

Article

Comparison of the Content Structures of Environmental Topics in Science Textbooks in Türkiye and Iran

Tufan Inaltekin^{1,*} , Hakan Akcay²  and Ataman Karaçöp¹ ¹ Dede Korkut Faculty of Education, Kafkas University, Kars 36100, Türkiye² The Faculty of Education, Boğaziçi University, Istanbul 34342, Türkiye

* Correspondence: inaltekintufan@gmail.com

Received: 14 August 2025; **Revised:** 15 December 2025; **Accepted:** 8 April 2026; **Published:** 21 April 2026

Abstract: The aim of this study was to compare the content structures related to environmental topics in primary and middle school science textbooks in Türkiye and Iran. A total of six textbooks from Türkiye and nine from Iran were analyzed as data sources. Conducted using document analysis, a qualitative research method the study revealed significant differences in how environmental topics are addressed in the textbooks of the two countries. It was found that the richness of content regarding environmental issues varies significantly between primary and middle school levels in both Turkish and Iranian textbooks. It was determined that science textbooks for primary and middle school in Türkiye offer much richer content compared to their Iranian counterparts in terms of data usage, content depth, scientific and technological perspectives, and the development of environmental awareness. Differences emerged between the two countries' curriculum approaches regarding the effectiveness of environmental education. It was observed that science textbooks in Türkiye support a sustainability-based approach to environmental education to a greater extent than those in Iran. Although textbooks in both countries address many environmental topics, shortcomings were identified. A common shortcoming in both countries is the insufficient integration of the cultural context into environmental education. In this context, it is clear that environmental issues in the textbooks of both countries need to be addressed more comprehensively and evaluated from a global perspective. Furthermore, taking educational levels into account, the content should be structured in a more balanced and inclusive manner that reflects current conditions.

Keywords: Türkiye; Iran; Environmental Topics; Science Textbooks; Primary-Middle School

1. Introduction

Environmental issues have become global problems today and are among the most important challenges that need worldwide resolution. These issues are not only ecological but also encompass social and economic dimensions [1]. Topics such as global warming, biodiversity loss, and air and water pollution rank among the most urgent concerns awaiting solutions today [2–5]. Enhancing individuals' levels of awareness is of vital importance in addressing environmental issues [6,7]. Environmental education at the primary and middle school levels plays a key role in shaping this awareness [8]. Therefore, instilling environmental consciousness in primary and middle school students from an early age is critically important in education. Science textbooks represent the most fundamental pillars of this education [9]. These textbooks play a critical role in raising students' awareness of environmental topics, fostering a sense of responsible citizenship, and promoting sustainability [10]. They provide students with information to help them understand natural phenomena, ecosystems, natural resources, and envi-

ronmental problems [11]. Moreover, they help students develop scientific thinking skills regarding issues such as pollution, climate change, and biodiversity which are crucial for addressing environmental problems [12]. Environmental topics in textbooks explain the balance between nature and humanity, teach that resources are limited and need to be preserved for future generations [13]. Through these books, students can become aware from an early age of the importance of efficient use of natural resources and protecting the environment [14]. By addressing environmental problems and solutions at both local and global levels (e.g., global warming, sea-level rise), textbooks help students develop a worldwide environmental consciousness [15,16]. Textbooks play a key role in ensuring that environmental topics are taught in a scientifically accurate and reliable manner from the earliest stages of education [17]. However, it has been noted that students require effective learning resources regarding today's most critical issues, such as environmental problems [18]. At the forefront of these resources stand the textbooks because their content directly influences students' interest in environmental topics.

Environmental issues are increasingly affecting every region of the world, prompting many countries to initiate reforms in their educational policies to cultivate students' awareness of these topics from their earliest schooling years. Significant efforts are being devoted to developing more effective learning resources [19]. Within educational materials, science textbooks hold a crucial place their approaches and quality in addressing environmental subjects are vital for students to acquire accurate and impactful knowledge [20]. For decades, there has been a perception that interest in environmental issues is largely the responsibility of students and educators in Europe and America. However, these global issues concern every individual in different regions of the world for a sustainable future. Therefore, students living in different parts of the world today need to have textbooks that provide them with accurate information on environmental issues in an effective manner. In a globalizing world, different education systems and curricula should be examined to assess the extent to which countries can achieve international standards in science education.

2. Literature Review

2.1. Comparison of Science Education Systems in Türkiye and Iran

The education system in Türkiye is shaped by a centralized curriculum and national exams. Science education begins in the 3rd grade and is explored in greater depth in middle school. Since the early 2000s, Türkiye has taken significant steps toward adopting scientific and contemporary methods in science education, particularly with curriculum changes in 2018 (Life Skills-Based Program) and 2024 (Maarif Program). In recent years, alongside curriculum reforms in science education in Türkiye, there has been a strong focus on providing content and instructional materials that enable students particularly in primary and middle school to develop an interdisciplinary understanding of science. The science education systems of the United States, China, and various European countries that have performed well on PISA exams have led the way in shaping Türkiye's science teaching models in recent years. Educational reforms have heavily incorporated technology-supported science lesson content, including smart boards, tablet computers, and web-based applications. Additionally, e-books and various digital applications are being integrated into science education. In Türkiye, the concept of STEM-based education and project-based learning has been at the center of science courses, particularly in primary and middle school levels, in recent years. Furthermore, outside of public schools, students participate in activities to develop their scientific understanding through various science centers. An assessment of Iran's science education system, however, can only be made superficially due to its closed state structure. In this context, it can be said that the system is characterized by a traditional teaching approach that remains dominant. When considering the curricula for primary and middle school levels, it is evident that innovation and technological transformation are quite limited. In Iran, more emphasis is placed on theoretical knowledge in the field of science. The development of students' scientific thinking and problem-solving skills is generally based on textbooks and teacher instruction. Teaching methods in Iran are generally more teacher-centered, and it can be said that the goal in science classes is for students to acquire more knowledge and delve deeper into specific topics. Today, the use of technology in science education is becoming more widespread in Iran, but it is not as common as it is in Türkiye. However, it is known that cultural and local factors play a significant role in science education in both Türkiye and Iran.

2.2. Studies on Environmental Topics in Science Textbooks in Türkiye and Iran

When previous studies on the content analysis of science textbooks in Türkiye and Iran are examined, the inadequacy of environmental issues in both countries stands out. In one of the studies on science textbooks in Iran, Karimzadegan and Meiboudia [21] examined the content of primary school science textbooks in the context of environmental literacy. The results showed that, in general, environmental literacy was not adequately addressed in these textbooks and that not all components of environmental literacy were given equal consideration. In another study, Zamani et al. [22] investigated the use of educational technologies in teaching environmental topics in science textbooks used in Iran from first to third grade. The results showed that allegory and role-playing methods were not used at all to teach environmental topics in Iran. It also revealed that greater importance was given to the use of technology in the third grade of primary school in Iran. Salmani et al. [23] conducted a content analysis of newly prepared science textbooks based on ecology, the environment, and human activities. The results showed that the content of the textbooks was based on environmental education based on ecology, environment, and human activities, respectively, in terms of information load and importance. Najjari and Darvish [24] analyzed the content of fourth-grade science textbooks according to the level of attention given to green management components. The results revealed that water and sewage management, renewable energy use, noise pollution control and transportation, energy management, and the introduction of culture and the environment had an importance coefficient of 0.17 for fourth-grade science lessons. In addition, Gülersoy and Aydemir [25] found that fourth-grade science textbooks in Türkiye do not include content covering all units from the perspective of sustainable environmental education. Demirezen and Kaya [26] examined science textbooks in terms of environmental education and determined that environmental education topics were addressed with abundant examples and visuals in 4th and 5th grade textbooks, while 6th and 7th grade textbooks were supported with more research-oriented questions and activities. Similarly, Koyuncu and Köksal [27] aimed to identify environmental problems and proposed solutions in 5th grade science textbooks. The results showed that environmental problems and proposed solutions were addressed in the context of biodiversity, waste, human-environment relations, and destructive natural events. In their study, Erten and Köseoğlu [28] examined the activities in 5th, 6th, 7th, and 8th grade textbooks within the scope of the “Zero Waste” project. The research results indicated that the majority of activities related to environmental education did not include explanations and objectives emphasizing the project’s goals. In another study, Erbaş [29] examined how global warming and climate change are addressed in primary school textbooks. The results revealed that the concepts of global warming and climate change are not directly mentioned in the textbooks examined.

Purpose of the Study and Problem Statement

In recent years, environmental education at the primary and middle levels has been regarded as a key factor in fostering students’ awareness toward a sustainable future. However, previous studies indicate a lack of comparative research examining how environmental topics are addressed in science textbooks one of the fundamental instructional tools in countries such as Türkiye and Iran, which share similar educational cultures. Existing studies have generally been limited to specific grade levels or have provided only superficial analyses without an in-depth exploration [24,25,27,30]. Therefore, conducting a comparative analysis of the scope, presentation format, and depth of content of environmental topics in Türkiye and Iranian science textbooks is significant for describing the environmental education approaches of both countries and identifying existing shortcomings. Both Türkiye and Iran have centralized education systems and stand out among other countries in the Middle East for the high quality of science education in their schools. Therefore, examining the textbooks of both countries will reveal important findings regarding the level of development of science education curricula related to environmental education. Comparing science textbooks in Türkiye and Iran in the context of environmental issues will help to understand how the education systems of these two countries have adapted to global trends and how they focus on student education in this area. Furthermore, it is important to understand the educational policies of two countries such as Türkiye and Iran, which have centuries old educational traditions in the same geography, in terms of contributing to global educational efforts. Türkiye and Iran are countries with different cultural and social structures, and their educational systems and curricula are also influenced by these differences. Therefore, science textbooks are important tools that reflect these cultural and pedagogical differences [31]. Furthermore, comparing the differences in the content structure of textbooks on environmental issues in the two countries is critical to understanding how this will affect

students' scientific thinking skills. A comparison of science textbooks in Türkiye and Iran will provide important data on how environmental issues are approached in both countries, which environmental problem themes are emphasized, and how students are encouraged to develop an understanding of these issues. In this context, conducting research on the comparison of environmental topics in primary and middle school science textbooks in Türkiye and Iran is of great importance in terms of contributing to the development of environmental education in both countries and providing students with more effective scientific environmental education. Therefore, this research will form an important basis for educators and policymakers in both countries to improve the curriculum and increase the quality of teaching materials on environmental issues. Ultimately, the aim is to make a significant contribution to global harmony in education by presenting concrete recommendations for improving the quality of education on environmental issues in both countries based on the results of the study. In this context, the study aims to reveal the differences in how environmental issues are presented in science textbooks in two countries with different educational cultures, such as Türkiye and Iran, by comparing them. The study seeks to answer two research questions:

1. What is the content structure of environmental topics in science textbooks in Türkiye and Iran?
2. How does the content structure of environmental topics in primary and middle school science textbooks in Türkiye and Iran differ?

3. Method

3.1. Research Design

Document analysis, one of the qualitative research methods was used in the study. In educational research, document analysis is commonly employed to examine textbooks, which serve as a fundamental learning resource for students [32]. In the present study, the document analysis method was preferred because it allows for a systematic and in-depth examination of the content within textbooks [33]. Moreover, document analysis is an effective method for revealing the structure, trends, and alignment of previously developed educational materials with curriculum objectives [34]. Through this method, the dimensions and frequency with which environmental topics are addressed can be evaluated objectively. Based on this method, environmental topics in current science textbooks taught at primary and middle school levels in Türkiye and Iran were analyzed descriptively in terms of content.

3.2. Data Set

Within the scope of this study, science textbooks used in primary and middle schools in Türkiye and Iran during the 2024–2025 academic year were examined. The selected textbooks are official textbooks approved by the Ministry of National Education (MoNE) of both countries (see **Table 1**).

Table 1. Information on Science Textbooks Used in Primary and Middle Schools in Türkiye and Iran.

Country	Level	Book Title	Publisher
Iran	Primary	Experimental Science (1st Grade)	Ministry of National Education Education Research and Planning Organization
		Experimental Science (2nd Grade)	
		Experimental Science (3rd Grade)	
		Experimental Science (4th Grade)	
		Experimental Science (5th Grade)	
	Experimental Science (6th Grade)		
Middle	Experimental Science (7th Grade)		
	Experimental Science (8th Grade)		
	Experimental Science (9th Grade)		
Türkiye	Primary	Science (3rd Grade)	SDR Publishing Pacific Publications
		Science (4th Grade)	
	Middle	Science (5th Grade) (Maarif Model)	Ministry of National Education Gün Publishing Ferman Publishing Ata Publishing
		Science (6th Grade)	
		Science (7th Grade)	
		Science (8th Grade)	

Table 1 shows the titles of science textbooks used in primary and middle schools in Türkiye and Iran in the

2024–2025 academic year. It can be seen that these books are taught for six years at the primary school level in Iran, but only for two years in Türkiye. At the middle school level, it is understood that these textbooks are used for 3 years in Iran and 4 years in Türkiye. In Iran, textbooks for all levels of primary and middle education are prepared by the Ministry of Education. In Türkiye, however, textbooks prepared by many private publishing houses are used at the primary and middle school levels.

3.3. Data Collection

Textbooks approved by the Ministries of Education of Türkiye and Iran were examined within the scope of this research. First, PDF versions of science textbooks taught at the primary and middle school levels in both countries were downloaded to a computer. Secondly, Iranian books were translated from Persian into Turkish via “Google Translate”. These translations were then reviewed by an education expert who is fluent in both Turkish and Persian. In this way, the data sets related to environmental topics in the textbooks of both countries were made suitable for analysis.

3.4. Data Analysis

The qualitative data of the study were analyzed descriptively. In this context, the researchers first focused on environmental topics in science education and on how the content structure of these topics should be organized. A coding framework was developed to analyze the content structure of environmental topics presented in the textbooks. By reviewing the relevant literature and obtaining expert opinions, eight content codes were determined prior to the analysis: “Data Usage”, “Depth of Content”, “Scientific and Technological Perspective”, “Environment–Economy–Sustainability Connection”, “Environmental Problems Solution Applications”, “Cultural and Social Factors”, “Future Perspective and Environmental Awareness” and “Student Participation and Practices”. Among these codes, “Depth of Content” serves the purpose of representing whether the environmental topics in the textbooks encourage thinking, inquiry, and research, or remain limited to general information. As a result of evaluations conducted with experts who have carried out research on science textbook analyses, two additional components reflecting the content structure in textbooks were included in the present analysis: (1) Content Format (Visual and Text) and (2) Context (Global, Local, and Unclear). Furthermore, based on a review of the related literature and consultations with experts in the field, twelve fundamental environmental themes in science education were identified for examination: “Global Warming”, “Climate Change”, “Overfishing”, “Biodiversity Loss”, “Melting Glaciers and Sea Level Rise”, “Deforestation”, “Air Pollution”, “Water Pollution and Scarcity”, “Soil Pollution and Loss”, “Food Waste”, “Plastic and Other Waste”, and “Ozone Layer Depletion”. In determining these themes, both the environmental topics presented in the textbooks and contemporary, widely discussed environmental issues were taken into account, with the aim of constructing a comprehensive thematic framework. Since the presentation format (visual and text) and context (global, local, and unclear) each consist of two sub-dimensions, the researchers described only the presence or absence of these forms within the textbooks. For the other content codes, a quantitative approach was adopted to indicate the frequency of occurrence of each code within the environmental topics. In this regard, and considering similar studies in the literature [35–37], it was decided that employing a combined descriptive and quantitative approach to the qualitative data would provide an effective means of comparing how environmental topics are represented in the textbooks of the two countries. In particular, it has been emphasized that transforming qualitative data into numerical indicators in such comparative document analysis studies can make a significant contribution to the meaningfulness and interpretability of the findings. For example, Sandelowski et al. [38] stated that “the cultural appeal of numbers associated with scientific precision and authority serves to reinforce the desire to transform qualitative data into quantitative form” (p. 208). Furthermore, these researchers emphasized that transforming qualitative data into a format involving numbers represents a kind of “data engineering” intended to generate different layers of meaning. The numerical differences derived from qualitative data collected from two groups can be compared using various statistical methods. Moreover, quantifying or transforming qualitative data can be a valuable approach if it helps achieve the analytical objectives of the study and provides the best answers to the research questions [39]. For this purpose, the present study adopted a method for quantifying the content characteristics of environmental topics in the science textbooks of both countries. The science textbooks from Türkiye and Iran were compared at the primary and middle levels in terms of the frequency of content codes and the number of codes per environmental topic. In document analysis, having multiple researchers independently evaluate the same data is a crucial procedure to enhance the reliability of the study [40]. To ensure the trustworthiness of the

of the data analysis process, all textbook descriptions were independently conducted by two researchers. These descriptions were then compared, and discussions were held until consensus was reached in cases of disagreement, thereby ensuring the consistency of the findings. To further strengthen reliability, an additional science education expert independently analyzed the 7th-grade science textbooks from both Türkiye and Iran. The analyses conducted by the researchers and the expert showed an inter-rater agreement exceeding 90% for the textbook descriptions of both countries. This value corresponds to an acceptable range according to Miles and Huberman [40] and Creswell [41]. Extensive discussions were held until full consensus was reached regarding the differing opinions among the evaluators concerning the codes. In this context, full consensus was reached on all codes. Since the study examined only publicly available printed and digital science textbooks, no human participants were involved. Consequently, ethical approval was not required; however, the research was conducted in full accordance with the principles of research and publication ethics. All copyright regulations were respected, textbook contents were used solely for analytical purposes, and proper citation practices were followed throughout the presentation of the study.

4. Findings

This study analyzes the content structure of environmental topics in science textbooks used in primary and middle schools in Türkiye and Iran.

4.1. Findings on the Distribution of Environmental Topics in Science Textbooks in Türkiye and Iran According to Grade Levels

Tables 2 and 3 present the content distribution of environmental topics in science textbooks in Türkiye and Iran.

Table 2. Distribution of Environmental Content in Türkiye Primary and Middle School Science Textbooks.

Environmental Theme	Grade	Contents
Global Warming	8	Greenhouse effect
Climate Change	8	Climate change
Deforestation	3	Deforestation and forest fires
Air Pollution	3	Factory gases
	6	Household fuels and factory gases
Water Pollution	3	Water waste
	4	Water pollution
	7	Wastewater
Soil Pollution and Loss	6	Acid rain
Food Waste/Waste, Waste Oil	4	Food waste
	5	Waste liquid oil
	7	Waste oils
Plastic, Metal, Glass, Textile, etc. Waste	3	Environmental pollution
	4	Waste and recycling
	5	Waste
	7	Waste and recycling
Ozone Layer Depletion	8	Sustainability and recycling
	8	Thinning of the ozone layer

Table 3. Distribution of Environmental Topics in Iran Primary and Middle School Science Textbooks.

Environmental Theme	Grade	Contents
Global Warming	9	Excessive use of fossil fuels
Loss of Biodiversity	4	Endangered species
	4	Destruction of habitats
	7	Destruction of nature
	9	Increase in carbon dioxide
	9	Factors reducing biodiversity

Table 3. Cont.

Environmental Theme	Grade	Contents
Melting Glaciers	9	Melting glaciers
Deforestation	6	Excessive logging in forests
Air Pollution	1	Air pollution
	2	Healthy air
	2	Exhaust fumes
Water Pollution	1	Water waste
	1	Water pollution
	2	River water
	2	Clean water
	2	Water consumption
	7	River pollution
	7	Lake drying
	9	Gulf pollution
Soil Pollution and Loss	5	Soil erosion
Food Waste/Waste	2	Waste separation
	4	Food waste
Plastic, Metal, Glass, Textile, etc., Waste	2	Waste separation
	4	Garbage
	4	Plastic beverage and food waste
	4	Plastic waste
	9	Plastic use
	4	Metal beverage and food waste

When the distribution in **Table 2** is examined, it is seen that environmental issues are covered intensively, especially in the 7th and 8th grade textbooks at the middle school level.

When the distribution in **Table 3** is examined, it is seen that environmental topics are covered more extensively at the primary school level.

Examples of environmental topics covered in Türkiye and Iranian textbooks are presented in **Table 4**.

Table 4. Examples of Environmental Topics in Science Textbooks in Türkiye and Iran.



Subject	Türkiye	Iran
Global Warming	<p>Due to global temperature differences, some regions are experiencing increases in the intensity and frequency of disasters such as hurricanes, heavy rainfall, and associated floods and flash floods. In other regions, however, prolonged droughts are occurring. As temperatures rise, the number of wildfires is also increasing. The depletion of water resources will affect agriculture in the future (Figure 6.21). Animals' search for water may cause them to migrate to different ecosystems.</p>  <p>Figure 6.21: Water scarcity affects agricultural lands.</p> <p>Ata Publishing (8th Grade, p. 207)</p>	<p>Fossil fuels (coal, crude oil, and natural gas) are formed over millions of years. This complex process involves various changes that occur very slowly. Fossil fuels release carbon dioxide into the atmosphere. All of them contain carbon, and when burned, they produce very large amounts of CO₂. One of the consequences of excessive carbon dioxide in the atmosphere is an increase in Earth's temperature, which leads to the melting of polar ice caps and significant changes in seasons.</p>  <p>Information gathering: Consult reliable sources to gather information on how rising carbon dioxide levels affect the Earth's temperature, and present your findings to the class in the form of a poster.</p> <p>MoNE Publications (9th Grade, p. 28)</p>

Table 4. Cont.


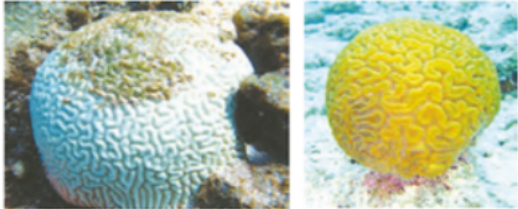


Subject	Türkiye	Iran
Biodiversity Loss	<p>Examples of animals facing the threat of extinction in our country include the Mediterranean monk seal, the Anatolian leopard, the sea turtle, the flamingo, the brown bear, the crane, the bittern, the black stork, and the sea bass. Examples of plants in our country that are at risk of extinction include the snowdrop, cyclamen, lake onion, fireweed, black crocus, daffodil, and peony (Figure 6.10).</p> 	<p>Did you know? Coral reefs in the Persian Gulf are home to and provide food for many marine animals; therefore, they play an important role in preserving the Gulf's biodiversity. Pollution of seawater causes coral reefs to die, a sign of which is their bleaching.</p>  <p>Activity: Biodiversity in Iran has declined due to natural and human causes. Some species, such as the Lorestani salamander, the black bear, and the cave blindfish, are at risk of extinction. The cave blindfish is found only in Iran. Referencing reliable sources on the state of biodiversity in the province where you live, write an article offering suggestions for conserving its natural habitats and their inhabitants.</p>
	SDR Publishing (5th Grade, p. 151)	MoNE Publications (9th Grade, p. 173)
Deforestation	<p>All environmental issues affect every living being on Earth. Factors such as deforestation, environmental pollution, desertification, and erosion have a negative impact on ecosystems. Please analyze the potential state of biodiversity in the ecosystems shown in the images below (Figure 6.3). How might organisms in an ecosystem affected by a fire be impacted by the fire (Figure 6.4)? Let's discuss this with our classmates.</p> 	<p>From tree to paper Among the components of a tree, only the trunk and sturdy stem and the wooden branches of mature trees are suitable for making paper. In the diagrams below, the various stages of converting a tree into paper are shown. With reference to them and the information you have gathered about each stage, discuss in the class; then answer the questions.</p> 
	<p>Figure 6.3-6.4: Forest ecosystem-Burned forest ecosystem SDR Publishing (5th Grade, p. 146)</p>	MoNE Publications (6th Grade, p. 11)

Table 4. Cont.

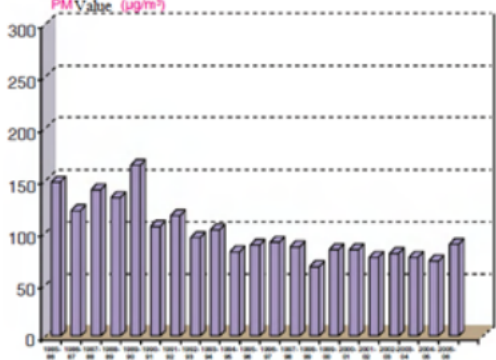



Subject	Türkiye	Iran
Air Pollution	<p>In Ankara, the air pollution level measured in the air was 1,300 units in 1980, but this figure dropped to 1,000 in 1981. By 1984, when natural gas began to be used, this level had fallen to around 250. Natural gas was first introduced in Ankara in 1984 and in Istanbul in 1992. As of 2023, it is in use in 81 provincial centers. Refer to Figure 4.1 to compare the environmental impact of natural gas with that of other fossil fuels. As can be seen from Figure 4.1, there has been a decrease in air pollution in the province of Ankara following the introduction of natural gas.</p>  <p>Note: PM (Particulate Matter) is a unit of measurement for particles in the air.</p> <p>Figure 4.1: Air pollution levels in Ankara Province by year</p> <p>Gün Publishing (6th Grade, p. 163)</p>	<p>The air must be clean.</p>  <p>What other things do you know that pollute the air?</p> <p>MoNE Publications (1st Grade, p. 69)</p>
Water Pollution (Oceans, seas, lakes, and rivers) and Scarcity (clean water)	<p>Recycling (Figure 4.47) contributes to the national economy in two distinct ways. One is the reduced consumption of resources. The benefits are particularly significant when raw materials are imported. In this way, the money that would have been spent on imports remains within the country. The other benefit is that it provides employment opportunities for people.</p>  <p>Figure 4.47 a. Wastewater discharged indiscriminately into the environment b. Wastewater treatment plant</p> <p>Ferman Publishing (7th Grade, p. 137)</p>	<p>In the past, it was thought that discharging sewage into rivers had no impact on pollution, as rivers were abundant in water. However, it has now been proven that even the slightest pollution in rivers leads to countless environmental problems. As an integral part of the environment and the primary source of water for drinking, agriculture and industry, rivers require greater protection and attention.</p>  <p>Test yourself</p> <p>In your opinion, what are the most significant sources of river pollution? What problems does river pollution cause?</p> <p>MoNE Publications (7th Grade, p. 53)</p>

Table 4. Cont.

Subject	Türkiye	Iran
Food Waste	<p>Vegetables and fruits account for approximately half of all household food waste. This also represents a significant economic loss. In addition to the economic loss, food that is wasted and discarded into the environment also contributes to environmental pollution (Figure 6.7). To prevent food waste, we should buy only as much food as we need. We should take care to consume the food we buy before it spoils. We should place foods with expiring expiration dates on the front shelves of our refrigerators and consume them first.</p>  <p>Figure 6.7. An example of food waste Pasifik Publishing (4th Grade, p. 218)</p>	<p>What is your contribution to waste recycling? We produce large quantities of metal, plastic and paper waste every day. If we leave this waste in the natural environment, it will harm the ecosystem. By recycling dry waste, such as metal cans, plastic containers and discarded paper, we can maintain a clean environment. In doing so, we preserve natural resources for the future and prevent environmental destruction.</p>  <p>For recycling waste: I collect paper waste separately. My family and I put drink cans, fruit juice cans and food tins into a separate bin, and then we deliver these sorted, recyclable wastes to dry waste collection centres. MoNE Publications (4th Grade, p. 66)</p>
Plastic, Metal, Glass, Textiles, Paper, etc., Waste	<p>Waste materials are sorted by type and then subjected to recycling processes. For this reason, separate collection bins have been established for recyclable items. This is because unsorted waste can contaminate other materials, which in turn makes it difficult to recycle certain types of waste. Additionally, waste materials disposed of without being sorted cause the recycling process to take longer and result in the expenditure of more labor and energy. Discarded books, scrap metal cans, plastic bottles, and glass bottles are some of the materials that can be recycled. Below is a list of some of the materials that can be placed in the recycling bin (Figure 7.1.2).</p>  <p>Figure 7.1.2: Recycling bins MoNE Publications Maarif Model (5th Grade, p. 141)</p>	<p>I pledge to protect God's natural resources and prevent harm to humans, animals and plants: I do not leave rubbish in nature. In nature, I do not move stones for no reason. I don't, because some small creatures live under the stones. What can you do to protect God's natural resources?</p>  <p>MoNE Publications (4th Grade, p. 58)</p>

4.2. Findings on Whether the Content Structures of Environmental Topics in Science Textbooks in Türkiye and Iran

Table 5 presents the findings describing the content structures of environmental topics included in the science textbooks used in Türkiye.

At the primary and middle levels in Türkiye, the content structures of environmental topics in science textbooks are presented in a balanced manner through both visual (V) and textual (T) formats (Table 5). Most of

these topics are addressed within local (L) or unclear (U) contexts. Data usage was identified in seven different environmental themes, while nine themes demonstrated depth of content and included scientific and technological explanations. The connection between environment, economy, and sustainability was emphasized in thirteen themes. Furthermore, fifteen themes contained content offering solution proposals to environmental problems. Four environmental topics were associated with cultural and social factors, and thirteen themes highlighted environmental awareness and responsibility for the future. Similarly, thirteen themes included examples of student activities or environmentally responsible behaviors. In addition, it was observed that the themes “Overfishing”, “Biodiversity Loss”, and “Melting Glaciers and Rising Sea Levels” were not addressed in Türkiye science textbooks, while the theme “Deforestation” was covered rather inadequately in terms of content codes.

Table 5. Findings of the Descriptive Analysis of Environmental Topics in Primary and Middle School Science Textbooks in Türkiye.

Environmental Theme	Grade Level	Content Presentation Format	Context of the Environment Issue	Code							Number of Codes Addressed in Topics (n)	
				Data Usage	Depth of Content	Scientific and Technological Perspective	Environment-Economy-Sustainability Connection	Environmental Problems Solution Applications	Cultural and Social Factors	Future Perspective and Environmental Awareness		Student Participation and Practices
Global Warming	8	VT	G	✓	✓		✓	✓		✓		6
Climate Change	8	VT	L								✓	1
Overfishing												0
Biodiversity Loss												0
Melting Glaciers and Rising Sea Levels												0
Deforestation	3	VT	U					✓				1
Air Pollution	3	VT	U			✓		✓				2
	6	VT	U	✓			✓	✓	✓	✓	✓	6
Water Pollution (Oceans, Seas, Lakes, and Rivers) and Scarcity (Clean Water)	3	VT	U					✓				1
	4	VT	U					✓				4
	7	V	U		✓	✓		✓		✓	✓	6
Soil Pollution and Loss	6	VT	U				✓					1
Food Waste and Waste Oil	4	VT	U	✓	✓		✓	✓		✓	✓	6
	5	V	U			✓	✓	✓		✓	✓	5
	7	VT	L	✓	✓	✓	✓	✓	✓	✓	✓	8
Plastic Waste, Paper, Textiles, Glass, Metal, etc.	3	V	U					✓				2
	4	VT	U		✓	✓		✓				6
	5	V	U	✓	✓	✓		✓				8
	7	VT	L	✓	✓	✓		✓	✓			7
	8	VT	U	✓	✓	✓		✓				7
Ozone Layer Depletion	8	VT	G		✓	✓	✓			✓		4
Frequency of codes used across all grade levels (f)				7	9	9	13	15	4	13	13	

Note: Content Presentation Format: V: Visual, T: Text; Context of Environmental Issues: G: Global, L: Local, U: Unclear.

Table 6 presents the findings describing the content structures of environmental topics included in the science textbooks used in Iran.

Table 6. Findings of the Descriptive Analysis of Environmental Topics in Primary and Middle School Science Textbooks in Iran.

Environmental Theme	Grade Level	Content Presentation Format	Context of the Environment Issue	Code							Number of Codes Addressed in Topics (n)	
				Data Usage	Depth of Content	Scientific and Technological Perspective	Environment-Economy-Sustainability Connection	Environmental Problems Solution Applications	Cultural and Social Factors	Future Perspective and Environmental Awareness		Student Participation and Practices
Global Warming	9	V	U								✓	1
Climate Change												0
Overfishing												0
Biodiversity Loss	4	T	G								✓	1
	4	V	L				✓	✓			✓	3
	7	VT	L					✓			✓	1
	9	T	G	✓		✓		✓			✓	4
	9	T	U				✓				✓	2
Melting Glaciers and Sea Level Rise	9	T	L								✓	1
	9	VT	G		✓	✓		✓		✓	✓	5

Table 6. Cont.

Environmental Theme	Grade Level	Content Presentation Format	Context of the Environment Issue	Code							Number of Codes Addressed in Topics (n)	
				Data Usage	Depth of Content	Scientific and Technological Perspective	Environment-Economy-Sustainability Connection	Environmental Problems Solution Applications	Cultural and Social Factors	Future Perspective and Environmental Awareness		Student Participation and Practices
Deforestation	6	V	U	✓			✓	✓		✓		4
Air Pollution	1	V	L								✓	1
	2	V	L								✓	1
	2	V	L									0
Water Pollution (Rivers, Lakes, Streams, Groundwater) and Scarcity Ocean and Sea Pollution	1	VT	L							✓	✓	2
	1	V	L									0
	2	V	L									0
	2	V	L				✓			✓		2
	2	V	L			✓	✓	✓				1
	7	VT	L				✓	✓				3
Soil Pollution and Loss	7	V	U									0
	9	VT	L				✓					1
	5	V	L								✓	1
Food Waste and Waste Oil	2	V	L									1
	4	T	U				✓	✓			✓	3
Plastic, Metal, Glass, Textiles, Paper, etc., Waste	2	V	L									1
	4	VT	L									1
	4	T	U				✓	✓			✓	3
	4	VT	G				✓	✓				2
	4	VT	U				✓	✓			✓	3
Ozone Layer Depletion	9	V	L							✓	✓	2
Frequency of codes used across all grade levels (f)				2	1	3	10	13	0	8	13	0

Note: Content Presentation Format: V: Visual, T: Text; Context of Environmental Issues: G: Global, L: Local, U: Unclear.

In the Iranian science textbooks, the content structure of environmental topics is predominantly visual, with limited use of textual explanations (Table 6). The topics are generally presented at the local (L) level, while global environmental issues are addressed only in a few instances. Data usage was observed in only two environmental themes, and depth of content was identified in just one theme. Three themes included scientific and technological explanations. The connection between environment, economy, and sustainability was established in ten themes. Furthermore, thirteen themes contained content related to solutions for environmental problems. The Iranian science textbooks were found to be completely lacking in addressing environmental topics based on cultural and social factors. Eight themes included content emphasizing future perspectives and environmental awareness, and thirteen themes involved examples of student participation and practical applications. Additionally, it was observed that the themes “Climate Change”, “Overfishing”, and “Ozone Layer Depletion” were not addressed in Iranian science textbooks, while the themes “Global Warming” and “Air Pollution” contained only a limited number of content codes. Moreover, many themes failed to include the majority of the content codes identified in the coding framework.

Figure 1 shows a comparison of the content codes related to environmental topics in science textbooks in Türkiye and Iran from the perspective of primary and middle schools.

In Türkiye, environmental themes at the primary school level were most frequently represented by the codes “Environmental Problem-Solving Applications” (f = 6), “Future Perspective and Environmental Awareness” (f = 4), and “Student Participation and Practices” (f = 4), while the code “Cultural and Social Factors” did not appear at all (f = 0). At the middle level, both the diversity and frequency of codes increased significantly. The most dominant code was “Environment-Economy-Sustainability Connection” (f = 11), followed by “Problem-Solving Applications” (f = 9), “Future Awareness” (f = 9), and “Student Participation” (f = 9). Almost all codes were represented at this level. Overall, environmental topics in Türkiye are becoming more content-rich from primary to middle education. In particular, themes emphasizing sustainability, future perspectives, environmental awareness, and active student participation stand out in the middle textbooks. In the Iranian primary school textbooks, the dominant codes were “Problem-Solving Applications” (f = 10), “Student Participation” (f = 7), and “Environment-Economy-Sustainability Connection” (f = 7), with “Future Awareness” (f = 5) also being notable. The code “Cultural and Social Factors” was entirely absent (f = 0). However, in the middle textbooks, the diversity of codes decreased, and generally lower frequencies were observed. Except for “Student Participation and Practices” (f = 6), other codes were either scarcely represented or entirely absent. In contrast to Türkiye, the trend in Iran was the opposite: environmental content in the primary school textbooks was more comprehensive and activity-based, whereas at the middle level, the scope

of the content decreased and became more superficial.

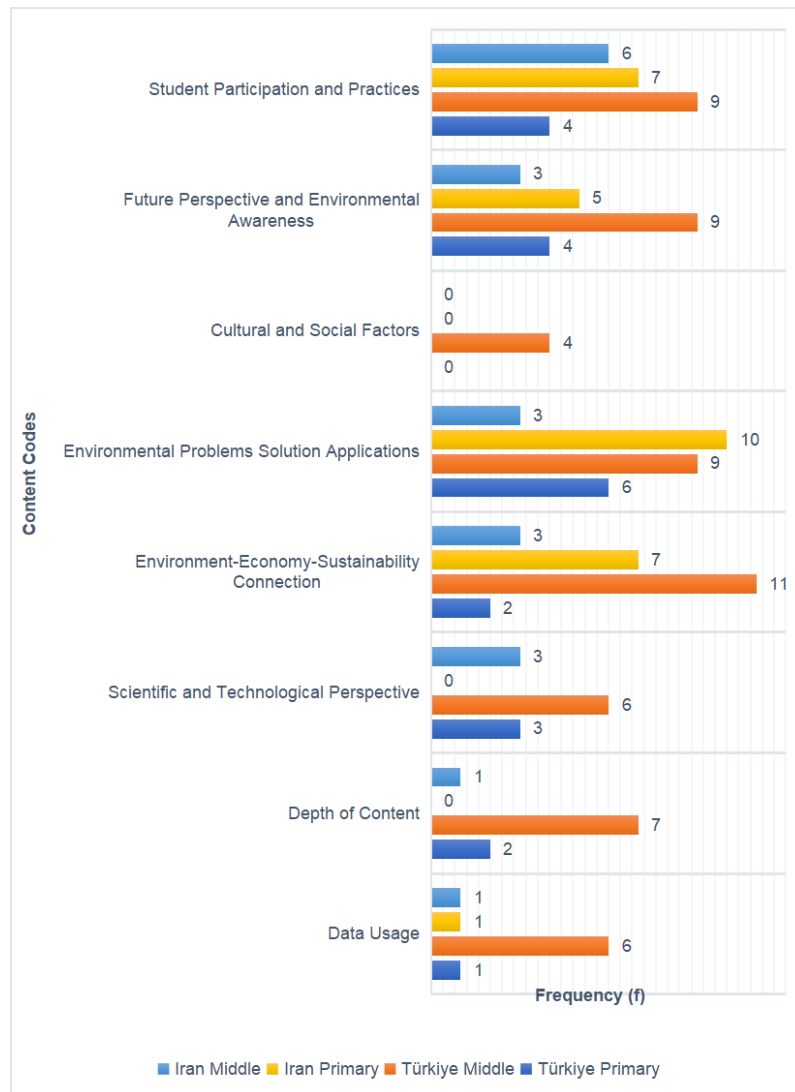


Figure 1. Frequency of Content Codes for Environmental Themes in Science Textbooks in Türkiye and Iran.

Findings based on educational level regarding subject-based content codes used in environmental themes in Türkiye and Iranian science textbooks are shown in **Figure 2**.

In terms of the number of content codes covered by environmental topics, the Türkiye science textbooks show that “Plastic Waste, etc.” (middle, n = 22; primary, n = 8), “Food Waste” (middle, n = 13; primary, n = 6), and “Water Pollution/Scarcity” (middle, n = 5; primary, n = 6) are the topics containing the highest number of codes. The topics that were not addressed at all in the primary school textbooks were “Global Warming” and “Climate Change”. At the middle level, the diversity of codes across topics increased significantly. In Türkiye, the environmental topic codes were predominantly concentrated around “waste management” and “consumer awareness”, with a considerable increase in variety observed at the middle level. In Iran, the environmental topics containing the highest number of codes were “Biodiversity Loss” (primary, n = 4; middle, n = 8), “Melting Glaciers and Sea Level Rise” (middle, n = 5), “Water Pollution/Scarcity” (primary, n = 5; middle, n = 4), and “Plastic Waste” (primary, n = 10; middle, n = 2). Certain topics such as “Climate Change”, “Overfishing”, and “Ozone Layer Depletion” were not addressed at all in the textbooks. Some topics appeared at different grade levels, but the continuity between primary and middle education was weak. Environmental themes in Iranian textbooks were primarily centered around “biodiversity” and “water resources”, while global issues such as “waste management” were limited in scope. When the science

textbooks of Türkiye and Iran are compared overall, the dominant themes in Türkiye are “waste management”, “water pollution”, and “food waste”, whereas in Iran they are “biodiversity” and “water pollution”. Global issues such as “global warming” and “climate change” are emphasized in Türkiye, particularly at the middle level, but are either limited or entirely absent in Iran. In terms of content codes, Türkiye shows a significant increase in code variety from primary to middle education, whereas in Iran the primary school textbooks contain a higher number of codes overall. While Türkiye textbooks exhibit broader and more diverse coverage of environmental topics, Iran textbooks show content richness in specific areas but remain limited in scope. In Türkiye, the educational focus of environmental topics in textbooks is primarily on “practical applications and consumer awareness”, whereas in Iran, the emphasis is on “natural resource conservation and environmental awareness”.

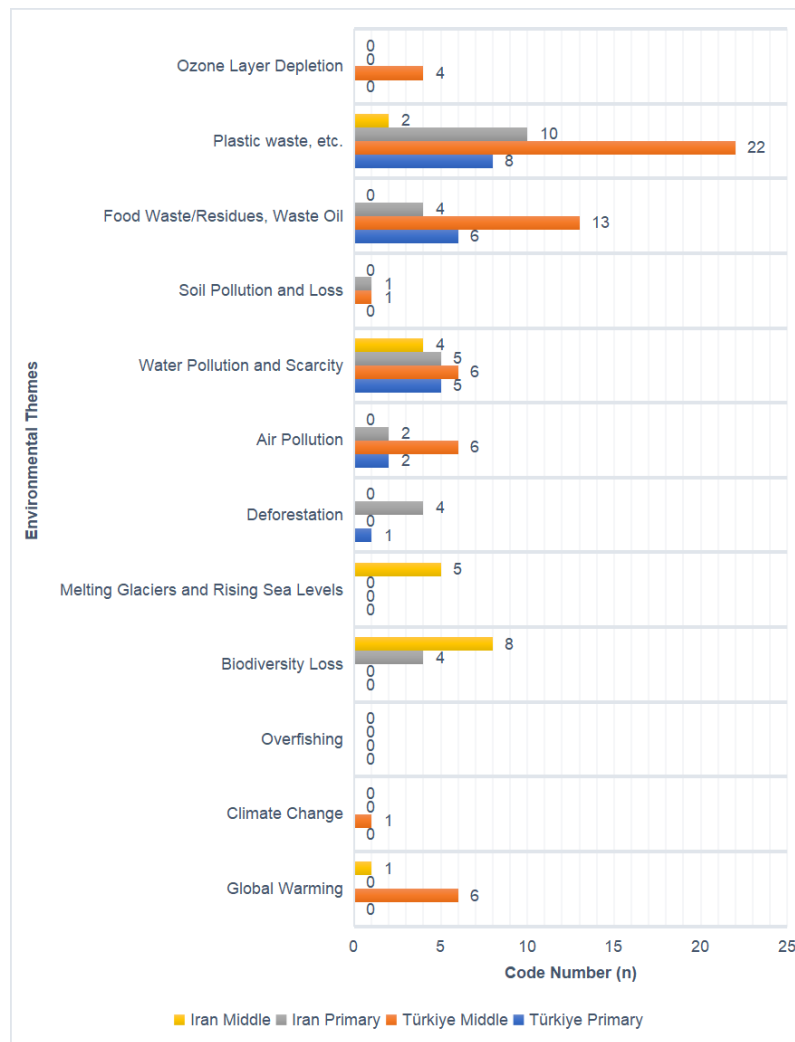


Figure 2. Number of Content Codes Used Based on Environmental Themes in Science Textbooks in Türkiye and Iran.

5. Discussion

In this study, the environmental topics included in the science textbooks of Türkiye and Iran were compared in terms of their content structures. The findings of the study point to significant differences in content regarding how Türkiye and Iran address environmental issues in their primary and middle school science textbooks. The ways in which the two countries address environmental issues vary significantly by grade level. While Türkiye’s textbooks feature content that is concentrated in the middle school years, Iran’s textbooks include a richer coverage of these topics in the primary school years. This finding suggests that there are significant differences between

the two countries regarding the continuity of environmental education content across primary and middle school levels. However, it has been observed that the distribution of environmental problem topics across both educational levels in Turkish textbooks is more systematic compared to Iran. In Turkish textbooks, content addressing problem-solving and fostering sustainability awareness is more prominently featured. This finding suggests that the goal of fostering environmental protection awareness is supported from the early stages of education in Turkish textbooks. Furthermore, it is evident that content addressing the connection between the environment and sustainability one of today's most pressing issues is prominently featured in Turkish textbooks. This suggests that science classes in Türkiye can make a significant contribution to helping students embrace environmental issues from an early age with a focus on sustainability. Furthermore, an examination of curriculum changes implemented in Türkiye in recent years reveals that textbook content aligned with learning objectives consistent with the goal of sustainable development is already in place [42,43].

There are also significant research findings that support these results [44,45]. These studies have shown that the science curriculum in Türkiye focuses on significantly enhancing students' understanding of environmental issues. However, it has been observed that while the connection between the environment and sustainability is fundamentally present in Iranian textbooks at the primary school level, it weakens significantly at the middle school level. Furthermore, it has been observed that there is a significant decline in the inclusion of codes representing the richness of content related to environmental issues in Iranian textbooks during the middle school period. It is clearly evident that an objective focused on reflecting environmental education based on nature conservation in textbooks was adopted during the primary school period. However, upon transitioning to the middle school level, it is observed that curriculum content addressing global-scale environmental threats affecting the entire world (e.g., global warming) is weakly represented in the textbooks. This indicates that textbooks in Iran, which serve as an effective resource for raising student awareness of environmental issues at an early age, primarily serve a purpose rooted in a local context. There is a limited number of research findings supporting this situation [46]. These studies indicate that environmental education in Iran is intended to be more prominent for students at an early age, but that its emphasis weakens in later stages. It can be said that this situation is reflected in Iranian textbooks. It is noteworthy that both Turkish and Iranian textbooks lack the integration of a contextual framework that links environmental issues to their social and cultural dimensions to enhance students' understanding. In particular, it is evident that both countries have been quite inadequate in reflecting their traditional ecological way of life within the context of environmental problems in textbook content. In particular, the importance of the cultural and social context in instilling environmental awareness in individuals at an early age has been emphasized in various studies [47,48]. Therefore, reflecting curriculum content that is consistent with cultural elements in textbooks is crucial as a means of fostering an environmentally conscious attitude. This contributes to supporting students' sense of responsibility toward the environment.

It is evident that the richness of content related to environmental issues varies significantly between primary and middle school textbooks in Türkiye and Iran. In Türkiye, the richness of content on environmental issues related to "waste" stands out distinctly in both primary and middle school textbooks. Furthermore, it has been revealed that content addressing "pollution" and "scarcity" issues related to "water" is covered more comprehensively in textbooks. This indicates that textbooks in Türkiye support the effort to instill an understanding of sustainable consumption in students. Although the treatment of global-scale issues such as "climate change" shows improvement at the middle school level, the weakness of this content in textbooks remains notable. This indicates that improvements are needed in how environmental problems are addressed on a global scale within Turkish textbooks. In Iranian textbooks, however, it is evident that the topic of "biodiversity" features content richness at both the primary and middle school levels. Furthermore, it is evident that Iranian primary school textbooks include content that emphasizes the concept of nature conservation. This indicates that textbooks possess significant content diversity in instilling an awareness of nature in students at an early stage. In contrast, the absence of content addressing global-scale environmental issues such as "Global Warming" and "Ozone Layer Depletion" across all educational levels in Iranian textbooks is one of the most striking findings. This reveals that environmental education is heavily focused on the local context, and this focus is significantly reflected in the textbooks. In Türkiye, environmental issues are seen to be reflected in textbooks through the lens of sustainable living to a greater extent compared to Iran. The primary reason for this difference can be attributed to the national political agenda and national priorities. It can also be argued that in recent years in Türkiye, policies addressing environmental issues have played a

decisive role in shaping the content of textbooks [42]. This is because the latest science curriculum initiatives in Türkiye explicitly emphasize the relationship between environmental problems and sustainability. In contrast, in Iran, the curriculum appears to place greater emphasis on the conservation of natural resources [49]. This situation indicates that environmental education in both countries is directly shaped by national objectives. In summary, it can be said that at the primary education level in Türkiye, the content of textbooks regarding environmental issues is richer compared to Iran and is presented with a stronger connection to the dimension of sustainability. In Iran, however, it is evident that the content of environmental issues is highlighted with a focus on nature conservation.

6. Conclusion

This study provides important insights into the quality of textbooks that serve as the primary instructional materials in science education regarding environmental issues in two countries with distinct educational cultures. In particular, it presents significant findings that should be of interest to science education researchers, teachers, instructional material developers, and educational planners in these two countries. Given the scarcity of comparative studies in educational research, the findings of this study will make significant contributions to the relevant literature. It has been observed that there are significant differences in how environmental issues are addressed in textbooks within the context of science education in Türkiye and Iran two neighboring countries where cultural exchanges have been frequent for centuries. It was observed that the content of textbooks in Türkiye is considerably more comprehensive and effective regarding this specific topic compared to Iran. In Turkish textbooks, the codes established for high-quality scientific content within this subject area were found to be more extensively incorporated. It was also revealed that the intensity of environmental problem-related content in textbooks increases as the educational level rises in Türkiye. In Iranian textbooks, it has been observed that the content is more intensive in the early stages of primary education and becomes simpler at higher levels. However, it has become clear that both countries need a new framework for incorporating content related to environmental issues into their science textbooks.

7. Limitations

This study compares the content related to environmental issues in science textbooks taught at the same educational levels in the two countries. In addition to the quality of this content in the textbooks, other variables in the teaching process such as teacher quality, pedagogical approaches, and other instructional materials should not be overlooked as factors determining the success and quality of teaching these topics in both countries.

8. Recommendations

Based on the findings of this study, our primary recommendation is that both countries revise the content of their science textbooks regarding environmental issues. In particular, the content should be restructured to be more balanced and inclusive, taking into account current conditions and educational levels. Efforts should be made to develop content that incorporates international environmental policies when revising textbooks. Iranian textbooks must be revised to include content based on more up-to-date scientific data and developments.

Author Contributions

Conceptualization, T.I.; design, T.I. and A.K.; data collection and processing, T.I.; analysis and interpretation, T.I. and H.A.; literature review, T.I., H.A. and A.K.; writing, T.I. and H.A. All authors have read and agreed to the published version of the manuscript.

Funding

The authors declare that this study has received no financial support.

Institutional Review Board Statement

Because the research was conducted solely using publicly available print and digital textbooks, it did not require human participants. Therefore, ethics committee approval was not required, and the research process was

conducted in accordance with the principles of scientific research and publication ethics.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data used in this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors have no conflict of interest.

AI Use Statement

During the preparation of this manuscript, the authors used ChatGPT and DeepL solely for language refinement. No AI tools were used for data analysis, interpretation, or generation of scientific content. All outputs were critically reviewed and edited by the authors. The authors take full responsibility for the integrity and accuracy of the work.

References

1. Hariram, N.P.; Mekha, K.B.; Suganthan, V.; et al. Sustainalism: An Integrated Socio-Economic-Environmental Model to Address Sustainable Development and Sustainability. *Sustainability* **2023**, *15*, 10682.
2. Ahmad, F.; Saeed, Q.; Shah, S.M.U.; et al. Environmental Sustainability: Challenges and Approaches. In *Natural Resources Conservation and Advances for Sustainability*; Jhariya, M.K., Meena, R.S., Banerjee, A., et al., Eds.; Elsevier: Amsterdam, The Netherlands, 2022; pp. 243–270.
3. Awewomom, J.; Dzeble, F.; Takyi, Y.D.; et al. Addressing Global Environmental Pollution Using Environmental Control Techniques: A Focus on Environmental Policy and Preventive Environmental Management. *Discov. Environ.* **2024**, *2*, 1–20.
4. Kolawole, A.S.; Iyiola, A.O. Environmental Pollution: Threats, Impact on Biodiversity, and Protection Strategies. In *Sustainable Utilization and Conservation of Africa's Biological Resources and Environment*; Izah, S.C., Ogwu, M.C., Eds.; Springer: Singapore, 2023; pp. 377–409.
5. Ogidi, O.I.; Akpan, U.M. Aquatic Biodiversity Loss: Impacts of Pollution and Anthropogenic Activities and Strategies for Conservation. In *Biodiversity in Africa: Potentials, Threats and Conservation*; Izah, S.C., Ed.; Springer: Singapore, 2022; pp. 421–448.
6. Farrukh, M.; Ansari, N.; Raza, A.; et al. Fostering Employee's Pro-Environmental Behavior through Green Transformational Leadership, Green Human Resource Management and Environmental Knowledge. *Technol. Forecast. Soc. Change.* **2022**, *179*, 121643.
7. Gomes, S.; Lopes, J.M.; Nogueira, S. Willingness to Pay More for Green Products: A Critical Challenge for Gen Z. *J. Clean. Prod.* **2023**, *390*, 136092.
8. Lee, A. The Importance of Cultivating Awareness of Environmental Matters in Science Classrooms: A Cross-Regional Study. *Aust. J. Environ. Educ.* **2023**, *39*, 467–491.
9. Biström, E.; Lundström, R. Textbooks and Action Competence for Sustainable Development: An Analysis of Swedish Lower Middle Level Textbooks in Geography and Biology. *Environ. Educ. Res.* **2020**, *27*, 279–294.
10. Darayseh, A.; AlHawamdeh, B. Science Textbooks as an Education Resources for Sustainability: A Content Analysis. *Eurasia J. Math. Sci. Tech. Ed.* **2024**, *20*, em2383.
11. Boujemaa, A.; Silvia, C.; Adriana, V.; et al. Knowledge and Values in Science Textbooks Concerning Complexity in Ecological Systems and Environmental Problems: A Cross-Cultural Study on Middle School Manuals. *US-China Educ. Rev.* **2009**, *6*, 25–37.
12. Choi, S.; Niyogi, D.; Shepardson, D.P.; et al. Do Earth and Environmental Science Textbooks Promote Middle and High School Students' Conceptual Development about Climate Change? Textbooks' Consideration of Students' Misconceptions. *Bull. Am. Meteorol. Soc.* **2010**, *91*, 889–898.
13. Sharma, A.; Buxton, C.A. Human-Nature Relationships in School Science: A Critical Discourse Analysis of a Middle-Grade Science Textbook. *Sci. Educ.* **2015**, *99*, 260–281.
14. Lebanese American University. Available online: <https://laur.lau.edu.lb:8443/xmlui/handle/10725/13779> (accessed on 26 March 2025).

15. Gola, B. Is Formal Environmental Education Friendly to Nature? Environmental Ethics in Science Textbooks for Primary School Pupils in Poland. *Ethics Educ.* **2017**, *12*, 320–336.
16. Vojříř, K.; Svobodová, S. Environmental Literacy Curriculum: An Analysis of Science Textbooks for Lower Middle Education. *J. Biol. Educ.* **2024**, *59*, 799–817.
17. Morris, H. Socioscientific Issues and Multidisciplinarity in School Science Textbooks. *Int. J. Sci. Educ.* **2014**, *36*, 1137–1158.
18. Fonseca, R.P. The Impacts of Animal Farming: A Critical Review of Middle and High School Textbooks. *Cult. Stud. Sci. Educ.* **2023**, *18*, 829–852.
19. Özdemir, F. Opinions of Social Studies Teachers on Environmental Education Through Social Studies Curriculum and Textbooks. *Particip. Educ. Res.* **2022**, *9*, 486–501.
20. Lacin Simsek, C. Investigation of Environmental Topics in the Science and Technology Curriculum and Textbooks in Terms of Environmental Ethics and Aesthetics. *Educ. Sci. Theory Pract.* **2011**, *11*, 2252–2257.
21. Karimzadegan, H.; Meiboudia, H. Exploration of Environmental Literacy in Science Education Curriculum in Primary Schools in Iran. *Procedia Soc. Behav. Sci.* **2012**, *46*, 404–409.
22. Zamani, B.E.; Azimi, S.A.; Soleimani, N. Content Analysis of Primary Science Books by Using Soft Educational Technology to Teach Environmental Issues in Iran and Russia. *J. Environ. Educ. Sustain. Dev.* **2020**, *8*, 15–36.
23. Salmani, B.; Hakimzadeh, R.; Asgari, M.; et al. Environmental Education in Iranian School Curriculum, A content Analyses of Social Studies and Science Textbooks. *Int. J. Environ. Res.* **2015**, *9*, 151–156.
24. Najjari, R.; Darvish, M. Analysis of the Content of Iran's Fourth-Grade Textbooks Based on the Level of Attention to Green Management Components. *J. Environ. Educ. Sustain. Dev.* **2022**, *10*, 147–155.
25. Gülersoy, A.E.; Aydemir, N. Analysis of 4th Grade Science Textbooks in Terms of Sustainable Environmental Education. *Ankara Univ. J. Environ. Sci.* **2024**, *11*, 23–42.
26. Demirezen, S.; Kaya, E. Environmental Issues in Social Sciences and Sciences Curriculum and Textbooks. *J. Educ. New Approaches* **2022**, *5*, 240–265.
27. Koyuncu, S.; Köksal, E.A. Environmental Problems and Solutions in the 5th Grade Science Textbook. *Educ. Sci.* **2023**, *18*, 1–12.
28. Erten, S.; Köseođlu, P. Zero Waste Project in Middle School Science Course Books. *Milli Egitim J.* **2022**, *51*, 1085–1110.
29. Erbař, A.A. Global Warming and Climate Change in Primary School Curriculums and Textbooks. *Abant İzzet Baysal Univ. J. Fac. Educ.* **2023**, *23*, 728–746.
30. Derman, M.; Gurbuz, H. Environmental education in the science curriculum in different countries: Turkey, Australia, Singapore, Ireland, and Canada. *J. Educ. Sci. Environ. Health* **2018**, *4*, 129–141.
31. Zidny, R.; Sjöström, J.; Eilks, I. A Multi-Perspective Reflection on How Indigenous Knowledge and Related Ideas Can Improve Science Education for Sustainability. *Sci. Educ.* **2020**, *29*, 145–185.
32. Örnek, F.; Alaam, S. Five Essential Features of Scientific Inquiry in Bahraini Primary School Science Textbooks and Workbooks. *Sci. Educ.* **2025**, *34*, 1551–1599.
33. Bowen, G.A. Document Analysis as a Qualitative Research Method. *Qual. Res. J.* **2009**, *9*, 27–40.
34. Morgan, H. Conducting a Qualitative Document Analysis. *Qual. Rep.* **2022**, *27*, 64–77.
35. Halawa, S.; Hsu, Y.-S.; Zhang, W.-X. Inquiry Activity Design from Singaporean and Indonesian Physics Textbooks. *Sci. Educ.* **2024**, *33*, 581–607.
36. Ma, Y.; Wang, T.; Wang, J.; et al. A Comparative Study on Scientific Inquiry Activities of Chinese Science Textbooks in High Schools. *Res. Sci. Educ.* **2021**, *51*, 407–427.
37. Wan, D.; Lee, Y.-J. Coherence of Topics from Middle-School Integrated Science Textbooks from Taiwan and Korea. *Int. J. Sci. Math. Educ.* **2022**, *20*, 881–899.
38. Sandelowski, M.; Voils, C.I.; Knafl, G. On Quantitizing. *J. Mix. Methods Res.* **2009**, *3*, 208–222.
39. Saldaña, J. *The Coding Manual for Qualitative Researchers*, 4th ed.; Sage: Los Angeles, CA, USA, 2021; pp. 1–400.
40. Miles, M.B.; Huberman, M.A. *Qualitative Data Analysis: An Expanded Sourcebook*, 2nd ed.; Sage Publications: Thousand Oaks, CA, USA, 1994.
41. Creswell, J.W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th ed.; Sage Publications Ltd: Thousand Oaks, CA, USA, 2014.
42. Yilmaz Na, E. A Critical Analysis of Turkish Environmental Education and Climate Change Curriculum through Posner Curriculum Analysis Model. *J. Hum. Soc. Sci. Res.* **2026**, *15*, 1–21.
43. Karahasan, B.C.; Pinar, M. Climate Change and Spatial Agricultural Development in Turkey. *Rev. Dev. Econ.* **2023**, *27*, 1699–1720.

44. Bulut, U.; Atay-Polat, M.; Bulut, A.S. Environmental Deterioration, Renewable Energy, Natural Resource Rents, and Schooling in Türkiye: Does the Degree of Energy Transition Matter for Environmental Quality? *J. Environ. Manag.* **2024**, *365*, 121639.
45. Yücel, D.; Önal Çalışkan, İ. A Comparative Investigation of Environmental Literacy Dimensions in Science Curricula of Several Countries. *Particip. Educ. Res.* **2025**, *12*, 210-228.
46. Mousavi, N.; Ahmadi, S.; Sharifian Sani, M.; et al. Identifying Environmental Education Strategies for Children with an Emphasis on Children under Four Years Old: A Qualitative Study in Iran. *Heliyon*, **2024**, *10*, e37161.
47. Gürhan, E. Prospective Primary School Teachers' Perspectives on Environmental Education, Cultural Heritage, and Values Education: An Action Research Study. *Tarbiyah J. Ilmiah Kependidikan* **2025**, *14*, 41-50.
48. Oe, H.; Yamaoka, Y.; Ochiai, H. A Qualitative Assessment of Community Learning Initiatives for Environmental Awareness and Behaviour Change: Applying UNESCO Education for Sustainable Development (ESD) Framework. *Int. J. Environ. Res. Public Health* **2022**, *19*, 3528.
49. Ghanbari, S.; Jafari, M.; Eastin, I.; et al. Education of climate changes and evaluation among high school students in Iran. *Appl. Environ. Educ. Commun.* **2023**, *22*, 43-60.



Copyright © 2026 by the author(s). Published by UK Scientific Publishing Limited. This is an open access article under the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Publisher's Note: The views, opinions, and information presented in all publications are the sole responsibility of the respective authors and contributors, and do not necessarily reflect the views of UK Scientific Publishing Limited and/or its editors. UK Scientific Publishing Limited and/or its editors hereby disclaim any liability for any harm or damage to individuals or property arising from the implementation of ideas, methods, instructions, or products mentioned in the content.