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## *An Evaluation of the Physics Textbook, Grade Twelve at Secondary Schools in Somalia*

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### **Abstract**

The purpose of this research was to evaluate the content of Grade 12 physics student textbook for Somali secondary schools. The study was conducted based on the Ministry of Education Culture and Higher Education (MEC&HE) demands that textbooks currently in use as well as those that will be produced in the future will be greatly improved or revised. The method of the research employed was content analysis. The different categories of Grade 12 physics textbook; such as chapter objectives, activities, figures and diagrams, text narratives, chapter summaries, and end-of-chapter exercises were evaluated. Quantitative analysis techniques were employed and index values for students' involvement were calculated.

The data obtained from the textbook analyzed quantitatively and interpreted based on the index value interpretation guideline adapted from literature. The results revealed that chapter objectives were stated in

all the chapters in the textbook. In addition, the figures, diagrams, other drawings, and points that demand emphasis were put in attractive colors that grasp students for reading. However, the other aspects of the textbook were found to have limitations. These aspects of the textbooks emphasized on memorization of facts, explanations, principles; the activities had immediate answers in the textbooks; figures and diagrams concentrated mainly for illustrative purpose; review questions and problems demanded simple memory and mere mathematical calculations based on previous learning of formulas; reflected main points in the text narratives . Accordingly, conclusions were drawn and recommendations for further improvements and revisions were forwarded.

**Keywords:** Physics text book; evaluation; quantitative analysis student-centered; textbook

## **Introduction**

“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”<sup>i</sup>. <https://www.teachmint.com/glossary/t/textbook/>

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)”. Physics grade 12 is one of the subjects in the secondary school of Somalia and its instruction starts in secondary school. In Somalia, Physics 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 the physics for four years during their secondary school stage. “The international comparisons of data collected on classroom teaching and learning resources from TIMSS indicates 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, 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 situations and developing technology also caused to produce a new curriculum and text books for Somali students. This is parallel regarding policy, curriculum objectives, content, teaching aids, teaching methods and assessment and evaluation approaches of the country. The Grade 12 physics textbook for Somali schools consisted of 11 chapters: Oscillatory Motion, Wave Motion, Sound Waves, Reflection of Light, Refraction of light, Dispersion of Light, Electromagnetic Induction, Alternating current, Electronics, Modern physics and nuclear physics. This study is centering to the evaluation of textbook physics for 12th grade student of secondary School. In this study, the researcher takes data from materials in the textbook and do an evaluation about the materials of the textbook to find out whether the textbook fulfill a good criteria of a good physics textbook or not. This study will help teachers who have difficulties in evaluating the physics Textbook by providing a simple format for physics textbook evaluation. In deciding whether the textbook here fulfill the criteria of a good physics textbook based on materials evaluation on the textbook. Thus, the research questions are set out:

*(1) How adequate are the chapter objectives and activities of the physics Grade 12 textbook in use in secondary schools?*

- (2) *What are the figures, text narratives and diagrams index of the physics Grade 12 textbook in use in secondary schools?*
- (3) *How appropriate the chapter questions and summaries of the physics Grade 12 textbook in use in secondary schools?*

The purpose of the study was to evaluate Grade 12 physics textbook from a series of four physics textbooks which are compulsory textbooks for all students from secondary schools in Somalia. The study aims to clarify the strengths and weaknesses of the book as used in the teaching and learning context of Somalia, and provides suggestions about how to improve this textbook for the particular conditions in the Somali secondary schools. The overall aim, then, is to help make physics teaching and learning in Somalia secondary become more interesting and effective.

## **Method**

### ***Data collection procedure***

The research methodology employed was content analysis. Data were collected using 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.

### ***Data analysis and Instrument***

The quantitative method proposed by Shaharom Noordin (1994)<sup>ii</sup> and 8-point evaluation model were used to answer the research questions. 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 as shown in Table 1 below.

**Table 1 Index interpretation**

| Index    | Interpretation   |
|----------|--|
| 0        | No involvement of students   |
| < 0.4    | Authoritarian, not challenging, more to memorizing and definitions.<br>(the value is below average)                            |
| 1.0      | Ideal and balance.   |
| > 1.5    | Not much contents, 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) |

## **Result of the Study**

### *Chapter Objectives*

Defining the Chapter/learning objectives before the learning process takes place is one of the characteristics that a book should have (ShaharomNoordin, 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:

$I_o = A/B$  From this formula:

A= Total number of chapters with objectives

B= Total number of chapters

**Table2: Index of Chapter objectives  $I_o = A/B$**

| Evaluation Aspects                 | A= Total number of chapters with objectives | B= Total number of chapters | A/B   | Index of Chapter objectives $I_o = A/B$ |
|------------------------------------|---|-----------------------------|-------|---|
| Chapter Learning Objectives, $I_o$ | 11  | 11                          | 11/11 | 1                                       |

### *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 of activities:

$$I_a = A/B$$

Where A=number of pages that have activities and B=total number of pages

**Table3: Index of Chapter activities  $I_a = A/B$**

| Evaluation Aspects | A  | B   | A/B    | Index of Chapter activities $I_a = A/B$ |
|--------------------|----|-----|--------|---|
| Activities, $I_a$  | 75 | 377 | 75/377 | 0.2                                     |

### ***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 followings:

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.

$$I_d = B/A$$

**Table4: Index of Chapter Diagrams  $I_d = B/A$**

| Evaluation Aspects | A   | B   | B/A     | Index of Chapter<br>Diagrams $I_d = B/A$ |
|--------------------|-----|-----|---------|--|
| Diagrams, $I_d$    | 212 | 134 | 134/212 | 0.63                                     |

### ***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 less 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.

**Table5: 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<br>$It = [E + F + G + H] / [A + B + C + D]$ |
|--------------------|-----------|----------|-------------------------------------|--|
| Texts, It          | 605       | 323      | 325/605                             | 0.537  |

### ***Chapter Summaries***

For summaries index evaluation, the 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 contain questions where the answers are not found in the texts.

The formula used to calculate the index for students' involvement from summaries is:  $I_s = B/A$

**Table6: Index of Chapter Summary  $I_s = B/A$**

| Evaluation Aspects     | A | B | B/A | Index of Chapter Summary $I_s =$ |
|------------------------|---|---|-----|----------------------------------|
| Chapter Summary, $I_s$ | 0 | 0 | 0   | 0                                |

### *Chapter Exercises*

As for the exercises at the end of a chapter, the evaluation can be done by selecting 10 chapters of the text book randomly. However, all chapters should be used if there are less than 10 chapters in the book. After that, 10 questions are randomly selected from each of the chapters and categorized into:

a= Questions which answer 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 from the exercises.  $I_e = [c + d] / [a + b]$

**Table7: Index of Chapter Summary Is= B/A**

| Evaluation Aspects    | [a + b] | [c + d] | [c + d] / [a + b] | Index of Chapter Exercise Ie= B/A |
|-----------------------|---------|---------|-------------------|-----------------------------------|
| Chapter Exercises, Ie | 248     | 228     | 228/248           | 0.9                               |

**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. The Table 8 below shows the summary of the data analysis results for learning objectives, activities, diagrams, texts, summaries and exercises.

**Table8: Summary of the total evaluation index**

| Evaluation Aspects              | Index |
|---------------------------------|-------|
| Chapter Learning Objectives, Io | 1.00  |
| Activities, Ia                  | 0.20  |
| Diagrams, Id                    | 0.63  |
| 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 divided by six.

$$I = [I_o + I_a + I_d + I_t + I_s + I_e] / 6$$

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

$$I = 0.54$$

## Discussion of Findings

- 1) The calculation of index value for student involvement gives different values for different aspects of the textbook. As Table 2 above depicts, the index value of student involvement for *Chapter objectives* is 1.0. Based on the index value interpretation guideline, this value is taken as ideal and balance. This implies that all the 11 chapters of form 4 physics textbook have chapter objectives. The learning objectives are very important to improve the students' understandings about a topic. It can also prepare them to achieve the objectives (Normalah, 2001)<sup>iii</sup>.
- 2) The index of student involvement for *activities* (Table 3 above) in the textbook gives 0.20 for form 4 physics textbook. The textbook does not have enough activities that help students do as they are in the process of learning. And not provides many activities for students such as group discussions, presentations, collecting data and role-plays. All these activities can help in strengthening the students' understandings about the concepts learned (Nor Rahimah, 2002)<sup>iv</sup>.
- 3) The calculated index of student involvement for *figures and diagrams* (Table 4 above) in the textbook gives 0.63 form 4 physics textbook is good in including figures and diagrams to involve students in performing some activities and predict relationships. As for diagrams, the index for students' involvement is 0.63. This is very important as diagrams are one of the methods to convey information to students in a simple and easier way (Norliana and Shaharom, 2004)<sup>v</sup>. Diagrams help students in acquiring information as well as promoting scientific skills.

4) As for *text narratives (Table 5 above)*, the index value for students' involvement for form 4 physics textbooks is 0.53 is good based on the index interpretation value. The result indicates that the students' involvements from texts are not fully obtained. There is lots of passive learning.

However, the textbook partly meets the criteria of promoting students-centered learning by having texts that suggest activities, problem-solving and questions that can attract students' interest to learn.

5) The index of student involvement for summaries at the end of chapters (Table 6 above) was found to be 0.00, which means there are no chapter summaries at the end of the chapters.

6) The index for students' involvement from the exercises (Table 7 above) was found to be 0.90 for form 4 physics textbook. And this slightly good index of student involvement is achieved. This value shows that this textbook consists of questions on applications and problem solving and questions with immediate answers from texts and questions that ask for definitions. In general, the exercises at the end of the chapters are able to get the students' effectively involved.

## Conclusions

The study evaluated and analyzed the six aspects (learning objectives, activities, figures and diagrams, text narratives, chapter summaries and exercises) of the form 4 physics textbook for Somali Schools. Based on the analysis made and the results obtained, the following conclusions were made:-

- The 11 chapter consisted of learning objectives, activities, figures and diagrams, text narratives, exercises with no chapter summaries.
- the learning objectives stated were not clearly written indicating the behavior expected of students after completing the chapters. The way of stating the learning objectives seemed to give weak emphasis that the objectives have to the rest of the components of instruction.
- The activities in the textbook demanded students to get immediate answers from textbook. This method does not help students discover or construct their own idea.
- The figures and diagrams in the textbook is colorful that attract students for reading. However, these figures and diagrams were found to be mostly for illustrative purpose that had limitations in helping students to analyze data and learn new situations.
- Text narratives were not organized in the needs of learners' behavior. They were prepared to fill students with definition of terms, facts, definitions and principles. In short, the focus seemed on science as a product not a process.
- There were no summaries at the end of the textbook were found.

## **Recommendations**

- Every aspect of the textbooksuch as learning objectives, activities, figures and diagrams text narratives, chapter summaries and exercises should be arranged in order to ease student-centered method and active engagement of students in the learning process.

- The physics textbook should be organized in a way that allows students to become investigators nature of science and the students to understand their environment.
- the learning objectives, activities, figures and diagrams text narratives, chapter summaries and exercises should be improved and revised in order to help students to engage actively in their own learning.
- Chapter summaries should be included at the end of the chapters.

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