Content Analysis of Elementary Science Books by Using Soft Educational Technology to Teach Environmental Issues in Iran and Russia

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تحلیل محتوای کتاب‌های علوم ابتدایی ایران و روسیه با رویکرد به‌کارگیری فناوری آموزشی نرم برای تدریس موضوعات محیط‌زیست

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Abstract:

Hard educational technologies received more attention today while soft educational technology has been considered as one of the keys and effective technologies in teaching and learning. The main purpose of this study was to investigate the use of soft educational technologies in teaching environmental issues in the first to the third grade of elementary science textbooks of Iran and Russia. This study is a descriptive analysis of the content. The statistical population of the study is all the first, second, and third-grade textbooks of sciences in Iran and the world around us in Russia. The statistical sample included environmental issues in the first, second, and third-grade elementary science textbooks of Iran and Russia. The research tool was a researcher-made checklist made by soft educational technology and an environmental health checklist from Yale University. The results showed that allegory and role-playing hadn't used at all to teach environmental issues in Iran. Questions and answers Iran 31.95, Russia 31.64)and comparisons of objects, the discovery of similarities and differences, and conclusions (Iran 20.61, Russia 17.72) have been widely used in both countries. In Iran, more emphasis has been placed on solving problems and carrying out projects(13.40), and more emphasis has been placed on the use of daily life activities(16.45) in teaching in Russia. The results also showed that the use of soft educational technology to teach environmental issues was given more significance in the third grade of an elementary school in both of the countries. Soft technology has been used less in the first grade of the elementary school of Iran but in the second grade of the elementary school of Russia.

Keywords: Soft Educational Technology, Environment, Iran, Russia, Science Book, World Book Around Us.

چکیده:

فناوری آموزشی نرم به‌عنوان یکی از فناوری‌های کلیدی و اثرگذار در آموزش و یادگیری محسوب می‌شود، درحالی‌که امروزه فناوری‌های آموزشی سخت بیشتر موردتوجه قرارگرفته‌اند. هدف اصلی این پژوهش بررسی میزان استفاده از فناوری‌های آموزشی نرم در تدریس موضوعات محیط‌زیست در کتاب‌های علوم پایه اول تا سوم ابتدایی ایران و روسیه است. این پژوهش، توصیفی از نوع تحلیل محتوا می‌باشد. جامعه آماری پژوهش را کلیه کتاب‌های پایه اول، دوم و سوم علوم تجربی ایران و دنیای اطراف ما روسیه تشکیل می‌دهند. نمونه آماری شامل مباحث مربوط به محیط‌زیست در کتاب‌های علوم سه‌پایه اول، دوم و سوم ابتدایی کشور ایران و روسیه بوده است. برای تحلیل داده‌ها از روش آنتروپی شانون استفاده شده است. نتایج پژوهش نشان داد که در ایران میزان اهمیت استفاده از فناوری آموزشی نرم برای تدریس موضوعات محیط‌زیست در پایه اول ابتدایی ۰/۲۷۶ درصد در پایه دوم ابتدایی ۰/۳۵۳ درصد و در پایه سوم ابتدایی ۰/۳۷۰ درصد بوده است. در روسیه میزان اهمیت استفاده از فناوری آموزشی نرم برای تدریس موضوعات محیط‌زیست در پایه اول ابتدایی ۰/۳۲۹ درصد در پایه دوم ابتدایی ۰/۲۲۸ درصد و در پایه سوم ابتدایی ۰/۴۴۴ درصد بوده است. براین اساس می‌توان گفت که در هر دو کشور در پایه سوم ابتدایی به استفاده از فناوری آموزشی نرم برای تدریس موضوعات محیط‌زیست اهمیت بیشتری داده شده است. همچنین داده‌ها نشان می‌دهد در ایران در پایه اول ابتدایی از فناوری نرم کمتر استفاده‌شده است و در روسیه در پایه دوم ابتدایی فناوری نرم کاربرد کمتری داشته است.

واژه‌های کلیدی: فناوری آموزشی نرم، محیط‌زیست، ایران، روسیه، کتاب علوم، کتاب دنیای اطراف ما.

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Introduction

With advances in science and technology in contemporary societies, environmental change is on the rise (Nishimura et al., 2019). This is followed by organizations such as UNESCO and UNICEF (Anggraini, & Karyanto, 2019; Ledneva, 2015; Salehi Omran et al., 2009). There have been numerous meetings and conferences over the years, followed by numerous regional and international conventions to prevent environmental degradation worldwide, many of which Iran and Russia have signed, pledging, and committing to the objectives outlined in these conventions. Considering the issue of environment in Article 50 of the Constitution of Iran (Lesani & Edalatjou, 2017), adopting more than 50 principles in the Constitution of the country on environmental protection and development (Ramazani Qavam Abadi, 2013), preparing educational leaflet titled Teachers and Environment by the Deputy Director of Environmental Education for Teachers of All Degrees, holding environmental education courses for education teachers (Department of Environmental Protection, 2018), and establishing comprehensive environmental schools in 2017 are the most important measures of Iran in building a culture for attention, protection, and preservation of the environment. Some measures have also been done in Russia: Adoption of the Resolution "on Environmental Education for Students in Russian Federation Educational Institutions" in 1994 (Golovacheva & Ushakova, 2009), Russian Federation Law "On Environmental Protection" (Morzova, 2002), Russian Federation Government Order on Environmental Doctrine (Morzova, 2002), the adoption of government policy principles for the development of the Russian environment for the period 2012-2030, and declaring 2017 as the Year of the Environment (Lukina et al.,

2017) are the Russian government has taken steps to protect the environment. The principle of good neighborliness between Iran and Russia has provided many grounds for cooperation between the two nations. The establishment of scientific relations between the two countries has made the conduct of joint research inevitable. The present study aimed to investigate the significance of using soft educational technology to teach environmental issues in primary school *Experimental Sciences* and *the World around Us* textbooks in both countries. Primary education is a good basis for teaching concepts about nature and emphasizes its importance in people's lives (Hafizova, 1988; Vorobieva & Maksimova, 2012). The purpose of environmental education in schools is to develop a system of scientific knowledge, attitudes and beliefs about the environment that can be found in all living activities (Al-Dajeh, 2012; Fabrigar et al., 2006; Lattner et al., 2005; Ledneva, 2015; McBeth & Volk, 2009; Parishani et al., 2018). Subjects such as a man being part of nature, the positive or negative effects of man on nature and nature on man, the ecological importance of air, water, soil for plants, animals, and humans should be taught in primary school textbooks (McBride et al., 2013). Awareness of these issues is realized in children with a lesson called *the World around Us* textbooks in Russia and *Experimental Sciences* textbooks in Iran. In general, the goal of *the World around Us* in primary schools is to achieve the following goals:

• To form an integrated image of the world and of understanding its place and understanding of the value of communicating with people and nature;

• to achieve the spiritual, moral, and educational development of a Russian citizen who treats his or her environment, natural and

cultural heritage, family, society, history, and modern life with respect.

Also, the empirical science course in Iran aims to gain knowledge, skills, and attitudes in the following areas:

• Knowledge of physical sciences, biology, earth sciences, health science;

• Essential skills, including problem-solving skills, critical thinking skills and skills for empowering research spirit;

• Essential attitudes such as observing the law and order in the phenomena of nature and understanding their creator, appreciating natural benefits as divine blessings, the willingness to work together, being responsible, respecting others' beliefs, flexibility in thinking, willingness to learn, curiosity, interest in work and effort.

One of the most important tools for achieving educational goals is effective teaching. To improve the quality of education and learning, the use of technology in education has been the focus of attention (Sobhani Nejad & Molla Zehi, 2010). UNESCO reports also suggest that the use of technology in education has made fundamental changes to the learning process (UNESCO, 2019). The question here is, what is technology? In the field of education, the concept of technology remains as the manipulation of physical means to solve limited problems, that is, hard technology. According to Jin (2011), hard technology is the technology of controlling tools and machines. Reiser (2007) defines hard instructional technologies as "physical tools for providing training to students. " The new concept that lies in technology is its soft dimension. Jin (2002) divides soft technology into three main categories: intellectual service provision, innovation environment enrichment, and enrichment of spiritual life. Soft technologies refer to technologies that facilitate human activities and their flexibility (Norman, 2014). Soft technology focuses more on human needs than on objects. Werner

and Bower (2012) believe that soft technology is a method that involves doing, learning, and problem-solving, and is adapted to the needs, customs, and abilities of individuals. Jalali (2015) called Applied Knowledge Systems, derived from the humanities, social sciences, and non-human sciences whose goal is to solve practical human problems, as soft technology. Also, using modern teaching methods in various sciences to solve educational problems based on scientific findings is called soft educational technology. AECT pays attention to both soft and hard technology in its definition of soft technology. In this definition, soft technology refers to intellectual processes that facilitate learning and performance through the application of methods and the application of content transfer. Intellectual processes are all things that take place between the input and the output of education. The original principle of soft technology is derived from Dewey's educational views. Dewey believed that students grow up in an educational environment that allows them to experience and interact with the curriculum, and that all students should be able to intervene and collaborate in their learning. He strongly emphasizes the importance of education not only as a space for the acquisition of subject knowledge but also as a space for learning life. In this point of view, the goal of education should not only be to acquire a set of predetermined skills, but also to fully realize one's abilities and gain the ability to use those skills for the collective good. But today, the development of technology is emphasized and the role of human and social factors in the development of human life is less considered. Emphasis on hard technology may allow the industry to grow rapidly, but it is certainly not effective for the growth of moral and human characteristics alone. Therefore, special attention to soft technology is essential. The environment around human

beings, both natural and unnatural, is the most accessible and widespread field of soft technology. Humans are part of the environment, and how they interact with them is very effective in preserving and destroying the environment. Using soft educational technology in teaching means engaging the learner with the environment in a real and tangible way. The importance of using soft technology in teaching, as well as the need to develop environmental protection skills from childhood and the experience of studying content analysis, has strengthened the motivation of researchers to conduct this research. Content analysis is one of the ways to recognize the strengths and weaknesses of the textbook, and comparative studies are a way to exchange experiences and identify broader strategies for the development of science.

Review of literature

Studies in Russia show that some research has been conducted on the environment in *the World around Us* textbooks. Kozlova (2012) analyzed the extent of attention to the environment and behavioral patterns in *the World around Us* textbook via the content analysis technique. In his study, the texts and images of the book were analyzed at all grades of primary school. The results showed that there was postmodern orientations in the relationship between humans and the environment. However, traditional and modernist models of varying degrees are also found in textbook educational materials. In his research "continuing environmental education for preschool and primary school children", Mironov (2019) analyzed the content of *the World around Us* in various grades of elementary schools. In these books, he believed, environmental issues are expressed in an orderly sequence, and the use of active

teaching methods has been very effective in teaching content. Also related to the topic of the present study are studies on the significance of environmental education to primary school children (Gvishiani, 1983; Litvinova & Zhirenko, 2007), models and educational activities for teaching environmental issues to primary school children (Gagarin, 2004; Gumenyuk, 2008; Moiseeva & Nikitina, 2011) and the role of the game was played in teaching environmental concepts to primary school children (Bukovskaya, 2002).

In Iran, research has also been done on primary school *Experimental Sciences* textbooks. For example, Salehi Omran et al. (2008) showed that considerations were given to the components of the environment, forests and trees, and the quality of exploiting the exhaustible and inexhaustible resources, and the other environmental components were ignored in the sixth primary school *Experimental Sciences* textbooks. According to Ghaderi (2010) in the primary school *Experimental Sciences* textbooks, environmental problems have been neglected. The fifth-grade primary school *Experimental Sciences* textbook focuses on environmental problems more than the fourth-grade primary school *Experimental Sciences* textbook. The study also showed that in the primary school *Experimental Sciences* textbooks the most attention was paid to soil and the least to acoustic problems (Ghaderi, 2010). Mehraban (2018) studied the content of the first, second and third-grade primary school *Experimental Sciences* textbooks via the qualitative analysis method and found that the textbooks focus on five components including 1- Environmental awareness; 2- Environmental knowledge improvement; 3- Encouragement of students to preserve environmental quality; 4- Identification and solution of environmental

challenges; and 5- Motivation of students to address environmental challenges.

Fazeli & Mahdavi (2019) investigated 8-year *experimental science textbooks* in the academic year 2013-2014 using a content analysis checklist instrument including the main component of environmental problems (air, water, soil and noise pollutions), natural resource conservation, waste segregation and recycling, and the role of humans in the environment. Their findings showed that the issue of environmental dilemmas received the most attention in the seventh-grade primary school *Experimental Science Textbook* and the least attention was paid to the third-grade primary school *Experimental Science Textbook*. Also, in reviewing the whole *Experimental Science Textbook*, the most attention was paid to the role of humans in the environment and the least to noise pollution.

In terms of attention to environmental issues, Mashaallahinejad et al.'s (2013) research on the content analysis of elementary science textbooks showed that the highest level of attention is related to the fifth, fourth, third, first and second grade, respectively. Also, books pay the most attention to environmental education according to the five standards of environmental education, namely questioning and analysis, and then knowledge of natural processes and systems, skills to study environmental issues and personal and civic responsibility, but they didn't pay attention to practice skills and decision making.

Findings of Kaviani and Nasr (2018) showed that six factors influence the effectiveness of environmental education in Iran: needs assessment, application of teaching methods, formal education, informal education, public education, and lifelong learning. According to their research, formal education has faced shortcomings and weaknesses, and informal education has been more effective in this regard.

In the study of "Comparative Environmental Education" in the elementary school curriculum of Iran with the curriculum of selected countries, based on the four main elements goals, content, teaching methods, and evaluation methods, findings of Khajoui et al. (2009) indicated that the goals and content of Iran's environmental education course have been well explained and there isn't a significant difference between them in Iran and selected countries. Also, the use of simulation teaching methods, brainstorming, multimedia resources, and ICT had neglected in addition to the use of diagnostic evaluation methods and standardized tests in the "Environmental Education" curriculum of the Iranian primary school.

In a study of how to include environmental education topics in the textbooks of the secondary high school of Iran and prioritizing neglected topics, Parishani et al. (2018) found that they should be included in all courses as a combination. The results of a survey of four groups of teachers showed that three items had neglected in the environmental education of Iran: protection of the country's natural environment, social, economic and environmental consequences of generating electricity from renewable and non-renewable sources, and the need to use renewable energy and environmental effects due to the primary consumption of fossil fuels.

The results of the research of Mousavi et al. to examine the level of attitude, knowledge, and environmental skills of preschool trainers and prepare them for teaching preschool children, showed that holding the training course improved attitudes and increased the skill level of subjects. Also, the greatest impact of training courses has been on the level of knowledge of trainers, and it is necessary to hold environmental training courses for preschool trainers.

Studies show that the analysis of the use of soft educational technology to teach environmental issues in the textbooks of the

world around us and experimental sciences have not been considered, therefore, with the present study, the necessity and importance of using soft technology intangible teaching and peaceful coexistence with the environment will be helped. Comparing the content of textbooks in Iran and Russia makes it possible for both countries to obtain information on the level of attention to each component and the use of soft educational technologies in teaching these indicators and be aware of their strengths and weaknesses. Using the experience of the neighboring country can be effective in reviewing the contents of the book as well as teaching methods.

According to the main purpose of the research, the questions that have been answered in this research are:

1. To what extent is the content of textbooks in the textbooks of the primary sciences of Iran and the world around us Russia assigned to the components of the environment?

2. How much soft educational technology should be used to teach environmental matters in the first to third grades primary school Experimental Sciences textbooks in Iran and the World around Us textbooks in Russia?

3. Is there a difference in the importance of using soft educational technology in teaching environmental education in the first to third grades primary school in Iran and Russia?

Research Method

The method of this research is content analysis in the form of evaluation analysis, which with a quantitative analysis of the examined text, can follow the type of trends and evaluations of the text producer. The statistical population of this research is the textbooks of science and the world around us. The number of textbooks in the world around us in Russia was 6 volumes (2 volumes per grade) and a total of 776 pages. The number

of science books in Iran was three volumes (one volume for each grade) and a total of 318 pages. Environmentally related topics in these books were selected as the statistical sample of the present study and using the prepared checklist, the data obtained from the frequency of the components were analyzed. To prepare the checklist, environmental components as well as soft technologies were identified by examining the library and Internet documents. The list of environmental performance indicators used by Yale and Columbia University was used to analyze environmental issues. This list includes components: 1. Environmental health, 2. Air quality, 3. Water quality, 4. Biodiversity and habitat, 5. The quality of producing natural resources and 6. Attention to sustainable energy.

The level of attention to exploratory learning and cultivating research spirit, critical thinking, problem solving and participatory learning, simile and allegory, storytelling, role-play, individual and group games, questions and answers, and Observation and scientific circulation are considered in analyzing the content of the book given using soft educational technology.

The validity of this checklist was confirmed by experienced teachers and 4 professors in the field of educational sciences (educational technology and primary education). Determining the reliability of the tool and validity of it is calculated using the Roman William formula. In Roman William's formula, the sum of the frequencies of the categories related to the use of soft technology to teach environmental issues to the unrelated category is obtained numerically. If the number is greater than 0.4 and less than 1.5, the book will be among the books that focus on using soft technology to teach environmental issues. In this way, the content

of the first, second, and third grades of elementary school textbooks was analyzed twice in two months. The text of the book was analyzed separately in the form of pictures, questions, sentences, and class activities. Thus, each sentence was coded according to the subject and based on the assigned categories. In examining the questions and assignments, each question or assignment was selected as a study unit. Also, in the case of examining shapes, diagrams, and images, each shape, diagram, or image was selected as a study unit. Then the cases that were the same in both cases were set aside as cases of agreement and the cases that had differences were reviewed. The reliability coefficient of this study was 87%. Shannon's entropy method was used to calculate the difference in the importance of using soft technology in teaching environmental issues, in the first to third-grade textbooks of Iran and Russia.

Results

The results of the research were as follows:

Research Question 1: To what extent is the content of textbooks in the textbooks of the primary sciences of Iran and the world around us Russia assigned to the components of the environment?

To answer this question, the frequency and percentage of environmental indicators are calculated.

Table 1. The frequency of environmental components in Iranian Experimental Science and Russian the World around Us textbooks

Variables	Russian first grade primary school	Russian second grade primary school	Russian third grade primary school	Russia (F)	Russia (%)	Iranian first grade primary school	Iranian second grade primary school	Iranian third grade primary school	Iran (F)	Iran (%)
Environmental health	17	17	22	56	0.63	2	6	7	15	0.65
Air quality	3	1	11	15	0.17	4	6	5	15	0.65
Water quality	4	1	14	19	0.21	4	1	8	13	0.56
Biodiversity & habitats	32	31	20	83	0.94	20	4	9	33	1.44
Quality of productive natural resources	5	0	13	18	0.20	3	5	7	15	0.65
Sustainable Energy	6	0	17	23	0.26	2	4	4	10	0.43
Frequency of environmental components	52	37	68	214	2.4	35	26	40	101	4.41
Percentage of environmental components compared to the whole book	3.56	1.13	1.66	2.42	6.35	4.86	3,39	4.98	4.41	13.23
The whole components of the textbook's contents	1464	3270	4079	8813	100	719	765	802	2286	100

Table 2. Frequency of the soft educational technology to teach environmental indicators in Iran

Environmental components	Educational bases	Use of allegory, poetry and story	Comparing objects, discovering similarities and differences, and drawing conclusions	Question and answer discussion	Produce a plan or set of proposed actions	Role play	Activities related to daily life	Problem solving project	Group learning	The frequency of each base
1. Environmental health	first	0	0	1	0	0	1	0	0	2
	Second	0	1	2	0	0	0	1	2	6
	Third	0	0	4	1	0	0	0	3	8
2. Air quality	first	0	2	1	0	0	1	0	0	4
	Second	0	2	2	1	0	1	0	1	7
	Third	0	1	0	1	0	0	0	0	5
3. water quality	first	0	1	2	0	0	1	0	0	4
	Second	0	0	0	1	0	0	0	0	1
	Third	0	1	4	2	0	0	1	0	8
4. Biodiversity and habitat	first	0	8	7	1	0	3	1	0	20
	Second	0	0	1	0	0	0	1	2	4
	Third	0	2	0	1	0	1	2	1	7
5. Quality of Producing natural resources	first	0	0	1	0	0	0	1	0	2
	Second	0	0	1	0	0	0	1	1	3
	Third	0	2	1	1	0	0	2	1	7
6. Sustainable energy	first	0	0	1	0	0	1	0	0	2
	Second	0	0	2	1	0	0	0	0	3
	third	0	0	1	1	0	1	0	1	4
7. The combination of soft technology used in teaching environmental indicators		0	20	31	11	0	10	13	12	97
		0	20.61	31.95	11.34	0	10.30	13.40	12.37	100

Table 3. Frequency of the soft educational technology to teach environmental indicators in Russia

Environmental components	Educational bases	Use of allegory, poetry and story	Comparing objects, discovering similarities and differences, and drawing conclusions	Question and answer discussion	Produce a plan or set of proposed actions	Role play	Activities related to daily life	Problem solving project	Group learning	The frequency of each base
1. Environmental health	first	0	0	8	1	0	3	1	0	13
	Second	0	6	3	2	1	1	4	0	17
	Third	1	3	5	2	0	1	2	0	14
2. Air quality	first	0	0	1	1	0	1	0	0	3
	Second	0	0	0	0	0	0	0	0	0
	Third	0	0	4	1	0	2	0	0	7
3. water quality	first	0	1	0	1	0	1	0	0	3
	Second	0	0	0	0	0	1	0	0	1
	Third	0	1	3	1	0	2	1	0	8
4. Biodiversity and habitat	first	0	14	4	1	0	7	0	2	28
	Second	2	2	8	1	4	3	0	3	23
	Third	0	0	4	0	0	0	1	8	13
5. Quality of Producing natural resources	first	0	0	0	1	0	0	1	0	2
	Second	0	0	0	0	0	0	0	0	0
	Third	0	1	6	2	0	0	1	0	10
6. Sustainable energy	first	1	0	1	0	0	2	0	0	4
	Second	0	0	0	0	0	0	0	0	0
	third	0	0	3	2	0	2	3	2	12
7. The combination of soft technology used in teaching environmental indicators		4	28	50	16	5	26	14	15	158
		2.53	17.72	31.64	10.12	3.16	16.45	8.86	9.49	100

The results of calculating the frequency and percentage of environmental components in the textbooks of the world around us Russia show that 3.56 percent for the first grade of elementary school, 1.13 percent for the second grade, and 1.66 percent for the third grade of the book content pointed to the environmental components. In the textbooks of Iran, 4.86% for the first grade of elementary school, 3.39% for the second grade of elementary school, and 4.98% for the third grade of elementary school have been pointed to the environmental components.

Research Question 1: How much the application degree of soft educational technology should be used should be used to teach environmental indicators in the first to third grades primary school *Experimental Sciences* textbooks in Iran and *the World around Us* textbooks in Russia? To answer this question, the frequency and percentage of soft educational technology are calculated to teach environmental indicators.

Results of Table 2 are as follows in Iran:

Use of allegory, poetry, and story were zero, Comparing objects, discovering similarities and differences, and concluding were 20.61percent, Question and answer discussions were 31.95 Produce a plan or set of proposed actions was 11.34 percent, Roleplay was 10.30, Activities related to daily life was 10.30 percent, Problem-solving project was 13.40 percent, Group learning was 12.37.

Results of Table 3 are as follows in Russia:

Use of allegory, poetry and story was 2.53, Comparing objects, discovering similarities and differences, and concluding were 17.72 percent, Question and answer discussions were 31.64, Produce a plan or set of proposed actions were 10.12 percent, Roleplay was 3.16, Activities related to daily life was 16.45 percent, Problem-solving project was 8.86 percent, Group learning was 9.49.

Research Question 2: Is there any difference between the significance of using soft educational technology in teaching environmental issues in the first to third grades primary school education in Iran and Russia? The Shannon entropy method was employed to answer this question.

Based on the results of Table 4, the total frequency of using soft educational technology to teach environmental components in *the World around Us* textbooks is 158, among which environmental health constitutes 1.12%, air quality 0.25%, water quality 0.30%, biodiversity and habitat 1.67%, quality of natural resources generating 0.30%, sustainable energy 0.40%. In Iran, in 97 of the cases, the *Experimental Sciences* textbooks use soft educational technology to teach environmental components, among which environmental health constituted 0.74%, air quality 0.74%, water quality 0.64%, biodiversity and habitat 1.58%, productive natural resources quality 0.59%, sustainable energy 0.49%. In both countries, in terms of biodiversity and habitats component, the use of soft educational technology is more common, and, the lowest use of soft educational technology is in the case of the sustainable energy component. In Russia, the lowest use of soft educational technology is in the case of the air quality component, while in Iran is in case of the sustainable energy component.

The data in Table 5 were normalized according to the following formula.

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \ , \quad j = 1. \dots . n$$

Table 4. Frequency of the application degree of soft educational technology to teach environmental indicators.

Variables	Russian first grade primary school	Russian second grade primary school	Russian third grade primary school	Russia (F)	Russia (%)	Iranian first grade primary school	Iranian second grade primary school	Iranian third grade primary school	Iran (F)	Iran (%)
Environmental health	13	15	16	44	1.12	2	6	7	15	0.74
Air quality	2	1	7	10	0.25	4	6	5	15	0.74
Water quality	3	1	8	12	0.30	4	1	8	13	0.64
Biodiversity & habitats	28	20	16	64	1.67	20	4	8	32	1.58
Quality of productive natural resources	2	0	10	12	0.30	2	3	7	12	0.59
Sustainable Energy	4	0	12	16	0.40	2	4	4	10	0.49
Total soft educational technologies used in teaching environmental indicators	52	37	68	158	4.40	34	24	39	97	4.79
Percent	7.14	2.08	4.83	14.05	-	5.31	3.67	5.60	14.39	-
Number of soft educational technologies related to environmental components	676	1734	1338	3748	95.97	606	665	657	1928	
Total soft educational technologies in the Iranian and Russian textbooks	728	1771	1406	3905	100	640	689	696	2025	100

Table 5. Normalized data for applying soft educational technology to teach environmental indicators

Environmental components	Russian first grade primary school	Russian second grade primary school	Russian third grade primary school	Iranian first grade primary school	Iranian second grade primary school	Iranian third grade primary school
Environmental health	0.250	0.405	0.232	0.058	0.25	0.179
Air quality	0.038	0.027	0.101	0.117	0.25	0.128
Water quality	0.058	0.027	0.116	0.117	0.041	0.205
Biodiversity and habitats	0.538	0.541	0.232	0.588	0.166	0.205
Quality of productive natural resources	0.038	0	0.145	0.058	0.125	0.179
Sustainable Energy	0.077	0	0.174	0.058	0.166	0.102

Table 6. The amount of information load of the textbook content related to applying soft educational technology to teach environmental indicators

Grades	First grade	Second grade	Third grade
The amount of information load (EJ) in the Russian textbooks	0.721	0.500	0.973
The amount of information load (EJ) in the Iranian textbooks	0.734	0.939	0.984

Table 7. Significance coefficient of applying soft educational technology to teach environmental indicators.

Grades	First grade	Second grade	Third grade
Significance coefficient (Wj) in the Russian textbooks	0.329	0.228	0.444
Significance coefficient (Wj) in the Russian textbooks	0.276	0.353	0.370

Table 5 shows the percentage of frequency of application of soft educational technology to teach environmental indicators. After calculating the percentages using Shannon's second-stage formula, the information load, or the degree of uncertainty (EJ) of each grade is obtained, as shown in Table 3.

$$E_j = -k \sum_{i-1}^{m} pij \times Ln\, P_{iJ} \qquad i = 1.2.\dots.m$$

The results of Table 6 indicate that in *the World around Us* textbooks, the highest amount of information load (uncertainty) is for the third grade and the lowest amount of information load (uncertainty) is for the second grade.

Finally, the significance coefficient of applying soft educational technology to teach environmental indicators in textbooks of two countries is obtained using the third-order Shannon entropy formula as shown below. Any grade with more information load is more important and has more weight (wj).

$$W_j = \frac{d_j}{\sum d_j}$$

The results of Table 7 show that the highest significance coefficient of the grades was for the third grade and the lowest significance coefficient (uncertainty) of applying soft educational technology for teaching environmental indicators was for the second grade.

Discussion

Environmental health component

This component accounts for 1.12% in the Russian textbooks and 0.74 percent in Iranian textbooks. In *the World around Us*, the second grade of Russia is more focused on this component, and in Iran in the third grade, more attention is paid to this component. A review of the content of the textbooks shows that in both countries the role-playing method has been used to teach this component. The students should also provide examples of environmental pollutants by thinking about the problem. In Russia, for example, to teach the component of environmental health, in the third primary textbook, Part 2, page 32 illustrates the cycle of contamination of the river by catching fish and eating it by humans and becoming sick. So, the students are asked asks to provide examples of the environmental pollution cycle.

In the Russia second grade primary school textbook, the students are asked to play

animals' roles and explain what they expect humans to do to maintain environmental health. In the Iranian second primary school textbook, page 18 shows pictures of a river in which other fish and animals have died. The students are asked to explain why these animals have disappeared? What would you expect of humans if you were a fish and a river bird? On page 21 of this textbook, the students are asked to make suggestions for a healthy environment. The students can also get help from family members.

Air quality

The air quality component in Russian textbooks constitutes 0.25% and in Iranian textbooks 0.74% of the contents. Russian textbooks use soft educational technology to incorporate students' learning into everyday activities to teach this component. For example, in the Russian third-grade primary school textbook on pages 33, it was explained that the students should pay attention to family members and observe what causes air pollution and the environment around them. For example, what are some ways to protect themselves from air pollution by paying attention to parental smoking or garbage collection in the kitchen? They are also asked if a road is green but it is longer than a polluted and high traffic road, which one they choose. Why?

The same issue is presented in the Iranian third-grade primary school textbook that children go to a pleasant climate by bus with their teacher. The road is crowded and busy. The smell of smoke and the noise of cars are annoying to humans. The students negotiate with each other to see what the harm of car exhaust is to them? What is the difference between the route of the car in a city and a village? In the Iranian second-grade primary school textbook, page 21, the students are asked to make suggestions on having healthy air. It can also get help from family members.

In Iran, teaching and exchanging information between students has been used to teach the topic of air quality. The students think about the problem and discuss the outcome of his thoughts with others. For example, in Iran's first elementary book, page 69, the students are asked to think about the sources of air pollutants and diseases transmitted through the air and to name some cases. In the second-grade primary school textbook, page 17, there is a lesson titled "healthy air, healthy water", asking students to discuss why are getting polluted and what are the strategies for enjoying healthy air and water. Via an activity, the students are asked to show how the rain cleans the polluted air. In this activity, the students are asked to belch smoke in a transparent bottle via a sting or flame, turn the bottle upside down and close it. They then are asked what they see in the bottle. They are asked to open the bottle. What happens when they spray on the smoke being emitted out of the bottle via a sprinkler? What color does water become then?

Water quality

The water quality component constitutes 0.30% of the Russian textbooks and 0.65% of the Iranian ones. In both countries, first, there is an explanation of the factors affecting water quality, and in the end, the students are asked to reflect on the daily activities of water pollution, water conservation practices, and optimal water consumption. For example, in the Russian third-grade primary school textbook, pages 51-63 water is described and explained. Besides, In the Russian third-grade primary school textbook, there are five pages on the causes of sources of water pollution as well as on water conservation methods. In the end, the students are asked to self-evaluate the content of what they have learned. In the home activity section, they are asked to list what can be water conservation methods, and what they can do to keep the water clean in cities.

The Iranian third-grade primary school *Experimental Sciences* textbook, on page 47, describes the groundwater and how it is formed in four lines. Students are then asked to gather and discuss information about springs, wells, and aqueducts in their town or village and the uses that can be made. Also, discuss what causes contamination of groundwater and ways to protect the water from pollution and water savings in the classroom. There are also 3-line descriptions on how to purify drinking water on page 5 of the textbook, and the environment is urged to be careful about wasting water at home and what is the correct use of water?

Biodiversity and habitats

The biodiversity and habitats component in the first, second, and third grades primary school *the World around Us* textbook somehow discusses the diversity of plants and animals in Russia. The second-grade primary school textbook discusses the diversity of flora and fauna in the four chapters, dividing the content into four chapters discussing four seasons, i.e. spring, summer, fall, and winter and biodiversity of flora and fauna in detail. The students are asked to gather some information regarding methods for protecting flora and fauna of each season and discuss them in class. They are also asked to look at the home and out-of-school activities and see what measures are being taken to conserve biodiversity and habitats. For example, on page 39 of the second part of the textbook, the students are asked to play the animals' roles, put on clothes or masks, and discuss their lifestyle, dangers, and problems in winters. In this game, the students learn how to care for animals and preserve the diversity of creatures in the winter environment. In the meantime, participatory learning is reinforced during the game, and if the students have low self-esteem and are unable to speak in public, this improves their self-esteem.

In Iran, the topic of biodiversity and habitats has been taught in such a way that the students collect and observe specimens of plants, leaves, roots, and fruits. In the second-grade primary school *Experimental Sciences* textbook in Iran, students are asked to research two to three animals each. In their study, they gather information about animals' lifestyle, their interactions, nutrition, care of their children, pregnancy season, etc. and discuss it in class. Also in class, they discuss how we can help animals stay healthy and not extinct.

Quality of productive natural resources

This component accounts for 0.30% of the content of the first to third grades primary school *the World around Us* textbook in Russia and 0.59% of the textbooks in Iran. Exploration and discussion are used to teach this component. In the first-grade primary school *Experimental Sciences* textbook, on page 68, the students are asked to look carefully at the environment around them and to see where the wind is used. In the final pages of the book, the students are asked to research the creation of light and illumination from ancient times to the present and to ask the elders about how the illumination works in ancient and modern times. Traditionally, wood was used to create light. How do electricity and light exist today?

The Russian first-grade primary school textbook, the second part, pages 85 and 86, the students are asked about the use of home appliances. They asked the elders to talk about their past lives and the tools they used. Then the students are asked to compare the old and the new era. What electrical and non-electrical appliances have been added to contemporary life? What are the benefits of these appliances? How to use these devices

correctly and efficiently? Which of the old electrical appliances are still in use? The Russian third-grade primary school book also discusses the role of the sun in the supply of electricity.

Sustainable energy

0.40% of soft educational technology has been used for teaching the Russian first to third grades primary school *the World around Us* textbooks, and 0.49% of soft educational technology has been used for teaching the Iranian first to third grades primary school the *Experimental Sciences* textbooks. For example, in Russia, the students are asked to go home to see where gas is used. What other things can be used instead of gas such as electricity or sunlight? In this way, both the students' minds get involved with the creative process and tangibly communicate with the environment around them, eventually leading to the use of sustainable energy.

In the Iranian third primary school *Experimental Science* textbook, for discussing sustainable energy, gasoline and oil are exemplified. For example, they are asked to answer this question: what is the fuel of a vehicle? They are also wanted to talk about other sources of fuel such as gas, oil, and gasoline. Accordingly, attempts have been made to lead students' attention toward renewable energy.

Conclusion

Today, all the people are agreeing that education is the most effective tool and method for facing future challenges, especially environmental protection. But for the sustainability of the world that is changing and evolving quickly, the use of new ideas and strategies in education is essential and vital. The use of educational ideas and strategies should be aimed at understanding the environment and living with it. Recent theories of teaching and learning are based on

the principle that the content should not be made available to the learner, but she or he should be faced with the problem and situation so that he or she can find the solution (Heidari, 2010). According to this, teaching methods should be designed in such a way that they make the learner active to increase their memorization, retention of content, and also the application of educational content. Today, the use of hard technology has changed educational methods in education, but the role of soft educational technology should not be overlooked with the increasing development of hard technology. Fostering children's creativity and paying attention to their interests requires the use of a variety of soft educational technologies. It should be noted that the range of soft technologies is wide, but in the analysis of the content of the book, 8 cases have been mentioned, based on which the results showed that soft technologies represent 2.53 percent for allegories and stories, 17.72 percent for comparing objects and understanding differences and similarities, 31.64 percent for the question and response and conversation, 10.12 percent for making suggestions, 3.16 percent for playing the role, 16.45 percent for daily life activities, 8.86 percent for problem-solving and project, 9.49 percent for group learning to teach environmental issues in Russia. In Iran, soft technologies are zero percent for allegory and storytelling, 20.61 percent for comparison of objects and understanding of differences and similarities, 31.95 percent for question and response and conversation, 11.34 percent for making suggestions, zero percent for playing the role, 10.30 percent for activities related to daily life 13.40 percent for problem solving and project implementation, 12.3 percent for group learning that have been used to teach environmental issues. The results also showed that in both countries, the use of soft educational technology to teach

environmental issues was given more importance in the third grade of elementary school. Soft technology has been used less in the first grade of an elementary school in Iran and the second grade of an elementary school in Russia.

The comparative study showed that allegory, poetry, and storytelling and role-playing have not been used at all to teach environmental issues in Iran. Questions and responses and comparison of objects, the discovery of similarities and differences, and conclusions have been widely used in both of the countries. Solving problems and carrying out projects has been emphasized in Iran, and the use of daily life activities in Russia.

In Iran, the use of discussion methods as well as exploration in the school environment has been considered to teach environmental issues. The conversation is a way to train as well as a brainstorm. In this way, the power of reasoning and the spirit of criticism are strengthened in learners.

While the use of poetry, storytelling, and allegory make a comprehensive acquaintance with national literature and culture in teaching environmental issues, they also institutionalize their applications in the pervasive mind. This type of soft technology increases the treasure of comprehensive words and phrases and is also effective in a person's linguistic and behavioral richness. Since children are interested in learning through storytelling and poetry from an early age, using this method can increase the attractiveness of environmental content and its permanence in the pervasive mind.

The findings of Sheibari et al. (2014) and Sheibri (2015) also emphasized the priority of storytelling methods in environmental education. Therefore, it is suggested to use national and cultural literature in teaching book topics in Iran. One of the most important

educational goals is the all-round growth of learners, so, one should also pay attention to the combination of courses to strengthen the concepts in the pervasive mind.

Role-playing is also very appealing to children. In this method, learners reinforce their sense of synchronization with the elements of the environment and interact deeply with the environment. This method is effective in eliminating the feeling of embarrassment and isolation of learners. The performance of theater and drama is effective in strengthening learning with the topics of environmental problems, interacting with them, and providing solutions to improve and solve them by the learner. Iran has neglected to use this method in the teaching curriculum. Although the use of common methods is very easy for teachers, it should not obstruct creativity in learning and teaching learners and teachers.

Inclusive engagement in daily activities and communication with family members has also been one of the soft technologies used to learn about the environment in Russia. The involvement of family members in children's educational activities, as well as the use of daily hobbies and activities to learn about the environment, has increased the stability of the content in the learner's mind, while the child interacts with the environment and puts his knowledge to the test, she/he can also reinforce his creativity, curiosity, and sense of belonging to the school and family environment. The use of these methods is especially attractive for children in the first grade of elementary school because they do not think that has been distinguished from family and school environment, so they show more enthusiasm for learning. This finding was confirmed by Afrid (2012) and Sheberi et al. (2014) and Haktanir and Kabuk (2000) and Nego (2008).

Based on findings, it should be said that more emphasis should be placed on active teaching methods in teaching environmental issues. The way that students are motivated during learning and trying to learn and teachers are guider. This method of teaching, while strengthening inclusive self-confidence, it also plays an important role in self-learning and inclusive self-learning.

Group learning and role-playing should also be considered in strengthening the use of soft technologies in teaching textbooks of the two countries. Group learning has a significant impact on strengthening collaborative skills, social interaction of learners. Learners need to learn the skill of living together, so this method is very useful. It can be useful to determine research work as a group for students about environmental issues, playing group games to teach environmental content in this field.

Also, the results of analyzing the content of the books of the world around us in the first, second, and third grades of the Russian elementary school based on environmental components showed that they emphasized on the topics such as environmental health and biodiversity and habitat. This level of attention is more pronounced in the second grade of elementary school.

However, issues such as sustainable energy and the quality of productive natural resources have received special attention in the third grade. In Iran, topics such as biodiversity and habitat, air quality, water quality have been considered in the first and third grades of elementary school, and more emphasis has been placed on the quality of productive natural resources and sustainable energy in the second grade of elementary school. Given the importance of environmental health, this is well illustrated in Russian textbooks. But the issues of sustainable energy and productive natural resources, which are mostly in the field of human intervention, need more

attention due to personal needs and economic exploitation. Resources such as gas and oil are vital in the production cycle of any country. On the other hand, the reconstruction of these resources requires considerable time, which makes the precautionary use of these resources and its useful use as a great responsibility for any citizen justifiable. In Iran, paying attention to air quality as an important social issue needs more attention. Several cities in Iran are in dusty conditions most days of the year. In Iran, paying attention to air quality as an important social issue needs more attention. Several cities are in dusty conditions most days of the year in Iran. Also, attention to biodiversity and habitat needs to be reviewed and measures are taken to maintain it. Therefore, education as the most key educational institution for all-round development and teachers and educational planners as a subset of large society, have a fundamental role in creating a culture to respect the environment and its preservation. Teachers on how to use educational technologies and educational planners to identify the factors influencing environmental education curricula that increase students 'accountability for the environment, protect and maintain it, and alter students' behavior. They have an important responsibility. The creation of learning opportunities in the classroom, which includes the conditions, activities, experiences, lessons, and interactions of learners, is formed by teachers who must be effective in human, social and cultural development (Salsbili, 2011). Therefore, the correct use of teaching methods and soft educational technologies creates the grounds and elements of sustainable education (Bernie, 2005). This sustainability is a model for thinking about a future in which it balances environmental, social, and economic considerations in achieving the development and improvement of quality of life (UNESCO, 2012). To

achieve this, educational planners must address environmental issues by designing appropriate curricula, and teachers must be up-to-date in implementing appropriate teaching methods in environmental issues, especially paying special attention to educational soft technologies, environmental protection. To teach students practically and desirably.

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