

Studying the Position of the History of Science in the Science Textbook of Fifth Grade, Elementary School**Farahnaz Kiani**

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Abstract: This paper aims at specifying the position of the history of science as one of the components of the nature of science in science textbook of elementary school, fifth grade. To achieve this goal, we used the content analysis. In this context, the science textbook in elementary school was analyzed by analysis unit of paragraph. This book includes 11 units in different subjects such as physical sciences, geology, biology, and health. This data is analyzed based on the four approaches to the history of science: providing the history of scientific concepts, providing the scientific methods in the history, the interaction between society and science, and studying the scientists' autobiographies. The results show that there is no significant position for the history of science in the science textbook in elementary school, fifth grade, and few paragraphs are discussing the nature of science. There isn't any paragraph about the history of science in ones on the physical sciences.

Key words: the History of Science, Textbook, Elementary School, the Nature of Science, Sciences, Teaching Science.

Introduction

Since the sciences have an important effect on the developments in human history, it is provided in the area of learning curriculum. They are reviewed frequently in different subjects such as teaching methods, the content of the book, etc. based rapid advances in science and technology.

The experiences by the countries had developed their general education system long before ours show that the best starting point to make advances and changes in the quality of general education is changing the sciences (Kiamanesh, 2002).

The content of the science textbook in the curriculum is provided by the approved objectives of the Education Department. As in the centralized education system like Iran's, in which books are the center of education and learning, the content as one of the main dimensions in curriculum is provided in the books and textbooks. The planning for making changes and qualification of the science requires studying the components of the nature of science in books. Mac Comas (2002:4) defines the nature of science as an intertwined mixture of the philosophy of science, the history of science, the sociology of science, and the psychology of science, by which we may specify the position of science. According to researchers, the history of science has an effective impact on education. According to Mahboobi, Vesali, and Sa'adat(2011:58) studying the history of science I teaching sciences has three main effects: learning of scientific concepts effectively, understanding the nature of science better, and making interest in sciences in the students. Nola and Irzik (2005: 12) believe that this theory is correct and verifiable, which asserts that learning science can be enhanced by studying the history of science and the way that scientists gain their goals. This does not mean that the students must follow all the stages of scientists' methods, but the real part in the history of science can be a model for teaching the scientific theories and concepts.

Education with the history of science can have consequences in the process of education. According to Matthews (1994:50), the reason why a part of history is inserted into the curriculum in different times and places can be:

1. History promotes the better comprehension of scientific concepts and methods.
2. Historical approaches connect the development of individual thinking with the development of scientific ideas.
3. History of science is intrinsically worthwhile. Important episodes in the history of science and culture- the scientific Revolution, Darwinism, the discovery of penicillin and so on- should be familiar to all students.
4. History is necessary to understand the nature of science.
5. History counteracts the scientism and dogmatism that are commonly found in science texts and classes.

6. History. By examining the life and times of individual scientists, humanizes the subject matter of science, making it less abstract and more engaging for students.
7. History allows connections to be made within topics and disciplines of science, as well as with other academic disciplines; history displays the integrative and interdependent nature of human achievements.

Studying the earlier activities done on providing scientific theories, the students should review the old scientific achievements in its historical context, and don't suppose the scientists' old works worthless.

For example, while studying the atomic models by Thomson, Rutherford, Bohr, and Quantum, they should recognize and understand that any modification in the earlier models that were valuable in the time it was proposed is considered as a step forward and shouldn't be criticized. And they caused more advancement in new atomic models ([Badrian, 2009:50](#)).

The history of science can be studied in science textbooks in some categories related to the history of science. According to [Gomeini\(2014\)](#) the categories of studying the history of science in teaching are: introducing the sequence of theories, introducing the theories of old science, the ways new scientific concepts formed, science vs. contrary theories, familiarity with the science methodologies, the concept of scientific evidence, the accuracy of the scientific theories, worth and worthless evidence of experimental reasons, rational reasons as well as their positions, the difference between theory and experience, and removing sacredness of science. And according to [Mahboobi\(2010: 49\)](#), an overall review on the fundamental studies since 1950 onward shows that there are four approaches to use the historical information in the classroom: providing the history of the scientific concepts, providing the scientific methods in history, the interaction between science and society, studying the scientists' autobiographies. Illustrating these approaches, it may be said that teaching the history of science can be done by explaining the developments of scientific concepts in textbooks. For instance, there were many changes in free fall since Aristotle to Newton. The second approach of historical information focuses on producing scientific knowledge. This approach can confirm the aspects of the nature of science. Based on another approach, the interaction between science and society is one of principles in the nature of science. The students should understand the value of scientific

knowledge; hence, teachers should inform the students of the effects of inventions and discoveries on cultural and social developments in societies. If there is no such interaction in classrooms, it can be said that the students are informed of the interaction among science, technology, and social environment, and their attitude toward the world we live in is far different from reality. Providing the history of science via expressing and studying the great scientists' lives is an approach whose basis is on important events in the great scientists' lives, and therefore, is not dealing with the content of science and the scientific concepts. Teacher introduce the great scientists to the students in order to change their views toward them.

As the writer of this paper has searched, there is no other identical study in this subject. But, there are some similar ones explained briefly as follows:

- [Mahboobi, Vesali, and Sa'adat](#)(2011) studied the effects of teaching the history of physics on knowledge and the students' attitudes and the relation between knowledge and their attitude. The results confirmed the significant and positive effect of the history of physics on knowledge and the students' attitude as well as the relation between knowledge and their attitude.
- [Karimi, Mazidi, and Mehrmohammadi](#) (2007: 132) concluded, by reviewing the science textbook in secondary school, first grade, that there should be a great consideration to history and the nature of science as a criterion of determining the content of the science textbook in writing the science textbooks, and introduce it as a standard. The history of science should be included in the science textbooks as it can illustrate a comprehensive image of scientific attempts, not a broken and discontinued.
- Holton, Rutherford, and Watson (2001) emphasized on Harvard Project by which the history of science should be included in education as a human activity. They practically administered their project, and included the history of science in physics curriculum.
- Warrik used the history of science as an activity out of his science classroom activities, and realized that it could make the students interested in knowing about the scientists and their lives. They did some researches on the great chemists and reported the result of their researches in the class. He claimed that it made the students more and more interested in this activity ([Mahboobi, 2011: 43](#)).

Elementary school is of great importance in growing, training children as well as making their personalities. This period of life is called the period of obedience, upbringing, creativity, and expressing general talents. This level of education is referred to as “primary education”, “compulsory education”, “public education”, and “general education” (Saafi, 2006: 98). Given the importance of this period, studying the categories of the history of science as fundamental components of the nature of science in the textbooks as the main component of a curriculum is considered so important and essential, whose achievements may be used by the writers and teachers.

Statement of the Problem

The history of science is a potential source. Being explained correctly in classrooms, the science can be illustrated as a human activity, and the students are convinced that the scientists are like the other ordinary people, and hence, they may make some mistakes, and fail. In this context, it can make the students interested in science. Therefore, the students can realize that they are able to do scientific activity as well, and they should not be afraid of failure (Mahboobiet al., 2011: 54). Considering the history of science and its importance in education, some, such as Kohn, believe that history is actually teaching philosophy by providing examples. Also, Steiner collected the researches about the history of science and concluded that studying the history of science can encourage students in changing the concepts (Karimi, Mazidi, Mehrmuhammadi, 2007: 114-115). By considering this fact that all research results and scholars focus on the role of the history of science in education, it is very important to study the position of history of science in curriculum. As textbooks are the main components of curriculum and the elementary education makes the basis of education in country, this paper aims at studying the position of the history of science in the science textbook in elementary school. This subject has not been investigated separately. The purpose is realizing the position of history of science as one of the main components of the nature of science and one of the effective factors on developments of education in textbooks in elementary schools.

Methodology

Considering the purpose of this paper, it aims at studying the position of the history of science in science textbook in science textbooks in elementary schools. Therefore, paragraph is the analysis unit in this paper. In this context, any part of the science textbook of elementary school, fifth grade, edited in 2014 was selected based on the number of paragraphs, and then, were studied through the four approaches in studying the history of science. These approaches are: providing the history of scientific concepts, providing the scientific methods in history, the interaction among science and society, and studying the scientists' autobiographies. The level of importance of the history of science in science textbooks of fifth grade in elementary schools was specified by calculating the frequency of any of these approaches.

Results

115 paragraphs including 11 units and 112 pages were studied in the science textbook of fifth grade, elementary school, edition 2014. These paragraphs are the texts of the book, and do not include the activities, tests, think...

Table 1: The units of the textbook based on the subject

Unit	1	2	3	4	5	6	7	8	9	10	11
Subject	Materials	Material changes	Machines	Neuron	The earth history	Soil	Earth	Animals	Hidden combat	Nervous system and movement organs	Human and environment

Table 2: the subjects of the science textbook based on the number of paragraphs

Subject	Physical sciences				Geology			Biology and health				Total
Unit	1	2	3	4	5	6	7 8	8	9	10	11	11
Page	14- 21	21- 29	30- 41	41- 49	50- 57	58- 65	66- 73	74- 83	84- 91	92- 101	102- 111	98
No. of paragraphs	9	7	11	10	10	6	9	17	17	6	14	116

Table 2 shows the subjects and the units of the science textbook in the fifth grade, elementary school. Three subjects are included in this book: physical sciences, geology, biology and health. Geology has the least number of paragraphs, 37, and biology and health has the highest, 54. Geology and biology have the least and the most number of pages, i.e. 23 and 37 pages respectively.

As the methodology used in this paper is studying the four approaches of studying the history of science, the paragraphs were compared based on these four approaches. Then, the paragraphs that have at least one of these approaches were classified, and the data was recorded in Table 3.

Table 3: The position of the four approaches of the history of science in texts of the science textbook, fifth grade, elementary school

Subject	Physical sciences				Geology			Biology and health				Total
Unit	1	2	3	4	5	6	7	8	9	10	11	13
Historical approach	-	-	-	-	• Providing the	-	-	• Interaction between	• Interaction between	-	-	15

ch					scientific methods			science and society	science and society			
					<ul style="list-style-type: none"> • Providing the history of scientific concepts 				<ul style="list-style-type: none"> • Providing the history of the scientific concepts • Providing the scientific methods 			
Frequency	0	.	0	0	9	0	0	1	4	0	0	15
Paragraphs	9	7	1	1	10	6	9	17	17	6	1	11
Percentage	0	0	0	0	90%	0	0	0.05%	23%	0	0	13%

As Table 3 shows 13% of the paragraphs in the textbook include the history of science. The highest frequency is 9 in unit 5, consisting 90% of total paragraphs. The subject of unit 5 is geology; its topic, according to Table 1, is the history of the earth, and has 7 pages. The number

of units in the subject biology and health, which contain the categories of the history of science are more than the subjects of physical sciences and geology. The frequency of the approaches is 5 in the unit biology and health, which includes 23.05% of total paragraphs. Moreover, there is no historical approach in the units on the physical sciences. Table 5 shows that, among the approaches of the history of science, 3 approaches were included in the studied science textbook, but there was no paragraph about the other approach, i.e. studying the scientists' autobiographies.

Discussion and Conclusion

Though, according to the results by the researchers and the scholars' viewpoints in education, the history of science has a positive effect on education, the results by this paper show that there is insufficient and little information on the historical approaches in the science textbook, fifth grade in elementary school. Although subjects like physical science have a deterministic position in changing the history of science, and as the results by [Mahboobi](#) and [Vesali](#) (2011) confirm the effect of the history of science on teaching physics, the students of elementary school, fifth grade, learn this science without learning any of these approaches. However, 90% of one unit (unit 5) on geology include two approaches. The analyses of unit 5 show that as the subject of this unit, i.e. the history of earth, has a historical nature and such matters as fossils are related to history, including high percentage of frequencies of the approaches of the history of science isn't meant the studying the effects of the history of science on education. Also the results show that the historical approaches lack the scientists' experiences and lives. Lack of such information can make a wrong imagination in the students toward scientists and science since, according to [Matthews](#) (1994), the history of science changes the subject of science into a human activity by studying the scientists' times and lives; also it makes the science objective, and interesting for the students. As a result, the history of science does not have a proper position in the science book of fifth grade in elementary school.

Suggestions

- Given the importance of elementary school and the role of science in education, it is suggested that the effects of the history of science should be studied on teaching the students in elementary school.
- This paper studied the science textbook in elementary school, it is suggested to the other researchers that study the position of the history of science in other textbooks of elementary school.
- It is suggested to the writers of textbook in elementary school that include the history of science, according to the results by the researchers and the scholars' viewpoints.

Reference

- 1) [Badraian](#), A. (2009). Teaching Chemistry. Tehran: The Basics of Thinking
- 2) [Saafi](#), A. (2006). The Department and Rules of Education in Iran. Tehran: SAMT
- 3) Science Textbook of fifth grade, elementary school. (2014). Research Institution and Writing Curriculum. Tehran: The Education Ministry
- 4) [Kiamanesh](#), A. R. (2002). Evaluating the Performance of 3rd International Mathematics and Sciences Study. (TIMSS) education research center
- 5) [Karimi](#), M.H; [Mazidi](#), M; [Mehrmohammadi](#), M. (2007). Reviewing the Science Textbook of First Grade, Secondary School based on the Philosophy of Science. Social Sciences and Humanities magazine, Shiraz University. No. 3, pp. 111-136
- 6) [Gomeini](#), A. M. (2014). The Role of History in Teaching Physics. Teaching Physics Conference, [Sanandaj](#), Iran, 3 Aug.
- 7) [Mahboobi](#), Kh. (2010). Applying the History Physics in Teaching It. Developing Teaching Physics magazine. No. 91, pp. 41-45
- 8) [Mahboobi](#), Kh; [Vesali](#), M; [Sa'adat](#), M. (2011). Studying the Effects of Teaching Physics on Knowledge and the Female Students' Attitudes, Second Grade in High School. Educational Innovation Quarterly. No. 37, pp. 53-70
- 9) Holton, Rutherford, and Watson (2001). Harvard Physics Project. U. 1, Translated by [Sharifzade](#), H, [KhajeNasirtoosi](#), A. Tehran:Fatemi Publisher. Edit. 5
- 10) Matthews, M.R. (1994). Science teaching: The Role of History and Philosophy of Science. New York. London: Routledge.

- 11) Mc Comas, W.F. (2002). *The Nature of Science in Science Education Rationales and Strategies*, Kluwer Academic Publisher.
- 12) Nola, R. & Larzik. G. (2005). *PHILOSOPHY, SCIENCE, EDUCATION AND CULTURE*. (Science & Technology Education Library Volume 28). Published by Springer. Printed in the Netherlands.