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ASSESSING OF UAE STUDENTS' INVOLVEMENT IN SCIENCE TEXTBOOK FOR THE 8TH GRADE

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Abstract:
The purpose of this research is to identify the level of UAE student involvement in the 8th grade science textbook by reviewing the educational content, graphics, and activities. It was calculated using Romey's Involvement Index, which measures the book involvement factor for the student using a random selection of textbook pages. The findings showed that students' involvement in the content of science textbook around the minimum value of the acceptable range identified by Romy. The value was at the (0.4) highlighting poor involvement in content that might not allow students to analyse, brainstorm, and draw their own conclusions. A decrease was noticed in students' involvement in graphics and image and illustrations, (0.14), indicating its poor effect on encouraging students to perform science investigations. It also showed student involvement in activities was (0.31), which is less than the range identified by Romey. Thus, the researchers recommended reviewing the original version of the textbook by the publisher and rewriting the scientific context in an educational format. They also recommended enriching the book with effective content materials, with more attention to image and illustrations and figures, to enhance student opportunities to participate and interact in lessons.

Keywords: involvement, science textbook, content analysis

1. Introduction

The school textbook is one of the most important resources for students' learning. In the United Arab Emirates, like many other countries, schoolbooks play an important role in the process of teaching and learning. Educators and curricula developers consider the school textbook as a learning aid which has a significant role in active learning, therefore, textbook content should always be analyzed and evaluated in light of rapid scientific knowledge discovery and the developing skills of students. Supporting student learning

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can be done through increasing their level of involvement with the learning process and including inquiry-based lessons and related activities. (Al-Dolimy & Dawood, 2019).

The teaching curricula has a large volume of data and educational elements including images and illustrations, text of theories, questions, worksheets, activities, graphs and conclusions, as a result, researchers adopt an analytic method to sift the content and divide it into readable categories which allows them to study the core interactive pieces of educational elements in the curricula. This content analysis method classifies data and creates categories based on a clear rule of coding (Steve Stemler, 2001). The content analysis method is used by researchers to identify the presence of certain words, concepts, themes, phrases within a text and to quantify their presence, objectively.

'Student involvement' assists students by displaying an engaging and interesting learning material in the science textbook. This supports their understanding, stimulates inquiry and problem-solving skills, and gives the students opportunities to think, express ideas and discuss thoughts using activities and exercises. (Alabdulkareem, 2016).

William Romey developed an analytical method to analyse the main educational elements contained in textbooks such as goals, objectives, text, images and illustrations, forms, questions, conclusions, and other educational elements. (Adili, Harahshe & Baarah, 2012). This analytical method has contributed to improving the curricula and textbooks and leads to the development of more interactive educational content. Content development could increase the number of active learning strategies and interactive items in the textbooks to help students involved positively with the learning process (Koulaidis & Sklaveniti, 2003).

The literature includes several research studies that used Romey's analytical method. Research by Haji's (2016) investigated the degree of student involvement in a social studies textbook. It revealed a reduction of students' involvement in educational content in geography, history, citizenship units, and did not locate within the acceptable range adopted by Romy's. The results also concluded there was reduced student involvement in figures & diagrams in the geography unit, and non-involvement for history and citizenship. The student involvement through an educational activities book showed excellent student involvement except in the geography unit. The researcher recommended the need for much attention to student involvement in a social studies textbook in the areas of educational content, figures & diagrams, and activities in geography unit. It also suggested conducting further typical analytical studies on social studies textbooks in other classrooms in general, in the light of the degree of the student involvement in it.

Science is one of the subjects that can be interesting if the student's engagement and participation are increased. This could happen when students apply hands-on experiments to demonstrate their understanding of the scientific concepts and when they provided with a learning environment filled with imagination and investigation.

Science textbooks have to introduce the different shapes of knowledge, identify scientific skills and teaching processes. The following studies have been reviewed as they were more related to this study which addresses the science textbooks. A study conducted by Al-Dolimy and Dawood (2019) aimed to examine the degree of student

engagement in science textbooks for the first and second years of an intermediate stage in Iraq. The study concluded that the degree of engagement is high among the students of first-class and low among the students of the second class. This is created using images and illustrations and figures in the first class and the less use of such tools in the second class.

Science has diverse subjects, e.g. biology, physics, chemistry, geology, space, and other related strands. Images and illustrations can be very supportive for students during student exposure to the wide range of topics in science education. Many researchers have addressed the level of the interactive image and illustrations embedded in science textbooks. A study by Dimopoulos & Sklaveniti (2003) presented the application of a grid for the analysis of the pedagogic functions of images included in school science textbooks and daily press articles about science and technology. The analysis used the dimensions of content specialization (classification) and social-pedagogic relationships (framing) promoted by the images, as well as the elaboration and abstraction of the corresponding visual code (formality), thus combining pedagogical and socio-semiotic perspectives. The grid applied to the analysis of visual images collected from school science textbooks and from the press. The results showed that the science textbooks, in comparison to the press material:

a) use ten times more images,
b) use more images to familiarize their readers with the specialized techno-scientific content and codes, and
c) tend to create a sense of higher empowerment for their readers by using the visual mode.

Furthermore, as the educational level of the school science textbooks is raised, the content specialization projected by the visual images. The research results have implications for the terms and conditions for the effective exploitation of visual material as the educational level rises and for the effective incorporation of visual images from press material into science lessons.

According to Moghadam and Nasab (2014), a study analyzed the educational content of secondary education physics textbooks, using Romey's analytical method. Content analysis included the formulation of the text, images, and questions in the textbook. This study helped to answer the questions: To what extent can learners learn to read, have involvement with questions and can capture images and enable the development of educational content via the coefficients of the students involved, how much is it? Results showed that the coefficient indicating the level of involvement of students actively develop educational content textbook, the text, and image and illustrations book of questions, much less than the rate specified in the analysis, which implies that physics textbooks need to increase the level of students' involvement in the textbooks.

In addition to the importance of student's interaction with questions, texts, and image and illustrations in science textbooks, the students' involvement with the values in science textbooks is also worth a review, especially that attaining desirable values could be easily done by getting involved with them rather being informed theoretically.

Sharma (2017) analyzed the content of 6th-grade NCERT science textbook in India, to assess content related to values included in a 6th-grade science textbook and the scope of developing desirable values in students of 6th grade through science curriculum. The study revealed that in almost all the topics many obvious and hidden values are given which may be taught during the teaching-learning process. Science subjects have a full scope of recognition of values, ideal acts of valuing, and moral and character education, but a teacher is required to understand the hidden values in given content and find innovative methods to impart this to students.

In order to achieve better student involvement, (Badr, 2019) recommended enriching the textbooks with learning aids and activities that meet students' learning needs in accordance with the intended goals and objectives. Including active content can involve more than one sense of students' senses during the learning and teaching process will lead to better learning experiences.

According to the researcher's methodology, science textbooks can be analyzed and reviewed mainly according to these educational elements:

a) Image and illustrations which interest students;
b) Assignments for students (Bromley, Meyer & Ramirez, 2011). For example, activities, shapes and case studies that require students to analyze and to solve a problem.
c) Explained exercises for practicing purposes;
d) All kinds of questions for students;
e) Facts;
f) Conclusions and other elements in Romey's tool.

In the United Arab Emirates, and according to the researchers, this study is the first one in analyzing the science textbook for 8th grade, so this study will support the curriculum developers with research-informed feedback that will increase the effectiveness of the active learning elements in the science textbooks.

2. Research Problem

Involving students in science textbooks should be taken into consideration during designing and developing the science curriculum. This could make the students' active learners as they interact with it, and it encourages them to investigate and research through content, activities, and graphics. However, if the content of the science textbook mainly depends on encouraging memorization, it will demotivate the students and create negative attitudes toward the subject.

Thus, the researchers see the need for analysing and evaluating science book which is being taught in schools. In order to emphasize the importance of the quality of the content in terms of the presentation of the content, graphics, pictures, activities.

Specifically, the study addresses the following research questions:

1) To what extent students are involved in the designing and developing of by content of science textbook for 8th grade in the UAE according to Romey's Formula?

2) To what extent students are involved in the graphics and image and illustrations of science textbook for 8th grade in the UAE according to Romey's Formula?
3) To what extent students are involved in the educational activities of science textbook for 8th grade in the UAE according to Romey's Formula?

3. Study Objectives

This study aims to reveal the extent of students' involvement in the science textbook for 8th grade through the presentation of each of the content, the graphics, the images and illustrations, and the activities.

3.1 Significance of the Study

The importance of this research came from the absence of previous studies since no similar study has been conducted in the subject of analysis and evaluation looking at student's involvement in science books. Researchers trawled the databases and search engines of published study in the United Arab Emirates).

This study provides an indication of the degree of science textbook involvement for the eighth-grade students. The review will provide relevant information to aid design and development of a science textbook in a way that contributes to increasing students' motivation to learn and provides an opportunity for them to think and express their opinions and urges them to search and investigate science.

The study is an attempt to inform science teachers of eighth-grade about the findings. So, they can use the book effectively when they teach their students.

The current study will be an initial step for other researchers to depend on to analyze other textbooks in different classes and subjects.

3.2 Study Limitation

This research is limited to the version (2020) of the science textbook for 8th grade. It is designed by the ministry of education in the UAE.

4. The Study Procedural Terms and Their Definitions

4.1 Involvement

How educational material in the textbook helps the students to understand knowledge, discover, and think about the information offered. Involvement as a procedural term is defined as the extent to which the book of science of 8th grade in the UAE presents content in a way that provides the students' interaction opportunities, encourages knowledge investigation and high order thinking. This is measured by a set of equations identified by Romey including content, graphics and images and illustrations and activities.

4.2 Science Textbook

Defined as the science textbook provided by the MOE in UAE for all public schools to be used as a curriculum for the 8th grade.

4.3 Content Analysis

The research methodology to make sense of the content of messages, images, symbols or audio data. In short, it could be a trial to determine textual meaning (Gheyle & Jacobs, 2017). It is known procedurally as fragmenting the science textbook of 8th grade in the UAE into quantitative components, to determine the nature of these components and their description, and how it meets the involvement standards of student in educational content, graphics and image and illustrations, and activities according to Romey's Formula.

5. Methodology and Procedures

The researchers used a descriptive approach and analytical method in this study. Romey's analytical method (Moghadam & Nasab, 2014; Haji, 2016) is adopted to analyse and determine the degree of involvement in the book of science of 8th grade in the UAE through the presentation of educational content, graphics and images and illustrations, and educational activities.

5.1 Research Community

The research community is represented in the 4-units, 164-page science textbook of 8th grade in the UAE for the academic year (2019-2020).

5.2 The Research Sample

The research sample used to estimate the book's involvement consisted of 10% of the book's total pages. These pages were chosen in an organized random way with one page from every ten consecutive pages of the book. Moreover, the questions at the end of chapters, and other cases irrelevant to the area of analysis already.

5.3 Methodology

The research tool used in this study consists of three analysis cards. They are compatible with the elements that form Romey's equations in measuring student involvement in the science textbooks. The first card consists of all the elements needed to measure the involvement coefficient in the presentation of the educational content. The second card consists of all the necessary elements to measure all the involvement coefficient in graphics and image and illustrations and the third one consisting of all the necessary elements to measure all the involvement coefficient in the educational activities.

To analyse science textbooks in terms of the educational content, the number of active and passive sentences were investigated by using the following elements:

1) Statements and facts: Simple sentences represent a sample of information or views done by someone else other than the students.
2) Conclusions or generalizations: The author's opinion expressed from meaning or the relation between sections or series of facts.
3) Definitions: Phrases that define the meaning of terms in the textbook.
4) Questions raised and answered directly by the textbook.

5) The questions requiring analysis of information by the students.
6) Declarative sentences which require the student to formulate their own conclusions.
7) The instructions which demand the students to perform and analyse and problem-solve an activity.
8) Questions with no direct answer in the book which may raise student curiosity and interest.

There are other elements mentioned by Romey that could in the content but do not influence the benefit of the book when teaching it, and these are (i) and (j):

1) The sentences which direct the readers to look at graphic or illustrative images and illustrations, activities' instructions, and other sentences which do not come under any of the previous categories.
2) Rhetorical questions presented just to drag the reader's attention the readers not to look for an answer.

It should be noted that (a, b, c, d) includes direct scientific knowledge transfer to students and (e, f, g, h) are sentences that require student participation in order to learn the content by using investigation methods.

$$Involvement\ coefficient\ in\ the\ presentation\ of\ the\ educational\ content = \frac{e+f+g+h}{a+b+c+d}$$

To analyse the Involvement of graphics and images and illustrations and then calculate its Involvement coefficient, the following elements need to specify:

a) Graphics and images and illustrations used directly for illustration purposes which do not involve a student in learning.
b) Graphics and images and illustrations requiring t students to do an activity or use information such as answering a question which involves the student.
c) Graphics and images and illustrations that do not match any of the elements a and b were disregarded in the calculation of the Involvement coefficient.

$$Involvement\ coefficient\ in\ graphics\ and\ pictures = \frac{b}{a}$$

To analyse the Involvement of educational activities in the book then calculate its Involvement coefficient, the following elements need to specify:

a) The number of activities the students are required to do.
b) The number of analysed pages in search of activities.

$$Involvement\ coefficient\ in\ educational\ activities = \frac{a}{b}$$

When the value of the involvement coefficient is between 0.4 and 1.4, it is considered acceptable and suggests the student can interact with the book effectively.

The following table showing values and standards measuring the Involvement coefficient as presented by Romy and mentioned in Azar's (1982).

Table 1: The values and standards of measuring involvement coefficient

The value of Involvement coefficient	**Assessment**
zero	Means the absence of involvement
1	Equals the numbers of statements that do not require the involvement of the students, and statements that do.
If the value involvement factor is more than (1)	This means there is an increase in the material which requires investigation by the students comparing to the material that does not.
If the value involvement factor is less than (0.4)	The book is authoritarian and includes few intellectual challenges
If more than (1.5)	This means that the book contains only questions and the students are not given enough information to deal with them efficiently.
The range (0.4 - 1.5)	The book involves the students.

5.4 Reliability

The researchers were agreed on the same encoding of the educational content, graphics, images and illustrations, and educational activities. Five pages were randomly taken from the book and analysed separately to measure the level of agreement. This involved simply adding up the number of cases that were coded the same way by the two researchers and dividing by the total number of cases. The agreement ratio between the analysts reached (0.86) with regard to the educational content, graphics, and images and illustrations was (0.93), and activities scored (0.98).

In order to combat the fact that researchers were expected to agree with each other a certain percentage of the time simply based on chance, reliability was calculated by using Cohen's Kappa where 1 as coding is perfectly reliable and 0 when there is no agreement other than what would be expected by chance. Kappa was reaching (0.78) which represents reasonably good overall agreement as it can be considered a strong value if it is between (0.61- 0.80) according to Stemler (2001).

Kappa was computed:

$$Kappa\ (\kappa) = \frac{Pa - Pc}{1 - Pc} = 0.78$$

where:
Pa = proportion of units on which the researchers agree.
Pc = the proportion of units for which agreement is expected by chance.

6. Results and Discussion

Results and findings related to the first research question; To what extent is there student involvement in the content of 8th grade science textbook in the UAE according to Romey's Formula.

The researchers extracted the Involvement coefficient of students in the educational content by analysing the Involvement variables of the educational content that were calculated according to Romy's equations and the results were as follows (Table 2).

Table 2: The occurrences of the sentences via the educational content display in the sample pages of the 8th-grade science book

Pages	a	b	c	d	e	f	j	h	i	j
7	8	3	2	1	2	-	-	-	2	-
17	7	7	3	1	-	1	-	-	6	-
27	-	-	-	-	9	1	-	-	9	-
36	-	-	-	-	-	6	2	-	4	-
47	1	4	2	1	1	-	-	-	4	-
57	8	7	1	-	-	1	-	-	5	-
67	8	12	-	2	-	1	-	-	6	-
81	-	1	-	-	1	2	-	-	2	-
82	1	1	-	1	-	-	1	-	4	-
91	1	5	2	1	4	10	-	-	8	-
100	-	4	3	-	1	-	-	-	6	-
110	2	15	5	1	2	4	-	-	8	-
124	1	2	2	1	4	-	-	-	5	-
134	1	6	1	-	1	1	-	-	6	-
148	2	5	2	2	2	-	-	-	3	-
154	-	5	1	-	-	3	-	-	3	-
Total	40	77	24	11	27	30	3	0	81	0

$$Involvement\ coefficient\ in\ the\ presentation\ of\ the\ educational\ content = \frac{e+f+g+h}{a+b+c+d} = \frac{60}{150} = 0.4$$

According to Table 2, the Involvement coefficient of the educational content around the minimum value of acceptable range identified by Romey is (0.4-1.5) reaching (0.4). This means that the Involvement coefficient is acceptable at the lowest limit. This shows that the content contains a large number of facts and information (71%) compared to sentences that engage students and encourages them to interact, where the percentage is (29%). This may be due to the fact that the textbook was translated from English to Arabic, and perhaps the translation and transfer process focused on the facts, believing their importance, therefore, the interaction factor could be lost in the translation. Furthermore, the ratio is acceptable according to the interpretation of the values of Romey's equations which may indicate that the content of the science textbook helps the students in analysis, thinking and induction. As a result, the student can interact with the book at less efficacy. The finding of this question is consistent with the findings of Nawafleh (2012) and Alabdulkareem (2016).

The findings relating to the second research question; To what extent is there student involvement in the graphics and images and illustrations of the 8th grade science textbook in the UAE according to Romey's Formula.

The researchers extracted the Involvement coefficient of students in the graphics and images and illustrations by analysing the involvement variables of the graphics and images and illustrations were calculated according to Romey's equations and the results were as follows:

$$Involvement\ coefficient\ in\ graphics\ and\ pictures = 0.14$$

The results showed an increase in the number of direct graphics and images and illustrations compared to those that urge the students to analyse, search and infer information. As a consequence, the science textbook graphics and images and illustrations might not involve the student in the learning process and most of the graphics and images and illustrations are used for illustrative purposes. It does not provide students with good opportunities to learn effectively. This may be due to the publisher when trying to replace some of the interactive images from the original book to be more appropriate to the emirate's culture and context, which results in reducing the values of students' involvement. The finding of this question is agreed with the findings of studies Nawaflah (2012) and Al Awadhi (2010).

Finally, the findings relating to the third research question, what is the extent of students' involvement in the educational activities for 8th grade science textbook in the UAE according to Romey's Formula.

The researchers extracted involvement coefficient of students in the educational activities by analysing the science textbook and the involvement variables of the educational activities were calculated according to Romy's equations and the results were as follows:

$$Involvement\ coefficient\ in\ educational\ activities = 0.25$$

The results for student textbook involvement in activities was (0.31), less than the range identified by Romy (0.4 - 1.5). These results suggest book activities do not give the students the chance to interact and engage with both a dry and a wet science lab. Furthermore, it does not encourage them to discover cause and effect relationships nor gathering and examining evidence from their environment. In such science activities, students do not have to think deeply, observations, analyse, investigate, or explore theories.

Thus, it can be concluded from these results, the 8th grade science textbook appears to have the same types of activities and it repeats them for different topics and units.

7. Conclusions and Recommendations

The student involvement in the content of the science textbook in an acceptable range. However, there was a weakness in the degree of students' involvement in the science

textbook for graphics and image and illustrations, and educational activities because the degree did not fall within the acceptable range identified by Romy.

In light of the findings of the research; the researchers recommend the following:

- Based on the result of student involvement in the content of the 8th grade science textbook, it appears the involvement coefficient is at the minimum This requires rewriting the scientific material in cooperation with specialists in this field.
- Enrich the science textbook with interactive graphics and images and illustrations as student Involvement was very weak in this element.
- Increase the number of graphics and images and illustrations which requires the students to do activities and decrease the number of graphics and images and illustrations which are included for illustrative purposes, only.
- Enrich the 8th grade science textbook with various activities that challenge the student minds and motivate them to be critical thinkers.
- Conduct further analytic and evaluative research in light of Involvement in science textbooks and other subject textbooks in the UAE.

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