooks use in senior secondary schools in Anambra State. It is against this background that the researcher deemed it necessary to evaluate the content of the approved biology textbooks use in senior secondary schools in Anambra State.

B. STATEMENT OF THE PROBLEM

The Performance of secondary school students in Biology in Nigeria, particularly in Anambra has not been encouraging over the years. Despite the importance of biology as a science subject, evidence has shown that students are not doing well in biology. The poor performance of secondary school students in Biology was revealed by WAEC Chief Examines Report 2015 – 2018. The report showed that the performance of Biology students is poor. (See the appendix C, pg 97) This low level of performance partly explains the shortfall in the number of students qualified candidates for admission into universities and other tertiary institutions to read biology, applied biology and other applied sciences that require biology as a basic subject. The scenario has a serious adverse effect on the availability of qualified personnel in the sciences that can guarantee technological development. The poor performance in biology among other factors implies that students lack understanding and mastery of content hence could not confidently write these external examinations and pass. Many factors could cause students poor performance in the examination. Studies noted that factors such as textbooks, teachers, poor planning, poor monitoring and supervision and poor evaluation could equally be responsible for poor performance in examination. However the ability to comprehend textbook is partly dependent on the learner and partly on the content of textbook and the manner it is presented. There are so many Biology textbooks in use in secondary schools in Nigeria. Some of these textbooks may be deficient content – wise and could mislead the students if used in teaching and learning of biology. It appears that in Anambra State Secondary Schools a number of textbooks have been approved without subjecting them to due process of textbook evaluation. Also Biology teachers appear to be faced with the problem of what criteria to adopt in selecting textbooks for effective teaching and learning.

Based on these discussions could the content of the recommended biology textbooks and the manner the contents are presented pose difficulty to the understanding of the approved biology textbooks in Anambra state? Therefore it is necessary that other factors held constant while investigation is carried out on approved biology textbooks use in senior secondary schools in Anambra state.

C. PURPOSE OF THE STUDY

Purpose of the study was to evaluate the content of approved biology textbooks for senior secondary schools in Anambra State.

Specifically, the researcher intends to determine:

- ✓ the extent of content (in terms of index) topical coverage of the syllabus.
- ✓ the adequacy of the learning activities of each of the Biology textbooks for use in the senior secondary schools.
- ✓ the adequacy of the study questions in each of the textbooks
- ✓ the adequacy of the illustrations in the biology textbooks.
- ✓ the adequacy of each of the textbooks chapter summaries.

D. SIGNIFICANCE OF THE STUDY

The significance of this study is built on the framework that the findings will be helpful to the ministry of education, students, curriculum planners, principals and teachers, government, authors and publishers. To the ministry of education who select and recommend textbooks for use in the secondary schools, the study will reveal the suitable Biology textbooks for use in senior secondary schools in terms of content coverage, illustrations, chapter summaries, learning activities, study questions. The students will also benefit from the result of this study since it will enable them identify good quality textbook in Biology from the poor quality ones using appropriate criteria. It will also help curriculum planners to be able to approve only textbooks that have been quantitatively and qualitatively evaluated and found efficient. This study will also be utilized by principals of schools in Anambra State to advice and encourage their students on appropriate Biology textbooks to use. This study will be beneficial to the government as it will help to sensitize the government on the need to evaluate the adequacy of textbooks before approving same to students. This is because if the most appropriate textbooks for that group of students are not approved through an appropriate evaluation, students may not understand the textbooks.

The results of this study will be of immense benefits to authors because the study will provide information on the need for textbooks to have adequate topical coverage, learning activities, study questions, illustrations and chapter summaries in the textbooks. This study will enable the authors to revisit the content of their textbooks where necessary for further improvement.

The result of this study will be beneficial to the publishers because the study will provide information on the topical coverage, learning activities, study question, illustration and chapter summaries in the text that will guide them.

Biology Teachers will benefit from the findings of the study as it will help to provide information on context of the biology textbooks. Through the study biology teachers will know which of the textbooks best fit their students. It will identify some of the good quality textbooks in Biology to be used by teachers and the students for effective teaching and learning in senior secondary schools in Anambra State.

E. SCOPE OF THE STUDY

The study was carried out in Anambra State of Nigeria. The study focused on content evaluation of five approved Biology textbooks for teaching and learning by teachers and students in Anambra State. Specifically, the study examined Topical coverage, learning activities, study questions,

illustrations and chapter summaries of the textbooks in use in Anambra State which include:

- ✓ Modern Biology for SSS by Sarojini T.R. published by Africana publishers.
- ✓ New Biology for senior secondary schools by R.H. Stone AB Cozen published by Learn Africa.
- ✓ Comprehensive Certificate Biology by Ambuno Sunday published by University Press PLC.
- ✓ Exam Focus Biology by A. Egunyome published by University Press.
- ✓ Senior Secondary School Biology (BK 1,2,3) by F.O.C. Ndu published by Learn Africa.

F. RESEARCH QUESTIONS

The following research questions guided this study:

- ✓ To what extent does the content of the approved Biology textbooks cover the content (in terms of index topical coverage) specified in the syllabus?
- ✓ What is the adequacy of learning activities index of the approved Biology textbooks for senior secondary schools in Anambra State?
- ✓ What is the adequacy of study questions in each of the approved Biology textbooks?
- ✓ What is the adequacy of illustrations in each of the approved Biology textbooks?
- ✓ What is the adequacy of chapter summaries in each of the approved Biology textbooks?

II. RESEARCH METHOD

This chapter specifically describes the design of the study, area of the study, population of the study, sample and sampling technique. It also describes the instrument for data collection, method of data collection, and method of data analysis.

A. DESIGN OF THE STUDY

This study was carried out using evaluation design. Evaluation design according to Anyakoha (2009) involves a systematic collection of evidence on the worth of educational programmes, products or techniques. Evaluation research design seeks to ascertain or judge the value of a program or resources by careful appraisal determined by a pre-stipulated standard. Evaluation research design is therefore suitable for the study since empirical data on the content of the textbooks would be obtained from the study and this would be used to take a decision on the worth of each textbook.

B. AREA OF THE STUDY

The study was carried out in Anambra State. Anambra state is one of the thirty six states of Nigeria. It is one of the five States that make up the South East Geopolitical Zone. It was created in 1991 from the old Anambra State which included the areas now known as Enugu and Ebonyi states. With 21 local Government Areas, Anambra has interstate boundaries with Delta to the West, Imo and Rivers to the

South, Enugu to the East and Kogi to the North. The state capital is Awka, with Onitsha and Nnewi as two of the other renowned Commercial Cities. The theme of Anambra state is "light of the Nation". The ethnic groups in Anambra state are the Igbo (98%), Igala (2%) who live mainly in the north-western part of the state. Anambra State has five education zones namely, Aguata, Awka, Ogidi, Onitsha and Nnewi. Ifejika (2009), from analyzing the history and development of education in the former Eastern Nigeria found that Anambra is one of the educationally progressive State in Nigeria and the state places emphasis on Science and Technology Education. Anambra State is chosen because of the persistent decline in students' performance in Biology as revealed by WAEC Chief Examiners Report (2015-2018).

C. POPULATION OF THE STUDY

The population for the study was all the 13 approved Biology textbooks used in senior secondary school in Anambra State namely:

- ✓ Score high in Biology by Eziofor C.C., published by Elite publishers.
- ✓ New System Biology by Lamp. K., published by Africana publishers..
- ✓ Progressive Biology for SSS by Odaibo A.B., published by Macmillan publishers.
- ✓ Modern Biology for SSS by Sarojini T.R. published by Africana publishers.
- ✓ The human automobile by Francis Nwankwo published by USA-New York publishers.
- ✓ New Comprehensive practical biology by JBC Obidiwe published by Mid-field Publishers.
- ✓ New Comprehensive practical biology by Emedo ABC published by Think –TANK Educ. publishers.
- ✓ Authority in Practical Biology by T.N Okonkwo published by Abbot Book publishers.
- ✓ Exam Focus Biology by A. Egunyome published by University Press.
- ✓ New Biology by R.H. Stone AB Cozen published by Learn Africa.
- ✓ Comprehensive Certificate Biology by Ambuno Sunday published by University Press PLC.
- ✓ Senior Secondary School Biology by F.O.C. Ndu published by Learn Africa1.
- ✓ STAN Biology for Secondary Schools by STAN.

D. SAMPLE AND SAMPLING TECHNIQUE

The sample for the study was five out of the 13 approved biology textbooks namely; Modern Biology For Senior Secondary Schools by Sarojini, T. R. published by Africana publishers., New Biology for Senior Secondary Schools by Stone, R. H published by Learn Africa. Comprehensive Certificate Biology for Senior Secondary Schools by Ambuno, S. published by University Press PLC., Exam Focus Biology for WASSCE & SSCE by Egunyome, A. published by University Press., Senior Secondary Biology (BK 1, 2, 3) by Ndu, F. O. C. published by Learn Africa1. Purposive sampling technique was employed to select the 5 biology textbooks. The criteria for its purposiveness is that these five Approved

Biology textbooks are mostly used by the teachers and students for teaching and learning process .Also these five Approved biology textbooks possess all the features that will satisfy those predetermined five criteria namely; topical coverage, learning activities, study questions, illustrations and chapter summaries.

E. INSTRUMENT FOR DATA COLLECTION

The instrument for data collection was the Quantitative Approach to the Content Evaluation of Science Textbooks (QACEST). The QACEST criteria adopted in the present study was developed by Nworgu (1988) and has been used for different studies at the masters and doctoral levels in determining content evaluation of science textbooks It was used to determine the five quantitative indices of the five approved Biology textbooks. These criteria are indices of Topical Coverage, Learning Activities Indices; Study Questions Indices, Illustration Indices and Chapter Summaries Indices. The criterion for indices of topical coverage measures the extent the textbook covers the topics and sub-topics in the Biology syllabus. The criterion for learning activities indices measures the degree to which the textbook provides learning activities which will ensure optimal participation of the learners. The criterion for chapter summaries indices determines the extent to which the chapter summaries of each chapter contain general overview that promote a more permanent understanding for the content of the textbook.

F. METHOD OF DATA COLLECTION

The data for this study was collected by the researcher respectively on the basis of each of the five research questions posed for the study as follows:

The first research question was answered using the indices of topical coverage formula.

$$ITC = \frac{1}{2} \left(\frac{T_t}{T_s} + \frac{S_t}{S_s} \right)$$

Where: T_t = Number of topics in the syllabus covered by the text

T_s = Number of topics in the syllabus.

S_t = Number of sub – topics in the syllabus covered by the text

S_s = Number of sub-topics in the syllabus.

PROCEDURE:

- ✓ Analyze the syllabus into topics and sub – topics.
- ✓ Determine (by counting) the total number of topics and sub – topics in the curriculum or syllabus as T_s and S_s respectively.
- ✓ Also determine in the same way, the number of these topics and sub-topics, which are covered by the textbook as T_t and S_t respectively.

The second research question was answered using the formula for learning activities indices thus:

$$LAI = \frac{A - P}{A + P}$$

Where

A = Number of sentence requiring the learner to perform some kind of activity

P = Number of sentences which do not require any form of activity on the part of the learner

PROCEDURE

- ✓ Sample at random, ten(10) sentence passage at two page intervals
- ✓ Analyse and categorize the sentences into the two categories as follows; category I Factual statements, stated conclusion and generalizations, definitions, questions asked but answered immediately by the text. Category II; statements requiring students to analyse data, formulate their own conclusions, perform and analyse some activities, solve some problems, provide answers to questions whose answers are not immediately provided by the text.
- ✓ Count the total number of sentences in category I and category II to obtain A and P respectively.

The third research question was answered using the formula for study question indices. It is expressed as

$$SQI = \frac{T - R}{T + R}$$

Where:

T = Total number of questions requiring students to engage in real thinking

R = Total number of question requiring students to merely regurgitate what has been learned from the textbook.

- ✓ Randomly sample, at least half (50%) of the study questions at the end of each chapter; (use all the questions if the number is small ie 10 or less).
- ✓ Analyze and categorize the questions into two as follows; Category 1 and category II. Category one are i) questions requiring answers which can directly be obtained from the text, ii) definitions. Category two are questions requiring solution of problems, application of what was learned from the text to new situations.
- ✓ Count the number of question in categories one and two. Their values will give R and T respectively.

The fourth research question was answered using the formula for illustration indices quantitatively express as:

$$ILI = \frac{L_a - L_b}{L_a + L_b}$$

La = Number of illustration requiring the learner to perform some activities other than doing the viewing

Lb = Number of illustration which do not require the learner to perform any activities other than doing the viewing.

PROCEDURE

- ✓ Sample illustrations from the text at regular intervals. What is recommended is between the interval of 4 and 10 illustrations. Whatever the interval, the first illustration should be determined through simple random sampling.
- ✓ Analyse the illustrations and classify them into two categories as follows; Category I; illustrations which require the learner to perform an activity,-use data;

Category II; illustrations which require the learner to;- view,-look or see.

- ✓ Determine the values of La and Lb by counting the number of illustrations in categories 1 and 11 respectively.

The fifth research question was answered using the formula for chapter summaries indices thus:

$$CSI = \frac{N - R}{N + R}$$

Where:

N = The number of statements in the summary which link the materials of the chapter with new materials to facilitate more permanent learning and transfer and

R = The number of statements in the summary which are mere repetitions of the materials previously treated in the chapter

PROCEDURE

- ✓ Randomly draw two paragraphs of each chapter summary. (If a chapter summary contains three or fewer paragraphs, sampling will be unnecessary).
- ✓ Analyze and categorize the statements as follows

CATEGORY ONE

Sentences which

- Raise extra questions/issues focusing on the materials not covered in the chapter
- Relate principles and generalizations from the chapter to new or practical situations or to principles and generalizations elsewhere;
- Provide a basis for the materials of the subsequent chapter(s).

- ✓ Count the number of sentences in categories one and two to obtain N and R respectively.

CATEGORY TWO

Sentences which

- raise questions/issues whose answers can be obtained from the chapter;
- repeat the principles, generalization conclusions from the chapter.

G. METHOD OF DATA ANALYSIS

The analysis of data was based on research questions. In the first research question the researcher used the indices of topical coverage (ITC) formula of 5-point Quantitative model to calculate the I.T.C. values for each of the five approved Biology textbooks for senior secondary schools .The I.T.C has a maximum value of 1.00 and this will occur when the text perfectly covers all the topics and sub-topics specified in the curriculum or syllabus .The minimum value of zero will occur when the text does not cover any of the materials in the curriculum or syllabus as in the guideline provided by Nworgu (1988). The guideline and researcher's decision will be presented based on the data collected.

In the second research question the researcher used the learning activity indices (LAI) formula of the same model to calculate the L.A.I values for each of the five approved Biology textbooks for senior secondary schools. The index ranges from -1.00 to +1.00.The minimum value -1.00 will occur when there is no provision in the text for the learner to

perform some kind of activity. Such a text will only require absolute passivity on the part of the learner and will therefore be perfectly authoritarian. The maximum value 1.00 will occur when the text contains nothing but activities for the learner. Such a text will be perfectly activity oriented. A value of zero will indicate a balance in the number of sentences requiring the learner to perform some activity and those which simply require him to accept or receive ideas, facts, principles and generalizations. The guideline and researcher's decision will be presented based on the data collected.

In the third research question the researcher used the study question indices (SQI) formula of the same model to calculate the S.Q.I values of each of the five approved Biology textbooks for senior secondary schools. The index ranges from -1.00 to +1.00 as in the case of L.A.I. and S.Q.I of -1.00 can be interpreted to mean that the textbook provides only questions which require mere regurgitation of the facts learned from the text. On the other hand, a S.Q.I of +1.00 implies that all the study questions provided by the text are of the type that requires real thinking on the part of the learners. A balance between the two types of questions will result in a S.Q.I of zero. The guideline and researcher's decision will be presented based on the data collected.

In the fourth research question the researcher used the illustration indices (ILI) formula of the same model to calculate the I.L.I values for each of the five approved Biology textbooks for senior secondary schools. The index ranges from -1.00 to +1.00. The I.L.I has a minimum value of -1.00 and a maximum of +1.00. When the value is -1.00, it means that all the illustrations provided by the text are of the type that requires only viewing, seeing or watching. If the value is +1.00, it means that all the illustration in the text is of the type that requires the learner to engage in one form of activity or the other. When there is a balance between the two types of illustration, the value of the I.L.I will be zero. The guideline and researcher's decision will be presented based on the data collected.

In the fifth research question the researcher used the chapter summaries indices (CSI) formula of the same model to calculate the C.S.I values for each of the five approved Biology textbooks for senior secondary schools. The index ranges from -1.00 to +1.00. It can therefore be interpreted in the same way that the previous indices with the same limits, were interpreted.

III. PRESENTATION OF RESULTS

This chapter presents the data analyzed and interpreted for the purpose of answering the research questions.

A. RESEARCH QUESTION 1

To what extent does the content of the Approved Biology textbooks cover the content (in terms of index topical coverage) specified in the syllabus?

The data for answering research question 1 was presented in table 1.

Textbook	Book A: Sarojini, T. R.	Book B: Stone, R. H.	Book C: Ambuno, S.	Book D: Eguyome, A.	Book E: Ndu, F. O. C.
Index of Topical Coverage ITC	0.64	0.51	0.74	0.60	1.00

Table 1: Topical coverage index scores of the five recommended Biology Textbook for teaching and learning by teachers and students in Anambra State

Data in table 1 reveal that Book E which is Senior Secondary School Biology (Book 1 – 3) by F. O. C. Ndu, had a topical coverage index score of 1.00. This showed that the book covered all the topics and sub-topics spelt out in the curriculum completely and is very adequate in topical coverage variable. The other books had varying levels of Topical coverage index with Book C being the next in line with a topical index of 0.74.

B. RESEARCH QUESTION 2

What is the adequacy of learning activities index of the approved Biology textbooks for senior secondary schools in Anambra State?

Textbooks	Book A: Sarojini, T. R.	Book B: Stone, R. H.	Book C: Ambuno, S.	Book D: Egunyome, A.	Book E: Ndu, F. O. C.
Learning Activity Index (LAI)	0.01	0.02	-0.05	-0.14	0.26

Table 2: Learning Activity Index (LAI) scores of the five approved Biology Textbooks for teaching and learning by teachers and students in Anambra State

Data in table 2 reveal that Book A, B and E which have their values approximately 0 indicate a balance in the number of sentences in the textbooks requiring the learner to perform some activity and those, which simply require him to accept or receive ideas, facts, principles and generalizations. Book D and C has negative values, this means the books are not adequate in learning activities it will simply make students not to perform any form of activity and will also make the students to be passive learners.

C. RESEARCH QUESTION 3

What is the adequacy of study questions in each of the approved Biology textbooks?

Textbooks	Book A: Sarojin, T. R.	Book B: Stone, R. H.	Book C: Ambun, S.	Book D: Egunyo me, A.	Book E: Ndu, F. O. C.
Study Questions Index (SQI)	0.47	0.80	-0.58	0.63	0.80

Table 3: Study question Index scores of the five approved Biology textbooks for senior secondary schools in Anambra State

Data in table 3 reveal that Book B and E have the highest study questions index of 0.80. This shows that the study questions provided in the textbooks are of the type requiring real thinking on the part of the learner. Book A had study question index score of 0.47. This shows that there is a

balance between the two types of study questions, that is balance in the number of study questions requiring students to engage in real thinking and those which simply require students to merely regurgitate what had been learned from the text.

Book C had a study question index score of -0.58, this shows that it provides only questions which require mere regurgitation of the facts learned from the text.

E. RESEARCH QUESTION 4

What is the adequacy of illustrations in each of the approved Biology Textbooks?

Textbooks	Book A Sarojini, T. R	Book B Stone, R. H.	Book C Ambuno, S.	Book D Egunyome, A.	Book E Ndu, F. O. C
Illustration Index (ILI)	0.16	0.33	0.12	0.19	0.16

Table 4: Illustration Index (ILI) scores of the five approved Biology Textbooks for senior secondary schools in Anambra State?

Data in table 4 reveal that book A – E have illustration index value of approximately 0. This shows there is a balance (Normal Activity) between the two types of illustrations. That is a balance between the illustration requiring the learner to perform some activities independently on his/herself and also have meaningful understanding of the idea and those which do not require any activity from the students but demand mere regurgitation of the knowledge acquired from the textbook.

F. RESEARCH QUESTION 5

What is the adequacy of chapter summaries in each of the approved Biology textbooks?

Textbooks	Book A Sarojini, T. R	Book B Stone, R. H.	Book C Ambuno, S.	Book D Egunyome, A.	Book E Ndu, F. O. C
Chapter Summaries Index (CSI)	0.31	NCS	0.83	NCS	-0.14

NCS: No Chapter Summary.

Table 5: Chapter summary index scores of the five approved Biology Textbooks for teaching and learning by teachers and students in Anambra State

Data in table 5 reveal that Book C has a chapter summary index of 0.83 which is approximately +1(Adequate). This shows that the chapter summary provided in Book C is of the type that promotes a more permanent understanding of the content of the text that is, the statements in the summary of Book C links the materials of the chapter with new materials to facilitate more permanent learning and transfer. Book B and D have No Chapter Summary (NCS), this shows that they are inadequate. Book E has a chapter summaries index of negative score of -0.14(Not adequate). This shows that it provide statements in the summary that are mere repetition of the chapter. Book A has a chapter summary index of 0.31 which is approximately 0(Normal Activity).This indicates a balance between the two types of chapter summary. That is a balance between the number of statements in the summary which links the materials of the chapter with new materials to facilitate

more permanent learning and transfer and the number of statements in the summary which are mere repetitions of the materials previously treated in the chapter.

G. SUMMARY OF FINDINGS

The findings of the study from the analyzed and interpreted data are as follows:

- ✓ All the textbooks cover the content of the curriculum they are approximately +1, but book E has the highest topical value of 1.00. It shows that the text (Book E) perfectly covers all the topics and the sub-topics specified in the curriculum or syllabus.
- ✓ Textbook E has the highest learning activity index score of 0.26 which indicates a balance in the number of sentences requiring the learner to perform some activity and those, which simply require the learner to accept or receive ideas, facts, principles and generalization.
- ✓ Textbooks B and E have the highest study questions value of 0.80 each. It is approximately +1. which shows these textbooks have the highest study questions which present challenges to the learner and also engage the learner in real thinking.
- ✓ Textbooks A, B, C, D and E have illustration index value approximately 0. This implies that there is a balance between the number of illustrations requiring the learner to perform some activity and number of illustrations which call for only viewing of what has been written in the textbooks.
- ✓ Book C has summary index scores of 0.83 which is approximately +1. This makes it adequate in the sense that it contains statements in the summary that link the materials of the chapter with new materials to facilitate more permanent learning and transfer. Book B and D have no chapter summary (NCS).
- ✓ Book E appears to be the best textbook among the five recommended textbooks because it has the highest topical coverage, highest number of study questions, adequate learning activities and illustrations.

IV. DISCUSSION OF FINDINGS, CONCLUSIONS, EDUCATIONAL IMPLICATIONS, RECOMMENDATIONS AND SUMMARY

In this chapter, the discussion of the findings is presented according to the research questions. This is followed by the conclusion; Educational implications of the findings of the study, recommendations, limitations of the study, suggestions for further studies and the summary of the entire study.

A. DISCUSSION OF FINDINGS

Discussion of findings is presented under the following sub-headings:

- ✓ The extent to which the content of the approved Biology textbooks cover the content specified in the syllabus.
- ✓ The adequacy of learning activities index of the approved Biology textbooks for senior secondary schools in Anambra State.

- ✓ The adequacy of study questions in each of the approved Biology textbooks.
- ✓ The adequacy of illustrations in each of the approved Biology textbooks.
- ✓ The adequacy of chapter summaries in each of the approved Biology textbooks.

b. THE EXTENT TO WHICH THE CONTENT OF THE RECOMMENDED BIOLOGY TEXTBOOKS COVER THE CONTENT SPECIFIED IN THE CURRICULUM/SYLLABUS

The findings of this study reveal that book E had a topical coverage index score of 1.00. This showed that the book covered all the topics and sub-topics spelt out in the curriculum completely and is very adequate in topical coverage variable. Book A, C and D had topical coverage index scores values approximately +1 of the topics and sub-topics spelt out in the curriculum and are equally adequate in topical coverage. Book B has the lowest adequate topical coverage value of 0.51. This showed that the book covered only 0.51 of the topics and sub-topics spelt out in the curriculum. The book is still adequate in topical coverage but made the least topical coverage of the topics and sub-topics spelt out in the curriculum among the five approved Biology textbooks.

The adequate topical coverage of the 5 evaluated Biology textbooks is a reflection that contents of the topics and sub-topics in each chapter of these textbooks adequately covered the content of the Biology curriculum. This will enable Biology teachers to effectively implement the curriculum for better performance of students in examination especially external examinations. It will also guide and help the students to read all the contents required of them in the syllabus/curriculum in order for them achieve better.

The finding of this study disagreed with Okafor (2008) who carried out a study on readability and content evaluation of recommended physics textbooks in Anambra and found among other things that the content validity score (topical coverage, illustrations, chapter summaries, study questions and learning activities) for all the five physics textbook were generally very low, although New school physics for senior secondary school by Anyakoha had the highest content validity. On the other hand, the finding of the study is in line with Fatoba (2015) who carried out a study on readability of biology textbooks and students' academic performance in senior secondary schools in Ekiti and found out among other things that the biology teachers should be guided with readability level and content coverage in the selection and recommendation of textbooks.

c. THE LEARNING ACTIVITY INDEX OF THE APPROVED BIOLOGY TEXTBOOKS FOR TEACHING AND LEARNING BY TEACHERS AND STUDENTS IN ANAMBRA STATE

According to the findings of this study, Books A, B and E have values approximately 0 indicating a balance in the number of sentences requiring the learner to perform some activity and those which simply require him to accept or

receive ideas, facts, principles and generalizations. Book D and C has negative values indicating that they are not adequate in learning activities.

Three out of the five textbooks are balanced in terms of learning activities which indicates a normal activity. This implies that these textbooks encourage student centered learning, that will promote critical thinking, skills and interest in the students. It will make the students to think on their own, individually or as a group in order to understand themselves.

The findings of this study differ from the finding of Anyaegbunam (2001) who carried out a study on Content Evaluation of 8 biology textbooks and found among other things all the 8 textbooks had flaws. They are inadequate in learning activities. The findings of this study also differ from the finding Akani and Abonyi (2011), that there were gross inadequacies in the area of topical coverage, learning activities, readability and efficiency in instructional delivery in the five recommended chemistry textbooks, they studied.

d. THE EXTENT TO WHICH THE APPROVED BIOLOGY TEXTBOOKS PROVIDE ADEQUATE STUDY QUESTIONS

The findings of this study show that textbooks B and E has the highest number of study questions with a value of 0.80 each which is approximately +1. This shows that textbooks B and E have study questions which pose challenges to the learner and also engage the learner in real thinking while Book D and A slightly have adequate study questions. The questions in those texts will help the students in real thinking, tackle any challenge they may face during examination, because they promote critical thinking. This will help them during examination to answer well all the questions that covers cognitive domain.

The findings of this study differ from the finding of Mama (2007), who found out on the study questions variable, in the textbooks they studied that four out of the six text books had SQI of negative values this indicates that the study questions are the type that require mere regurgitation of the facts learnt from the text. The findings of this study also differ from the findings of Anyaegbunam (2001) who carried out a study on Content Evaluation of 8 biology textbooks and found among other things that the study questions in all the 8 biology textbooks were not good. This shows that these textbooks will not present challenges to the learner and will not engage the learner in real thinking.

e. THE EXTENT TO WHICH THE APPROVED BIOLOGY TEXTBOOKS PROVIDE ADEQUATE ILLUSTRATION

Data in table 4 reveal that book A – E have illustration index value of approximately 0 which indicates a normal activity. This shows there is a balance between the two types of illustrations. That is a balance between the illustration requiring the learner to perform some activities independently on his/herself and also have meaningful understanding of the idea and those which do not require any activity from the students but demand mere regurgitation of the knowledge acquired from the textbooks.

The findings are against the findings of Yousuo, (2015) on the readability and content evaluation of 8 recommended chemistry textbooks for senior secondary schools in Bayelsa State which indicates that out of the eight recommended chemistry textbooks they studied; only two were good in terms of illustration index (ILI). The finding is also against the finding of Anyaegbunam (2001) which indicated that most of the 8 biology textbook studied have flaws in illustration index, that the illustration in these textbooks encouraged only listening, seeing and viewing with no challenges for students to perform other kinds of activities higher than those illustrated.

f. THE EXTENT TO WHICH THE APPROVED BIOLOGY TEXTBOOKS PROVIDE ADEQUATE CHAPTER SUMMARIES

According to the findings of this study, Book C has a chapter summary index of 0.83 which is approximately +1. This shows that the chapter summary provided in Book C is of the type that promotes a more permanent understanding of the content of the text ie the statements in the summary of Book C link the materials of the chapter with new materials to facilitate more permanent learning and transfer. Book B and D had no Chapter Summary (NCS), this shows that they are inadequate. Book E has chapter summaries index of negative score of -0.14. This shows that it provide statements in the summary that are mere repetition of the chapter.

Chapter summaries promote permanent understanding of content in each chapter of the text. In this study, only one book is adequate in chapter summary, this implies that it will help students to have more understanding of what they read and enable them catch up before examinations. The other books are inadequate in chapter summary and contain statements in the summary which are mere repetitions of the materials previously treated in the chapter, such will not facilitate permanent learning and transfer in students and they will not be able to catch up that before examinations. The findings are in line with the findings of Anyaegbunam, (2001) on the readability of 8 recommended biology textbooks for senior secondary schools which indicates that most of recommended textbooks studied have flaws in chapter summaries and topical coverage.

B. CONCLUSION

This study evaluated the content of 5 recommended textbooks in Anambra state and exposed the strength and weaknesses of these textbooks in terms of its content using QACEST A – 5 point quantitative model. The following conclusions were made based on the findings of the study;

- ✓ The indices topical coverage of the five approved Biology Textbooks evaluated in this study were generally adequate. This can be concluded that the content of the five approved Biology textbooks used in Anambra State have good topical coverage and are in line with the stipulated curriculum.
- ✓ The learning activity indices of three approved Biology Textbooks evaluated are good. Two have poor learning activities. This can be concluded that the learning activity

of the three approved biology textbooks in Anambra State enable the learner to perform some kind of activity while the learning activity of the two approved biology textbooks in Anambra State do not enable the learner to perform some kind of activity other than receiving what has been written in the biology textbooks.

- ✓ The study questions indices of four out of the five approved biology textbooks in Anambra State evaluated are generally adequate while one of the approved biology textbooks is inadequate. This can be concluded that the study questions provided in the four approved biology textbooks present or pose challenges to the learner, and as well engage the learners in real thinking. One of approved biology textbooks is unsatisfactory in order words do not engage the learner in real thinking.

C. EDUCATIONAL IMPLICATION OF THE FINDINGS

The followings are the educational implications of the findings of the study.

- ✓ The adequate topical coverage of the 5 evaluated Biology textbooks is a reflection that the contents of the topics and sub-topic in each chapter of these textbooks are adequately covered as it is in the Biology curriculum. This will enable Biology teachers to effectively implement the curriculum for better performance of students in examination especially external examinations. It will also guide and aid the students to read all the contents required of them to the syllabus/curriculum in order for them achieve better.
- ✓ Three out of the five textbooks are balanced in terms of learning activities and two are inadequate in learning activities. This implies that these textbooks do not encourage student centered learning. They will not promote critical thinking, skills and interest in the students. It will make the students not to think on their own, individually or as a group in order to understand themselves. The textbooks will make the students to be passive learners without trying to evaluate themselves on the contents they have studied.
- ✓ Books B and E have adequate study questions index. The questions in those texts will help the students in real thinking, tackle any challenge they may face during examination, because they promote critical thinking. This will help them during examination to answer all the questions pertaining to cognitive domain very well.

D. RECOMMENDATIONS

The researcher made the following recommendations based on the findings of the study.

- ✓ The Ministry of Education should approve only those textbooks which are evaluated and found adequate in content for use in our school system.
- ✓ Publishers of textbooks should insist on the provision of evidence of having been evaluated and found adequate in most of the five criteria before publication of any textbook for school use.

- ✓ Authors of biology textbooks should always review and improve on their textbooks in line with any new Biology Curriculum.

E. LIMITATIONS OF THE STUDY

The study was geographically delimited to biology textbooks used in Anambra state and this may affect generalization of its findings to biology textbooks used in other states.

F. SUGGESTION FOR FURTHER STUDIES

The researcher made the following suggestions for further studies based on the findings of this study.

- ✓ Content evaluation of other senior secondary school science textbooks such as chemistry, physics and mathematics should be conducted in other states of Nigeria.
- ✓ Readability and content evaluation of senior secondary school Biology textbooks used in Enugu State should also be conducted.
- ✓ Content evaluation of Junior Secondary School integrated science textbooks used in teaching integrated science should be conducted in any states of Nigeria.

G. SUMMARY OF THE STUDY

The purpose of this study is to evaluate the content of approved biology textbooks for senior secondary schools in Anambra State. Five research questions were posed for the study. Five recommended biology textbooks were evaluated in this study. This study adopted an evaluation research design. Literature was reviewed under the conceptual framework showing the schematic representation of variables used in the study. Biology and its importance; need to evaluate the adequacy of textbooks, criteria for evaluating textbooks, content evaluation of textbooks were the concepts explicitly discussed in other related sub-theme. Theoretical framework were anchored on (Bruner's cognitive theory and Stufflebeam's (CIPP) Model), empirical studies (studies on evaluation of content of textbooks and studies on Quantitative approach to content Evaluation of science textbooks) and Summary of Reviewed Literature. The instrument the researcher used in this study is called Quantitative Approach to the Content Evaluation of Science Textbooks (QACEST) the instrument was developed by Nworgu (1988).

The following findings were made;

- ✓ All the textbooks covers the content of the curriculum they are approximately +1, but book E has the highest topical value of 1.00. It shows that the text (Book E) perfectly covers all the topics and the sub-topics specified in the curriculum or syllabus.
- ✓ Textbook E has the highest learning activity index score of 0.26 which indicates a balance in the number of sentences requiring the learner to perform some activity and those, which simply require the learner to accept or receive ideas, facts, principles and generalization.
- ✓ Textbooks B and E have the highest study questions value of 0.80 each. It is approximately +1. which shows these

textbooks has the highest study questions which present challenges to the learner and also engage the learner in real thinking.

- ✓ Textbooks A, B, C, D and E have illustration index value approximately 0. This implies that there is a balance between the number of illustrations requiring the learner to perform some activity and number of illustrations which call for only viewing of what has been written in the textbooks.
- ✓ The conclusions were made from the findings of the study. Also, the educational implications of the study were drawn from the findings. Finally, the recommendations, limitations and suggestions for further studies were made based on the research findings.

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