

## Evaluation of Experimental Sciences Textbook for Elementary School with Regard to the Application of Problem-Solving Components

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### ABSTRACT

The aim of this study is evaluation of experimental sciences textbook for elementary school with regard to the application of problem-solving components that survey for this study was used descriptive research method. Statistical population has been elementary school training teachers and mentors in West education departments of Mazandaran and Guilan(Iran) in 2009-2010 school year that sample size is estimated 305 teachers and 52 training mentors based on Krejcie Morgan table. The data collection tool was a questionnaire consisting of 41 questions with five-point Likert scale of educational sciences teachers and studying and investigation and application of other similar studies, The questionnaire also has made specifically experimental science in six dimensions that These include: The Problem-based component with Cronbach alpha of 78%, learning activities components with Cronbach alpha of 72%, components of intellectual foundations with Cronbach alpha of 74%, components of the perceptual approach with Cronbach alpha of 73%, components of simplicity concepts with Cronbach alpha of 79%, component of images quality with Cronbach alpha of 74%. Analysis of data at two levels of descriptive and inferential statistics (t test of two independent groups) showed that there is significant difference in observance of problem-based position components, intellectual foundations of concepts, image quality of books, perceptual approach of concepts, learning activity but there isn't significant difference in views of studied samples about simplicity of content in activities of teaching - learning that at the end of the study practical suggestions were presented along with results.

**KEYWORDS:** Problem Approach, Experimental Sciences, Perceptual Approach, Thinking Foundations in Course Content of Elementary Schools.

### 1. INTRODUCTION

Changes in human behavior are done influenced by factors and valid fields in time spectrum gradually. Easy experiences and activities learning has no significant effect on learner alone, changes in ways of thinking in children and adolescents and to create basic habits and healthy attitudes with regard learning resources and lesson gradually formed. Therefore, in educational system of Iran, textbook is the most important learning resource and maybe it can say only educational tool for students and teachers. In this study, the content of experimental science textbooks in elementary schools, practices of presenting content and standards organizing course content studied. The conceptual model of this study is derived from theories of Roalf Tayler curriculum and criteria textbook approved in writing textbook and focuses to measure the value and survey way of organizing content based on components of problem-solving approach in experimental science books of elementary schools (Ahmadi, 2001:28).

Since understand the lessons matters has a direct relationship with the activities of the students in learning, so content of the curriculum should be designed and developed so that students are forced to "activity" (Khoeinejad, 2005:19).

Thus, whenever an active role in the learning process (mental and physical) is not considered to students and control of the learning process is under the authority of external factors such as teacher, will called inactive learning or non-research. Because repeated application of the traditional approach, the process teaching, learning, due to being unfamiliar of the book content with the need of the student and their situation is boring and imposed and negatively affected stimulate growth of learners and leads non interest and less motivational than educational process (Khoeinejad,2005:27).

Dewey (1859-1952) one of the differences progressive education with traditional education knows "free activity against imposing external discipline" and "learning by the experience against learning by books and teachers". Piaget (1896-1980) believed that human is always in search of contact and interaction with the environment and in this way, the acquisition of knowledge and his/her thought process is more complicated and more efficient. In Piaget's opinion, the child does not receive knowledge passively but the child from the beginning is actively seeking motivation and interprets the world around them and creates cognitive solutions to solve problems.

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Bruner believed to active and exploratory methods in the learning process. He believes that should create a kind of specific intellectual training in the student that include the ability to correct guess and make new discoveries, because to solve problems independently (Soleymanpour, 2007:58). So " it is method of valuable learning that help to being active and creative and socialization of children rather than just will lead internalize the experience of others in the past and passively absorbing them (Badrian, 2006:70).

Content planning in the form of research and discovery provides parse (separate concepts) and analyze (explain relationship of lessons concepts) for students and in proportion to the situation in which people are involved in this process according to their abilities (past experiences and knowledge, readiness of cognitive, emotional, social, physical) will find enough time to think in order to understand person from issue raised, to consider aspects and dimensions of the problem, and guide by guidance of a teacher or mentors in information gathering and acquisition of knowledge needed. In such cases the educational motivation of person is coordinate talented and their individual differences (Parvizian, 2005:59).

With this conditions organized of curriculum, is done most important characteristics of active learning and it include education in inclusive relationship with environmental factors in two-way (Ojani, 1999:39). Education experts in the field of desirable qualities in textbook mentioned criteria as following that include:

- 1 - The content in textbook activities should be based on programs and specific educational goals.
- 2 - The sequence of content should be in a clear and logical line according to previous learning students.
- 3 - Great emphasis of author and teacher should be on developing basic concepts and methods, not transferring mass scientific realities.
- 4 - The content must match the class age group and power understanding of middle school students.
- 5 - Content must emphasize the direct involvement of students in learning experience.
- 6 - Practices and questions must be used in the evaluation of various jurisdictions and levels of human thought, as well as evaluating the values, attitudes and skills.
- 7 - Content must be relevant as possible with daily living and social environment.
- 8 - The content should be having sufficient scientific activities.
- 9 - Scientific activities should facilitate to reaching goals by easy tools.
- 10 - Textbook should be attention to the time required to complete training curriculum.
- 11 - Content of the book should provide suitable fields and scenes to improving criteria and optimal human attitudes (Yarmohammadian, 2007:76).

Characteristics of experimental science book content may lead to conduct and to explain appropriate teaching methods. Therefore it is necessary that experimental science textbooks should be writing more carefully and always resolve their inadequacies and weaknesses with the investigation.

Relevant research results done indicate that all elements of problem-solving approaches in experimental science course content that is currently being used in schools, did not observe active components of the content to coordinate and complete.

Dadsetan (1997) in research, in addition to analysis of experimental science content in elementary school and survey of teachers found that although more than 50 percent of teachers consider appropriate understanding of concepts in experimental science books in the elementary school and have used guidebooks to teaching, but a group of teachers state that receiving some concepts and topics of elementary school experimental science books is difficult (Emam Jome, 1998:12).

Research finding of Rahbarinejad (2007) showed that one of organizing principles of content in fifth grade elementary school textbook is providing notions from the objective to subjective and from simplify to the problem. Frequently has not been considered and some of the concepts in this book is not understandable for students. Also in organizing in fourth grade book in some cases, difficult of curriculum concepts and their non-compliance with the mental ability of the students cause proper understanding of concepts and to establish an appropriate checks and balances among content elements (skills, attitudes, knowledge) has received little attention (Fathi,2000:48).

Hajforoush (2001) in addition, content analysis of research experimental sciences books in elementary school, pointed out that existence of some suggestions based on the demands of raising skills, questions and activities for students in challenging situations and creativity, questions or activities that find answers and solutions it require the use of searching, research and problem solving, critical thinking, divergent thinking and information processing and the contents of such books of experimental science in elementary schools is necessary (Jamshidnejad,2000:35).

Research findings of Sedaghat (1996) showed that images and questions of experimental science book in first grade and second grade in elementary has been provided inactive. Shahmohammadi (2002) in research also analyze content of experimental science book in fifth grade and surveys teachers opinions, thus he found that there is coordination between lesson objectives and objectives outlined in the guidelines for teaching experimental science books in the fourth and fifth grade and content of this book provides

necessary knowledge for students. But images and diagrams of book in fifth grade are not enough involve students to lesson (Hadinejad, 2005:71).

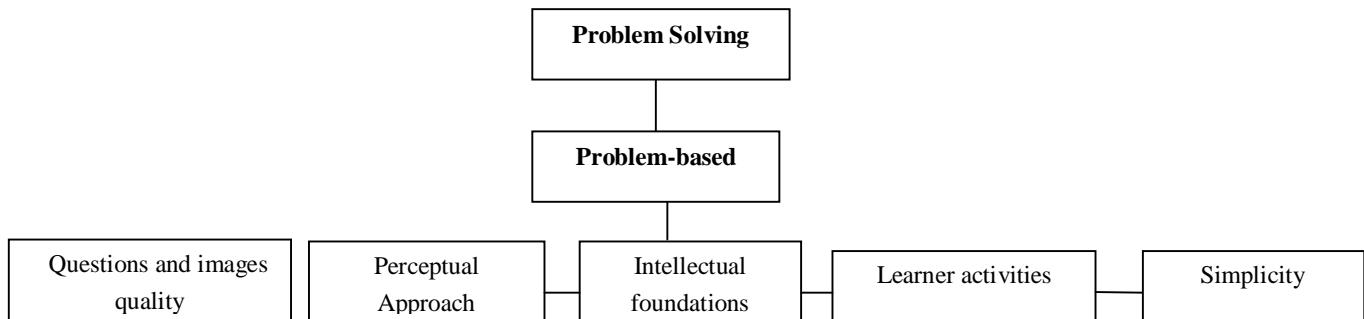
According to the above content, this study is done with aim to evaluate elementary school experimental science books based on problem-solving approach. In addition to the significant differences between teachers' views and training mentors of elementary school experimental science books based on variables of problem-based, learning activities, intellectual foundations, perceptual approach, simplicity and quality of images has been studied.

To achieve mentioned objectives, the following hypotheses were addressed during the implementation of the study:

- 1- There is difference between views of training teachers and mentors about observance rate of problem position for textbook of experimental sciences.
- 2- There is difference between views of training teachers and mentors about observance rate of learner activities.
- 3- There is difference between views of training teachers and mentors about observance of intellectual foundations.
- 4- There is difference between views of training teachers and mentors about observance rate of perceptual approach.
- 5- There is difference between views of training teachers and mentors about observance rate of simplicity.
- 6- There is difference between views of training teachers and mentors about observance rate of images quality.

## 2. RESEARCH METHODOLOGY

Implementation method in this study is descriptive (Naderi & Seyfnaragh, 1994:69). This study was conducted with emphasize on approach of survey to assess and evaluate content of textbooks. But in terms of nature, it used evaluation research. Based on the conceptual model of research, factors considered problem-solving approach in developing and organization of experimental sciences course content in the elementary school was used in following chart.



(Soleymanpour, 2007:86)

Therefore the statistical population of the study consisted of elementary school teachers in West of Mazandaran province, training mentors in Education organization of Mazandaran and Guilan West (1533 people) in the 2009-2010 school year. Sampling method in this study is Stratified random that sample size is obtained 305 teachers and 52 training mentors by Morgan table that census method were selected due to the limited number individuals of training mentors in Mazandaran and Guilan West.

### 3. Research Tools and Methods of Data Analysis

In this research In order to gather the required information used questionnaire consisted of 41 questions with response spectrum five point likert that were presented Cronbach alpha coefficients for each components according to the specific research questions: Problem-based component (78%), component of inclusive Guided to learning activities (72%), intellectual foundation component (77%), the components of perceptual approach (83%), components of Simplicity a lesson concepts (79%), image quality component (84%). The main source of research questions (Soleymanpour, 2008) in the evaluation of experimental sciences lesson in elementary school and Middle School is based on the theory of discipline -oriented with approach of problem solving.

In this questionnaire, Problem-based component has 8 questions with a total score of 40, learner activities has 8 questions with a total score of 40, intellectual foundation has 7 questions with a total score of

35, the components of perceptual approach has 6 questions with a total score of 30, components of Simplicity has 6 questions with a total score of 30 and image quality component has 6 questions with a total score of 30. And content and face validity has been approved by Supervisor and Consultant and three Educational Sciences teachers.

In this study to analyze data are used parameters such as frequency, mean, standard deviation, and charts drawing in descriptive statistics and t -Test (two independent groups) In inferential statistics and by SPSS is done.

#### 4. Research Findings

The findings of research according to hypotheses are presented as follows:

First hypothesis: there is difference between views of training teachers and mentors about observance rate of problem position for textbook of experimental sciences.

According to variables mentioned and result of field observations recorded in two groups of training mentors and teachers, first the table mean and variance of sample is determined. The mean and variance of the data obtained in two populations by using SPSS software is estimated in the following table.

Table 1. Descriptive data of textbook problem variable

groups	training mentors	Teachers
mean	27/80	26/34
Variance	7/8	10/536

First, by using Leven ratio, equality of variance against a different lesson variance was performed by using the F-statistic that result is shown in the following table:

Table 2. Leven test about problem component of experimental science textbook

Leven test	F	P
Assumption of equal variances in two groups	3/990	0/047

According to p-value obtained that is less than 5%, so the assumption of equal variances was not rejected and it can be said that variances in two groups are equal. The following table determines a decision path of the statistical hypothesis that by using the following T-test and p-values obtained can be expressed result obtained:

Table 3. T test statistic in Problem-based component

t-test	df	P value
3/406	77	0/001

According to value of test statistic 3/406 and p-values obtained (0/001) can conclude that there is difference between problem-based value of training teachers and mentors and research hypothesis of this study is confirmed.

Second hypothesis: there is difference between views of training teachers and mentors about Observance rate of Learner activities in content.

By using field data and available documents and by using SPSS software, mean and variance of two societies are presented following table:

Table 4. Descriptive data of learner activities component

groups	training mentors	teachers
mean	34/5192	33/53
Variance	8/05	6/039

In the following by using Leven test to assess the equality of variance in two societies for variable desired (learner activity) was performed that is shown in follow table:

Table 5. Leven test about learner activity component

Leven test	F	P
Assumption of equal variances	3/085	0/025

According to value of F-test and p-value is less than 5%, thus can conclude that assumption of equal variances is confirmed and so it can be said that there is difference between variances of the two societies. The following table determines the path of second hypothesis decision:

Table 6. T test statistic in component of learner activities

t-test	df	p-value
2/618	77	0/009

According to value of test statistic 2/618 and p-values obtained (0/009) can conclude that there is difference between learner activities value of training teachers and mentors and second hypothesis of this study is confirmed.

Third hypothesis: there is difference between views of training teachers and mentors about observance of intellectual foundations.

According to variables intended of the above hypothesis and field research in two societies of training teachers and mentors, in first identifies table of the sample mean and variance.

Table 7. Descriptive data of intellectual foundations component

Statistic of groups	training mentors	teachers
mean	24/03	26/98
Variance	13/175	13/684

According to descriptive data obtained in first by using Leven test is done to assess the equality of variance in two societies (two groups) against the difference between the variances by using F-statistic that is shown in following table:

Table 8. Leven test about intellectual foundations component

Leven test	F	P
Assumption of equal variances	0/473	0/047

According to p-value obtained is less than 5%, thus assumption of equal variances is confirmed. According to this result will be analyzed statistical hypothesis III.

Table 9. T test statistic in component of intellectual foundations

t-test	df	p-value
5/327	355	0/0017

According to value of test statistic 5/327 and p-values obtained (0/0017) can conclude that there is difference between intellectual foundations value of training teachers and mentors and even can say according negative value of test statistic, mean of intellectual foundations in training mentors is less than mean of intellectual foundations in teachers and thus research hypothesis is confirmed.

Fourth hypothesis: there is difference between views of training teachers and mentors about observance rate of perceptual approach.

According to variables intended and result of field research in two groups of training teachers and mentors, in first identifies table of the sample mean and variance.

Table 10. Descriptive data of Perceptual Approach component

Statistic of groups	training mentors	teachers
mean	26/1154	24/023
Variance	4/84	8/075

In first by using Leven test is done to assess the equality of variance in two societies (two groups) against the difference between the variances by using F-statistic that is shown in following table

Table 11. Leven test about perceptual approach component

Leven test	F	P
Assumption of equal variances	10/204	0/002

According to F-value was high and p-value is less than 5%, thus assumption of equal variances is rejected. So table of test statistic and (p- value) assumption of equal variances against the difference between the means is as follows:

Table 12. T test statistic in component of perceptual approach

test statistic	df	p-value
6/047	83	0/004

According to value of test statistic 6/047 and p-values obtained (0/004) can conclude that there is difference between perceptual approach value between training teachers and mentors and thus research hypothesis is confirmed.

Fifth hypothesis: there is difference between views of training teachers and mentors about Observance rate of Simplicity.

The following table shows information about the sample mean and variance for two independent groups of teacher and training mentors.

Table 10. Descriptive data of simplicity component

Statistic of groups	mentors	teachers
mean	21/0385	20/2525
Variance	9/43	11/946

Later by using Leven test is done to assess the equality of variance in two societies (two groups) against the difference between the variances that is shown in following table:

Table 14. Leven test about simplicity component

Leven test	F	P
Assumption of equal variances	1/79	0/185

According to p-value obtained isn't less than 5%, thus assumption of equal variances isn't rejected and as a result, it can say that variances of the two populations are almost equal.

Table 15. T test statistic in component of content Simplicity

t-test	df	p-value
1/539	355	0/125

According to value of test statistic is low and p-values obtained is greater than 5%, thus research hypothesis is rejected and is not accepted. In other words, do not differ in mean scores and has little difference.

Sixth hypothesis: there is difference between views of training teachers and mentors about observance rate of images quality.

According to the field survey, data from the two groups, training mentors and teachers were summarized in the following table.

Table 16. Descriptive data of Images Quality component

Statistic of groups	training mentors	Teachers
Mean	17/6295	17/6295
Variance	8/857	8/05

In the following by using Leven test is analyzed assumption of equal variances in the two groups.

Table 17. Leven test about images quality component

Leven test	F	P
Assumption of equal variances	0/33	0/56

According to F-value is low and p-value is greater than 5%, thus assumption of equal variances isn't rejected. So by presumption consider the table of the test statistic (p-value) for the test t:

Table 18. T test statistic in component of images quality

t -test	df	p-value
5/35	355	0/00015

According to high t-value and less p-value can say that mean for image quality variable among training teachers and mentors is difference.

## 5. DISCUSSION AND CONCLUSION

The aim of this study has been evaluation of experimental sciences textbook for elementary school with regard to the application of problem-solving components from views of teachers' and training mentors in north provinces of Iran.

This study by considering the necessities and objectives was applied and to achieve its objectives has been studied views of teachers' and training mentors. Reason for deployment of this research population is the close relationship education organization with students and teachers through the textbooks. This study identifies the active component based on approach of problem solving in organizing content of experimental sciences textbooks. So to investigate objectives according to the type and number of its active component content of the lessons is used the six hypotheses that each hypotheses has been studied differences of teachers views and training mentors to component of problem-based, learner activities, intellectual foundation, perceptual approach, simplicity, quality of images.

First hypothesis: there is difference between views of training teachers and mentors about observance rate of problem position for textbook of experimental sciences.

In present study, the results and data obtained from T-test in two independent groups showed that in elementary school experimental sciences textbooks there is significant difference in means of problem-based among training teachers and mentors. Result obtained of this study has consistent and conformity with findings of Dewey (1952), hajforoush (2008). Hajforoush show in his result that existence of questions or activities that find answers and solutions it require the use of searching, research and problem solving, critical thinking, divergent thinking and information processing and the contents of such books of experimental science in elementary schools is necessary.

Second hypothesis: there is difference between views of training teachers and mentors about observance rate of learner activities in experimental sciences lesson contents.

Generally according to the data obtained and T-test and p-value that are higher than 5%, thus assumption of equal variances isn't rejected and there is significant difference between two study groups' views about the extent of compliance activities in the content of the lessons. These findings is approved with result of Gorg Kerschensteiner (1984-1932). Gorg Kerschensteiner emphasizes the principle of learner activities in formulating content of the lessons.

Third hypothesis: there is difference between views of training teachers and mentors about observance of intellectual foundations in experimental sciences lesson contents.

T-test results in two independent groups according to the test statistic, p-value and mean scores, indicate that there is significant difference between studied groups and hypothesis of research is confirmed. Research done by Hajforoush (2008) show that the need for attention to Intellectual foundations in content, such as comparing, interpreting, responding, talking in survey. While the present study also was approved intellectual foundation in content according to the above components in intellectual foundation and other components and features and is coordination and alignment with organizing content of experimental sciences textbook in elementary school.

Fourth hypothesis: there is difference between views of training teachers and mentors about observance rate of perceptual approach.

Data obtained from study shows that according to value of the test statistic and p-value, there is difference between value of perceptual approach in training teachers and mentors. Therefore, the null hypothesis based on the lack of difference between the views was rejected and research hypothesis was

confirmed. Research by Dadsetan (1997) show that a group of teachers have stated that receiving some of the concepts and issues of experimental sciences books in Elementary school is difficult.

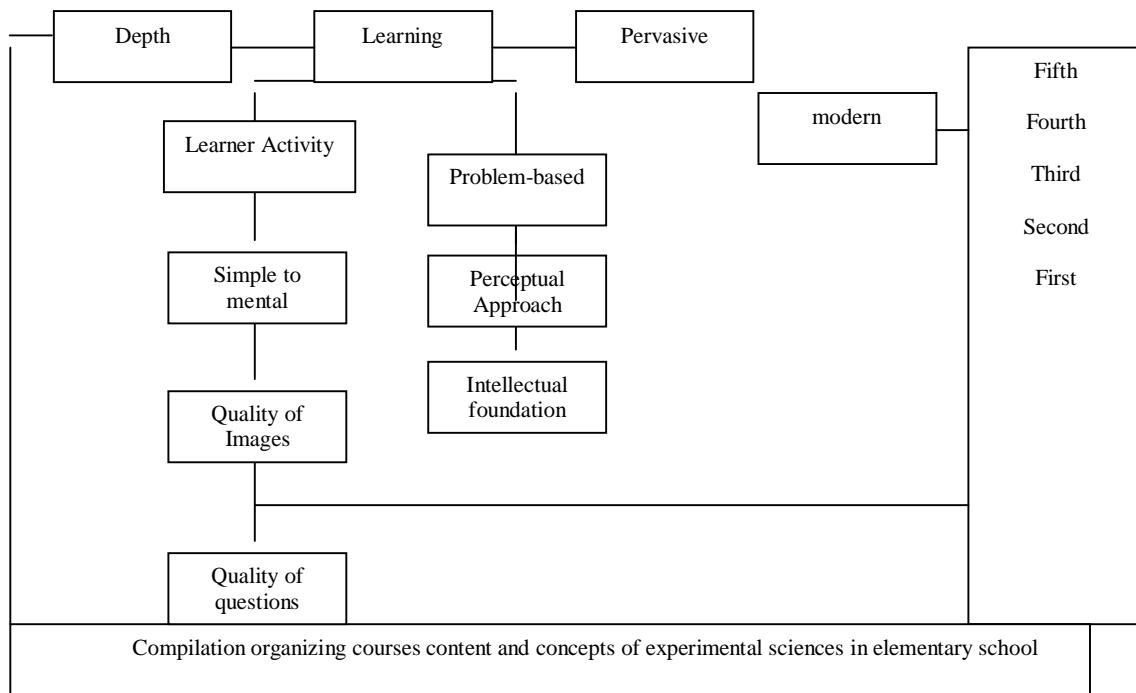
Fifth hypothesis: there is difference between views of training teachers and mentors about observance rate of simplicity.

According to value of the test statistic is low and p-value obtained is higher than 5%, thus research hypothesis was rejected and the null hypothesis based on the lack of significant difference about simplicity was accepted. In other words, the mean score between the two groups was not different and research hypothesis was rejected. Result of Rahbari research (2007) emphasized on objective to the subjective of concepts, highlights examples and appropriate objective examples and prerequisite in experimental sciences that in this study, similar results have been obtained.

Sixth hypothesis: there is difference between views of training teachers and mentors about observance rate of images quality.

Result show that t obtained is high and p-value is low, thus it can say that there is significant difference between mean score of images quality among training teachers and mentors and research hypothesis is confirmed. Research done by sedaghat (2006) in related to images and questions of experimental sciences book in elementary school showed that images must be have effective and active features with regard related character. This issue is coordinated and aligned with present study's findings about maintaining image quality and being active it to engage the mind and the physical with text. Also it corresponded to findings of Shahmohammadi(2005) that stated in research, pictures and diagrams in books of fifth grade don't engages enough students with lesson text.

Due to the nature of the research are expressed suggestions to authors of textbooks especially in lesson of experimental sciences as follows: regard to having the measure and criterion for the distribution of learning content, especially in terms of (persistence concepts) and concepts are complicated while repeating, new concepts will be necessary. Hence it is necessary; researchers with research identify standards and criteria to cover all aspects of experimental sciences with the various components in the more levels. Therefore, in order to organize the compilation of experimental sciences content in line with consistency, and unity and growing and modernization is recommended that the following pattern is illustrates this proposal to the authors of textbooks to elementary school experimental sciences courses to organize content.



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