



Content Analysis of Experimental Sciences Book of Fifth-Grade Elementary Based on William Rumi Method

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Abstract: *The importance of textbooks in focused educational systems such as the one in Iran, whose almost all educational factors are determined and implemented based on their content, is more than other types of educational systems and due to this excessive importance spending time by experts in evaluating and analyzing textbooks can be a solution to many of the current educational problems. This study aimed at analyzing the content of experimental sciences book of fifth-grade elementary using William Rumi method in the academic year of 2016-2017. Based on this analysis, students' involvement in the three components of "text", "questions", and "book illustrations" has been examined based on three hypotheses. The entire content of the experimental Sciences Book was selected as the statistical sample of the research, analyzed based on the active and passive categories, and the coefficient of their involvement was determined through William Rumi method. Accordingly, the involvement coefficient was achieved 1.217 for the text, 1.777 for the questions and 0.586 for the images respectively and it became clear that unlike the questions provided in the book, the texts and images are active.*

Keywords: *content analysis, experimental sciences, fifth grade, active and passive, William Rumi*

INTRODUCTION

Textbooks are the focus of attention of education professionals because of their importance in determining the educational content and guidelines. The importance of textbooks in focused educational systems such as the one in Iran, whose almost all educational factors are determined and implemented based on their content, is more than other types of educational systems and due to this excessive importance, spending time by experts in evaluating and analyzing textbooks can be a solution to many of the current educational problems. At present, textbooks are one of the most important references and resources for learning because most educational activities are carried out within the framework of this medium (Niknafas S, 2013). The use of content analysis method is one of the ways that can ensure us that books are consistent with the objectives of the curriculum, as well as appropriate principles and standards of teaching applied in it (Rasuli, M et al., 2014). Therefore, this study aims at analyzing the content of the fifth-grade elementary experimental sciences book (text, questions, and illustrations) in terms of being active or passive based on William Rumi method. The main question of the research is whether the content of the fifth-grade experimental sciences (text, questions and images) are presented in an active way.

Content analysis is based on the techniques of documentary methods in social science research. The documentary method is referred to all methods in which the purpose of the research is to be met by studying,

analyzing and evaluating documents and texts. As it is obvious from the name of content analysis, this technique analyzes content and tries to extract data from the text using analysis. However, what is called the "content analysis" is a specific type of analysis that differs from other methods which try to extract findings from the text (Corlinger et al., 2003). Hageman identified and explained eight types of content analysis which include: rhetorical analysis, myth and narration analysis, discourse analysis, structural analysis or semiotics, interpretive analysis, conversational analysis, critical analysis, and normative analysis (Bakhshi H, 2006).

The use of content analysis in the text goes back to a very far-reaching era. As it comes from history, in the golden age of ancient Greek civilization, the issues relating to content analysis were exploited. The history of the first experimental study of the content of communication goes back to theological studies in the late seventeenth century which relates to the concern of the church about the spread of secular materials in the newspapers; however, historians attribute this research to the work of those political scientists who were interested in the impact of advertising and other persuasive messages (Kripendrov K, 2011).

The first case of a quantitative analysis of written content is the analysis of content carried out in the 18th century in Sweden. This reviews a collection of 90 religious poems as titled Zion' Hymns released by an unknown poet. This collection of poems is immune to government censorship, but it will soon be accused of weakening the orthodox clergy of the state church and can be an excuse for opposition groups. There is a scientific controversy over whether the poems are dangerous or not. A series of controversies count the religious symbols used in these poems and the other side sees the same symbol in the book of official poetry and does not find any differences between them (Kripendrov K, 2011).

The purpose of these studies was to determine whether these hymns have the risk of inappropriate effects on church followers or not. Therefore, an analysis of various religious themes, the value and quality of the emergence (to be favorable or unfavorable) as well as the complexity of their style were carried out. Gradually, content analysis became an investigative method, and with the beginning of the 20th century many scholars in different countries, such as the United Kingdom, the Soviet Union, Germany and the United States, turned to this way. Since 1930, the scope of content analysis has spread from newspapers to radio, television, books, poetry and advertising. Since the 1940s, several agencies in Europe and the United States have analyzed the propaganda of the countries in war through mass media and tried to anticipate the enemy's policy. Since then, the study of political speeches and their content analysis became widespread.

Research hypotheses

Based on the main research question, three hypotheses were considered as follows:

H1: The text of experimental sciences book of fifth-grade elementary is presented in active form.

H2: The illustrations of experimental sciences book of fifth-grade elementary are presented in active form.

H3: The questions of experimental sciences book of fifth-grade elementary are presented in active form.

Review of literature

A lot of studies have been done on content analysis. In a study, Ashton stated that German parents after attending various high schools, expressed their dissatisfaction with memorizing religious materials, and said the use of this method would effectively stop the implementation of ethical principles (Eskandari Nasab M, 2015). Fathi Vajargah, (Fathi vajargah K, 2014) carried out a study entitled "evaluation of the method of presenting the content of experimental books (second to fifth grades) of the elementary school using William Rumi method". For this purpose, the way to present content (text, questions, assignments, illustrations and charts) was studied in the textbooks. The studies have shown that the texts of experimental sciences book of elementary school did not have appropriate involvement coefficients and in most cases, the resulting coefficient indicated the passive presentation of the textbook. Also, the illustrations and charts of experimental sciences book did not have appropriate involvement coefficients and was presented in passive form, but the final questions and assignments in terms of active presentation were in better shape (Samiei A et al., 2012).

In an analysis conducted by the Hajforush (Hajforush A, 2001). on experimental sciences books, it was concluded that the existence of a plan for developing skills, the existence of questions and activities that put students in ambiguous and imaginative situations, the existence of questions or activities whose response and resolution requires the use of prospecting, research and problem solving, critical thinking, thinking divergent and information processing are essential. (Karami et al., 2013), in a study entitled "content analysis of mathematics of the first grade of the middle school based on William Rumi method and Bloom's cognitive domain", concluded that the number of exercises and activities at very high levels in the cognitive domain was very small and is merely at the level of understanding; therefore, do not engage students in active learning. Eskandari Nasab (Eskandari Nasab et al., 2015) conducted a study entitled "studying and analyzing the contents of experimental sciences book of the fourth grade elementary school using William Rumi method". The results showed that the texts and questions presented in the book are active unlike illustrations and the contents of experimental sciences book of the fourth grade elementary school has less research value and thinking, and also its verbal sentences were more than its understanding sentences.

Methodology

The type of research in this study was descriptive and its method was content analysis using the William Rumi method. The statistical society of this research was the experimental sciences book of fifth-grade elementary in the academic year of 2016-2017 that due to the limits on the society, the entire of the book was selected as the sample of the study in which text, questions, and illustrations of the book were examined and analyzed. As a result, the analysis consisted of categories, some of which are related to active text, questions and illustrations, and some categories are related to passive text, questions and illustrations.

The purpose of using this method in content analysis is to find out how much the categories of the book (text, questions and illustrations) can attract the learner to learn through engaging with these categories. Accordingly, William Rumi method (1968) was used in this study whose description is mentioned here. The data gathering tool in this study was a content analysis checklist based on William Rumi method. Data and information at the descriptive statistics level such as frequency, percentage, calculation of the involvement coefficient in each chapter for the text, questions and illustrations, as well as the calculation of the relative coefficient in each chapter for the content components, and then calculating the student's involvement coefficient with the whole text, questions and illustrations were calculated.

Evaluation of the text's lesson in William Rumi Method

Ten pages of different sections or pages of a book are randomly selected and marked. In this study, the entire pages of the textbook were selected as the sample. In each of the selected pages, 25 sentences or more were studied and each one was placed in one of the following categories.

- a) Expression of Truth: Expression of Truth is the simple expression of assumptions or observations made by someone other than the student.
- b) Expression of results or general principles (generalizations): The purpose of expressing results or general principles is the views expressed by the authors of the book on the relation between the assumptions and the various subjects. For example: almost all living organisms require oxygen.
- c) Definitions: sentences that define the phenomenon or a particular concept. For example, the ability to do a work is called energy.
- d) The questions arisen in the text and their answers are immediately given by the author.
- e) Questions that require a student to analyze the assumptions given to them.
- f) The student is asked to express the results he has obtained.
- g) The student is asked to analyze the results of an experiment they did or solve the issues stated.
- h) Questions that have been presented to attract the student's attention and their answers are not given in the text by the author of the book.
- i) Sentences that do not fall into any of the above categories are in this category.

Of the above categories, categories a, b, c and d are considered as passive categories and categories e, f, g and h are considered as active categories. And the last category, i, is a neutral category that do not play an important role in the evaluation of the book and therefore can be ignored in the evaluation and analysis (Rasuli, M et al., 2014). In order to calculate the student involvement coefficient with the text or to measure the level of overall activity, total active categories are divided by passive categories:

$$\text{Student involvement coefficient with the text} = \frac{e + f + g + h}{a + b + c + d}$$

Evaluation of the illustrations and pictures in William Rumi Method

1) Ten illustrations or the entire illustrations of a book are randomly selected. In this study, the entire illustrations of the textbook were selected as the sample. Each of the selected illustrations were analyzed and placed in one of the following categories.

- a) An illustration used only to describe a particular subject.
- b) An illustration that asks the student to perform an activity or experiment using the topics given.
- c) An illustration presented to explain the way to gather things needed for an experiment.
- d) An illustration that does not fit in any of the above categories.

Of the above categories, category a is considered as passive category and category b is considered as active category. And categories, c and d are neutral categories. In order to calculate the involvement coefficient, the active category is divided by passive category:

$$\text{Pervasive involvement coefficient with illustrations and diagrams} = \frac{b}{a}$$

Evaluation of the questions in William Rumi Method

1) Ten questions from ten chapters or the entire questions of the book are randomly selected. In this study, the entire questions of the textbook were selected as the sample. Each of the selected illustrations were placed in one of the following categories.

- a) A question whose answer can be found directly in the book.
- b) A question whose answer relates to expressing definition.
- c) A question that to answer it the student should use his learning in the new lesson to draw conclusions on new issues.
- d) A question by which the student is asked to solve a particular problem.

In the above categories, categories a and b are classified as passive categories and categories c and d are among the active categories and the active categories are divided by passive category:

$$\text{Student involvement coefficient with the questions} = \frac{c + d}{a + b}$$

Interpreting Results in William Rumi Content Analysis Method

Eventually, after the student involvement coefficient (involvement index) is determined by the content (text, illustrations, questions), it is time to interpret the results. The student involvement coefficient with the content is a number that shows how much the content is active. The range of this number may be from zero to infinity, but according to William Rumi, a textbook is active when the involvement coefficient (involvement index) is between 0.4 and 1.5. Involvement coefficient less than 0.4 indicate that the book deals only with the provision of scientific information and asks learners to memorize scientific information provided. Such a book is a non-research book in which the student does not play any active role in learning, and he and his mind are

considered as a banking system that always seeks to preserve and keep records. Involvement coefficient more than 1.5 indicates a book that asks the student to work and analyze in any given sentence, illustration and question. Such books do not provide sufficient knowledge and information to students, and only require students to do some kind of work. According to William Rumi, these books are also passive because they require a lot of work.

Analysis method

Research hypotheses are presented in relation to each of the categories of the book (text, illustrations, and questions), and according to William Rumi method and the statistical calculations and content analysis tables for each of the categories, the results of each hypothesis are determined.

H1: The text of experimental sciences book of fifth-grade elementary is presented in active form.

Table 1: Content Analysis Data of text involvement of experimental sciences book

Categories Chapter	A	B	C	D	E	F	G	H	I	Total	
One	2	1	0	0	0	2	3	1	1	10	
Two	5	0	2	0	0	1	3	0	1	12	
Three	1	1	3	0	0	0	7	3	3	18	
Four	3	0	1	0	2	4	3	2	3	18	
Five	4	2	4	2	3	5	3	3	2	28	
Six	3	2	4	1	1	2	3	2	3	21	
Seven	7	0	1	1	2	3	4	2	4	24	
Eight	3	1	2	0	1	3	4	0	0	14	
Nine	4	0	2	3	2	1	4	3	1	20	
Ten	5	0	1	0	0	0	5	2	3	16	
Eleven	3	2	1	1	1	2	4	0	3	17	
Twelve	4	0	1	0	0	1	2	2	1	11	
Total	44	9	22	8	12	24	45	20	25	209	
	Total of passive categories				Total of active categories						
	83				101						
Involvement coefficient	1/21686747										

$$\text{Involvement coefficient} = \frac{101}{83} = \text{Statistical calculation of text data in experimental sciences book } 1/21686747 \text{ with text}$$

First hypothesis test: the text of experimental sciences book of fifth-grade elementary is presented in active form.

Based on the division of active categories by passive categories, the involvement coefficient is 1.216. According to William Rumi, a book is active when involvement coefficient (involvement index) is between 0.4 and 1.5; therefore, by confirming the above hypothesis, it can be concluded that the text of experimental sciences book of fifth-grade elementary is dynamic and active.

H2: The illustrations of experimental sciences book of fifth-grade elementary are presented in active form.

Table 2: Content Analysis Data of illustrations of experimental sciences book

categories Chapter	A	B	C	D	Total
One	0	2	1	2	5
Two	3	5	3	1	12
Three	2	3	2	1	8
Four	7	3	1	2	13
Five	7	1	1	3	12
Six	5	1	1	3	10
Seven	6	2	2	2	12
Eight	2		3	2	7
Nine	6	2	1	2	11
Ten	4	4	4	2	14
Eleven	2	2	1	0	5
Twelve	2	2	3	1	8
Total	46	27	23	21	117
Involvement coefficient	0/586956522				

Statistical calculation of illustrations data in experimental sciences book

Student involvement coefficient of the illustrations of experimental sciences book = $\frac{b}{a}$

Student involvement coefficient of the illustrations of the book = $\frac{27}{46} = 0/586956522$

Second hypothesis test: the illustrations of experimental sciences book of fifth-grade elementary are presented in active form.

Based on the division of active categories by passive categories, the involvement coefficient is 0.586. Therefore, by confirming the above hypothesis, it can be concluded that the illustrations of experimental sciences book of fifth-grade elementary is dynamic and active.

H3: The questions of experimental sciences book of fifth-grade elementary are presented in active form.

Table 3: Content Analysis Data of questions of experimental sciences book

Categories Chapter	A	B	C	D	Total
One	0	0	1	0	1
Two	0	1	4	4	9
Three	1	0	0	1	2
Four	0	1	2	0	3
Five	3	0	3	0	6
Six	0	1	2	1	4
Seven	0	2	2	1	5
Eight	1	0	0	0	1
Nine	0	2	4	0	6

Ten	1	1	3	0	5
Eleven	0	2	1	0	3
Twelve	2	0	3	0	5
Total	8	10	25	7	50
	Total of passive categories		Total of active categories		
	18		32		
Involvement Coefficient	1/77777778				

Statistical calculation of questions data in experimental sciences book

$$\text{Involvement coefficient of the illustrations of the book} = \frac{32}{18} = 1.77777778$$

Third hypothesis test: the questions of experimental sciences book of fifth-grade elementary are presented in active form.

Based on the division of active categories by passive categories, the involvement coefficient is 1.777. According to William Rumi, a book is active when involvement coefficient (involvement index) is between 0.4 and 1.5; therefore, by rejecting the above hypothesis, it can be concluded that the questions of experimental sciences book of fifth-grade elementary is passive unlike the text and illustrations.

Conclusions

Some believe that subsequent changes to textbooks will disrupt the "teaching-learning" process, and teachers and students will be concerned about these books' changes every year. Another group believes that no changes in the textbooks is a sign of stagnation and in the era known as the explosion of knowledge and is growing every day and in a situation where new teachings are being added to human knowledge every day and science and technology move quickly, leave textbooks without changing, and without considering these changes, continue to use books with past-time content. Therefore, the textbooks should be reviewed and their content should be coordinated with the latest scientific developments in various fields and needs of the day, so that the student society does not go far beyond the advancement of global knowledge. In this study through using William Rumi method, it was determined that the text of experimental sciences book of fifth-grade elementary with involvement coefficient of 1.216 was dynamic and active (according to William Rumi, a book is suitable and active when students' involvement index with its content is more than 0.4 and less than 1.5). Also, in the category of the book illustrations, the involvement coefficient was 0.586 indicating the appropriateness of the illustrations and in total it shows that in two dimensions of the text of the book and its pervasive illustrations, the two parts of the book are involved in. But in the category of questions, the involvement coefficient of 1.777 indicated that the questions in this book were passive.

Criticisms and recommendations

- 1.The text of the book is very simple and typical while in some other chapters very difficult containing lots of experiments with various results; therefore, it is recommended to be more accurate in terms of distribution of curriculum materials and corresponding experiments and its monitoring is necessary.
2. In final questions of each chapter, it is suggested to design the questions on the basis of sufficient academic information for learners and not to be limited to mere activities for students.
3. The opening illustrations of the chapters of this book are not so dynamic and challenging. It is best to choose debatable and interpretational images, and it is suggested to include attractive and challenging images

at the end of each chapter, in order to continually investigate and improve students' knowledge of the relevant chapters.

4. In terms of images, it is suggested to provide the illustrator with the text and make him fully clarified regarding to the subject, so that the images without the background of the illustrator will not be designed, since this problem is clearly seen in the first images of the lessons which is basically the starting point and motivates students.

5. It is suggested, before writing the book hastily and presenting to students, the subjects of the experimental sciences to be presented to the students of the target group in different provinces as trial, and ask them to draw images appropriate to the various subjects of the curriculum, and even use the same images or similar images in such a way that they are tailored to the student's mental background and contribute to the understanding of the material.

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