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A Content Analysis of the Math Textbook, Grade Twelve at Secondary Schools in Somalia

Author: Dr. Shuaib Abdullahi Salad
Lecturer at Postgraduate Program, Faculty of Education, Mogadishu University, and Somali National University
Email: shuaip1@hotmail.com

Abstract

This study conducted a content analysis of the math textbook used in grade twelve at secondary schools in Somalia. The study aimed to evaluate the adequacy of the chapter objectives, assess the suitability of the exercises, analyze the figures and diagrams index, analyze the text narratives index, evaluate the appropriateness of the chapter summaries, and assess the suitability of the questions in the math textbook.

The study found that while the chapter objectives are adequate, the textbook lacks in providing challenging exercises, figures, and diagrams. The text narratives also need improvement in terms of student involvement, and there are no chapter summaries at the end of the chapters. However, the exercises at the end of the chapters are effective in promoting student involvement. The study concludes with suggestions for enhancing and revising the textbook to improve student engagement and learning.

Keywords: Math Text Book; Evaluation; Quantitative Analysis, Content Amylases, Grade Twelve.

1. Introduction

A **textbook** is a book that contains study material dedicated to a specific topic. People use it to study a particular subject, especially at school or college Textbooks are found in all subjects and used at all levels. They are

typically used to aid a student in recalling information for exams, but they have many other uses for students and teachers alike.[1]"

"A textbook is a book that contains comprehensive information about a course or a subject that a student needs, to get through the academic year. This has a set of chapters, question-answers, and exercises included in the curriculum to improve the learning standards of a student[2]

"A textbook is a book containing a comprehensive compilation of content in a branch of study with the intention of explaining it. Textbooks are produced to meet the needs of educators, usually at educational institutions. Schoolbooks are textbooks and other books used in schools. Today, many textbooks are published in both print and digital formats[3]".

Textbooks are the guide for the syllabus material they have to cover in the academic year. Textbooks assist teachers enable to design the scheme of work and lesson plan.

"One of the most common resources in the classroom is the textbook. Textbooks are packages with different but interrelated parts. They are the main sources that could convey the knowledge and information to the learners in an easy and organized way

(Ahour & Ahmadi, 2012)

Math form 4 is one of the subjects in the secondary school of Somalia and its instruction starts in secondary school. In Somalia, Math textbooks are prepared regarding the outcomes of the new curriculum framework of the Ministry of Education and Higher Education of Somalia. In Somalia, students usually study Math for four years during their secondary school stage.

"The international comparisons of data collected on classroom teaching and learning resources from TIMSS indicate the following: Despite the politicians' claims that digital media are the teaching tool of the future, printed textbooks still plays a major role among other classroom curricular resources(Horsley and Sikorova, 2014)

"Teachers and also learners spend a lot of their planning; class also,

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[1] **https://www.studysmarter.co.uk/explanations/english-literature/literary-devices/textbook/"**

[2] https://www.teachmint.com/glossary/t/textbook/

[3] *"schoolbook". The American Heritage Dictionary of the English Language (5th ed.). HarperCollins.* https://en.wikipedia.org/wiki/Textbook#:~:text=A%20textbook%20is,and%20digital%20formats

homework time working with course book materials (Nicol & Crespo, 2006, p. 331). Course readings are relied upon to give a structure to what is taught, how it might be taught and in what grouping it can be taught. Of the numerous components, which advance or impede science taking in, the reading material is a standout amongst the most discriminating (Leite, 1999; Hubisz, 2003).

In Somalia, changing circumstances and evolving technologies necessitated the creation of a new curriculum and textbooks for Somali pupils. This is similar to the country's policy, curriculum objectives, content, teaching aids, teaching techniques, and assessment and evaluation procedures.

The form 4 math textbook for Somali schools consisted of seven chapters: Analytic Geometry, Complex numbers, Probability, Statistics, Limits and Continuity, Differentiation, and Integration.

1.1 Problem statement

Mathematics education is critical to the development of any country, and textbooks are one of the primary resources used to deliver mathematical content to learners. However, the effectiveness of textbooks in promoting quality education largely depends on their content. In Somalia, the quality of education is affected by many factors, including inadequate teaching resources and infrastructure. Therefore, there is a need to investigate the quality of the content in the math textbook used in grade twelve at secondary schools in Somalia, to determine its adequacy and relevance in promoting quality education.

1.2 Significance of the study

The study is significant in several ways. Firstly, it will provide insights into the quality of the math textbook used in grade twelve at secondary schools in Somalia. This information can be used by textbook developers and policymakers to improve the quality of the textbook and to make it more relevant to the needs of the learners. Secondly, the study can help teachers to identify the strengths and weaknesses of the textbook, thus enabling them to make informed decisions when selecting teaching materials. Finally, the findings of the study can contribute to the broader discourse on the quality of education in Somalia and provide recommendations for improving the teaching and learning of mathematics in the country

1.3 Research Objectives:

The main objective of this study is to conduct a content analysis of the math

textbook used in grade twelve at secondary schools in Somalia. The specific objectives are:

1. To evaluate the adequacy of the chapter objectives in the math textbook used in grade twelve at secondary schools in Somalia.
2. To assess the suitability of the exercises in the math textbook used in grade twelve at secondary schools in Somalia.
3. To analyze the figures and diagrams index of the math textbook used in grade twelve at secondary schools in Somalia.
4. To analyze the text narratives index of the math textbook used in grade twelve at secondary schools in Somalia.
5. To evaluate the appropriateness of the chapter summaries in the math textbook used in grade twelve at secondary schools in Somalia.
6. To assess the suitability of the questions in the math textbook used in grade twelve at secondary schools in Somalia.

1.4 Research Questions:

The study will be guided by the following research questions:

1. To what extent are the chapter objectives in the math textbook used in grade twelve at secondary schools in Somalia considered adequate?
2. How suitable are the exercises in the math textbook used in grade twelve at secondary schools in Somalia?
3. What is the figures and diagrams index of the math textbook used in grade twelve at secondary schools in Somalia?
4. What is the text narratives index of the math textbook used in grade twelve at secondary schools in Somalia?
5. How appropriate are the chapter summaries in the math textbook used in grade twelve at secondary schools in Somalia?
6. How suitable are the questions in the math textbook used in grade twelve at secondary schools in Somalia?

2. Methodology

The research methodology employed was content analysis. Data were collected using **the** quantitative method proposed by Shaharom Noordin (1994). As suggested by Shaharom Noordin (1994) and the 8-point quantitative approach for content evaluation to determine the indices of Chapter Objectives, activities, Diagrams/illustrations, texts, Chapter Summary, Chapter exercise, and total evaluation index.

According to the seminal work done by PINGEL (2010), the main distinction

in the textbook analysis is between didactic and content analysis. There are two techniques for evaluating a textbook. The two techniques are: Quantitative (Shaharom Noordin, 1994) and Qualitative (American Association for the Advancement of Science, Project 2061, since 1985). This research will follow the quantitative method proposed by Shaharom Noordin (1994). As suggested by Shaharom Noordin (1994), a good textbook is more student-centered, can promote self-directed learning, allow students to learn by themselves at their own pace, have activities for students to enhance their mastery of a topic, and outline the objectives of a topic before the learning process takes place. In this paper, quantitative analyses of different aspects of the math grade 12 textbook were investigated. These aspects of the textbook can be arranged into six categories: Chapter objectives, Text narratives, Activities, Figures and Diagrams, Unit summaries, and Exercises at the end of units. Each category can be again broken down into points to identify and calculate the index for students' involvement (Dalim and Mubarrak, 2013; Mergo, 2012; Engida, 2005).

3. Results

3.1 Chapter Objectives

Defining the Chapter/learning objectives before the learning process takes place is one of the characteristics that a book should have (Shaharom Noordin, 1994). To determine the index of learning objectives of a book, the total number of chapters with objectives should be counted and divided by the total number of chapters of the book. The mathematical formula for the evaluation is as follows:

$Io = A/B$

From this formula:

A= Total number of chapters with objectives.

B= Total number of chapters.

Table1: Index of Chapter Objectives Io= A/B

Evaluation Aspects	A= Total number of chapters with objectives	B = Total number of chapters	A/B	Index of Chapter objectives Io= A/B
Chapter Learning Objectives, Io	7	7	7/7	1

3.2. Activities

According to Robert (1962), textbooks should have several purposeful activities that require students to work together. The following formula is used for student involvement in activities: I_a=A/B, Where A=number of pages that have activities and B=total number of pages

Table2: Index of Chapter Activities Ia= A/B

Evaluation Aspects	A	B	A/B	Index of Chapter activities Ia= A/B
Activities, Ia	32	275	32/275	0.10

3.3. Figures and Diagrams

The index for students' involvement from diagrams can be determined by selecting at least 10 diagrams or more in the textbook. The diagrams are then analyzed and categorized into one of the following:

A=For illustrative purposes

B= For activities or data analysis

After that, the following formula is used to compute the index value for diagram evaluation.

I_d =B/A

Table3: Index of Chapter Diagrams Id= B/A

Evaluation Aspects	A	B	B/A	Index of Chapter Diagrams Id= B/A
Diagrams, Id	13	1	1/13	0.07

3.4. Text Narratives

According to Shaharom Noordin (1994), a text in a textbook can be divided into eight categories which are:

A= Facts- simple statements given by the author

B= Conclusion/ Generalization – author's opinions
C= Definitions of a concept or principle
D= Questions with immediate answers from the texts
E= Questions that ask the students to analyze some data.
F= Statements that require the students to make their own conclusion
G= Statements that require the students to solve a problem or conduct an activity
H=Questions that attract students' interest and there are no immediate answers to the
questions.

To determine the index for students' involvement from texts, at least 10 pages or around 10% - 15% pages of the book are selected. The first 25 sentences for each page are read and classified according to the categories listed above. The sentences on the next page can be used if there are fewer than 25 sentences on the current page. The 25 sentences read should not include the headings, diagram captions, titles, and introduction of the chapter. After that, the following formula is used to calculate the index value:

It = [E + F + G + H] / [A + B + C + D]

In this formula, the categories a, b, c, and d are related to passive learning whereas categories e, f, g, and h are considered as active learning.

Table4: Index of Text Narratives It= [E + F + G + H] / [A + B + C + D]

Evaluation Aspects	[A+B+C+D]	E+F+G+H]	[E + F + G + H] / [A + B + C + D]	Index of Text Narratives It= [E + F + G + H] / [A + B + C + D]
Texts, It	304	162	162/304	0.533

3.5. Chapter Summaries

For summary index evaluation, summaries of at least three chapters are selected. From the summaries, any two of the paragraphs are read and categorized into the followings:

A= Summary that only summarizes the same ideas from the texts
B= Summary that contains questions where the answers are not found in the texts.

The formula used to calculate the index for students' involvement from summaries is:

Is = B/A

Table5: Index of Chapter Summary Is= B/A

Evaluation Aspects	A	B	B/A	Index of Chapter Summary Is=
Chapter Summary, Is	0	0	0	0

3.6. Chapter Exercises

As for the exercises at the end of a chapter, the evaluation can be done by selecting 10 chapters of the textbook randomly. However, all chapters should be used if there are fewer than 10 chapters in the book.

After that, 10 questions are randomly selected from each of the chapters and categorized into:

a= Questions their answers can be obtained straight from the text.

b= Questions asking for definitions.

c= Questions about applications.

d= Questions about problem-solving.

The following formula is then used to calculate the index for students' involvement in the exercises.

Ie=[c + d] / [a + b]

Table6: Index of Chapter Exercises Ie= B/A

Evaluation Aspects	[a + b]	[c + d]	[c + d] / [a + b]	Index of Chapter Exercise Ie= B/A
Chapter Exercises, Ie	44	40	40/44	0.90

3.7 Total Evaluation Index

A total evaluation index for students' involvement from the textbook is calculated after obtaining all the values of the six categories involved. Table 7 below shows the summary of the data analysis results for learning objectives, activities, diagrams, texts, summaries, and exercises.

Table7: Summary of the Total Evaluation Index

Evaluation Aspects	Index
Chapter Learning Objectives, Io	1.00
Activities, Ia	0.20
Diagrams, Id	0.07
Texts, It	0.53
Summary, Is	0.00
Exercises, Ie	0.90

The total evaluation index for the students' involvement from the textbook

can be obtained by summing up all the values and then dividing by six.

I= [Io + Ia + Id + It + Is+ Ie] / 6

= [1.00+ 0.20 + 0.63+ 0.53 + 0.00 + 0.90] / 6

I = 0.45

Finally, an index interpretation table is used to interpret the results obtained (Shaharom Noordin, 1994).

The index value will indicate how good the textbook is in promoting the students' learning. The index interpretation table is shown in Table 8 below.

Table 8: Index Interpretation

Index	Interpretation
0	No involvement of students
< 0.4	Authoritarian, not challenging, more to memorizing and definitions.
1.0	Ideal and balance.
> 1.5	Not much content, only questions or activities. Not enough information for students to work with.
Infinity	No contents only require students to do analysis(the textbook is full of points requiring students to do analysis no contents)

4. Discussion

The content analysis of the grade 12 math textbook used in secondary schools in Somalia has revealed strengths and weaknesses in various aspects of the textbook. While the chapter objectives and exercises are generally adequate, there is a lack of student involvement in activities, figures and diagrams, text narratives, and summaries. However, the exercises at the end of the chapters are effective in promoting student involvement

The index value for student involvement varies for different aspects of the textbook. The index value for chapter objectives is 1.0, indicating that all 11 chapters of the grade 12 math textbook have adequate chapter objectives. Learning objectives are crucial in improving students' understanding of a topic and preparing them to achieve their educational goals.

The index of student involvement for activities in the grade 12 math textbook is 0.20. The textbook is authoritarian, lacks challenge, and mostly focuses on memorization and definitions. The textbook needs more activities that encourage students to engage in the learning process, such as group discussions, presentations, collecting data, and role-plays. These activities can enhance students' understanding of mathematical concepts.

The calculated index of student involvement for figures and diagrams in the grade 12 math textbook is 0.07. The textbook is authoritarian, not challenging, and mainly focuses on memorization and definitions. Figures and diagrams are crucial in conveying information to students in a simple and understandable way. They also help students acquire information and promote scientific skills.

The index value for students' involvement in text narratives in the grade 12 math textbook is 0.53, indicating that students' involvement in texts is not fully achieved, and passive learning is prevalent.

The index of student involvement for summaries at the end of chapters in the grade 12 math textbook is 0.00, indicating that there are no chapter summaries. The textbook is authoritarian, not challenging, and mainly focuses on memorization and definitions. Chapter summaries can aid students in reviewing the material.

The index for students' involvement from exercises in the grade 12 math textbook is 0.90, indicating a good level of student involvement. The textbook has questions that encourage problem-solving and critical thinking skills, questions with immediate answers from texts, and questions that ask for definitions. Overall, the exercises at the end of the chapters are effective in engaging students.

5. Conclusions

The results of the study provide insights into the quality of the math textbook used in grade twelve at secondary schools in Somalia. The study found that while the chapter objectives are adequate, the textbook lacks in providing challenging exercises, figures, and diagrams. The text narratives also need improvement in terms of student involvement, and there are no chapter summaries at the end of the chapters.

6. Recommendations

Based on the findings of the study, the following recommendations are made:

1. The textbook developers should focus on providing more challenging exercises that encourage critical thinking and problem-solving skills.

2. The textbook should include more figures and diagrams to enhance students' understanding of mathematical concepts.
3. The text narratives should be revised to promote active learning and student involvement.
4. Chapter summaries should be added to the end of each chapter to aid students in reviewing the material.
5. Teachers should be trained to use the textbook effectively and engage students in activities such as group discussions, presentations, and role-plays.

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