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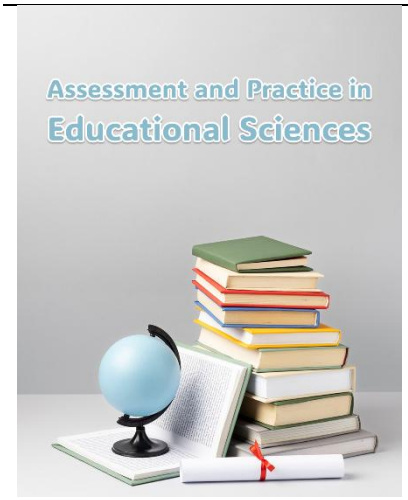

A Comparative Study of the Objectives, Teaching Methods, Educational Content, and Assessment Strategies in Environmental Education within the Curricula of Selected Countries

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ABSTRACT

This study aims to compare the goals, teaching methods, content, and assessment strategies of environmental education in the national curricula of Iran, the United States, Canada, and Finland to identify similarities, differences, and opportunities for improvement. The study employed a qualitative, comparative-descriptive design using George Bereday's four-stage model (description, interpretation, juxtaposition, and comparison). National curriculum documents, educational policy papers, research articles, and official reports from the four selected countries were purposefully sampled and analyzed. Data collection focused on primary and secondary education systems, with particular attention to environmental education content, objectives, pedagogical approaches, and evaluation methods. Credibility of the sources was ensured through internal and external validation, and data were analyzed using thematic comparison and content synthesis. All countries share a strong emphasis on fostering environmental responsibility, resource conservation, and cognitive understanding of environmental systems. The U.S., Canada, and Finland apply integrated goals encompassing knowledge, attitudes, and skills, while Iran lacks a clear emphasis on skill development. Teaching strategies across all countries prioritize active and experiential learning, though methods such as simulation, digital media, and lab-based inquiry are more prevalent in Western systems. Content related to ecology, sustainability, and environmental threats is uniformly present, with only minor terminological differences. Assessment practices vary: Finland favors qualitative feedback, the U.S. emphasizes standardized testing, and Canada and Iran apply performance-based and innovative evaluative methods. While there is global consensus on the core components of environmental education, national approaches vary according to cultural, structural, and technological contexts. The study highlights the need for Iran to integrate more practical skill-building, modernize assessment tools, and adopt a more interdisciplinary and student-centered approach. Comparative insights from leading systems offer valuable guidance for improving environmental education within Iran and similar contexts.

Keywords: Environmental Education, Curriculum Comparison, Teaching Methods, Educational Assessment, Sustainable Development

Introduction

The accelerating environmental crises of the 21st century—ranging from climate change and biodiversity loss to pollution and resource depletion—have underscored the critical role of education in shaping environmentally responsible behaviors. In this context, **environmental education (EE)** has emerged as a strategic response to foster environmental awareness, ecological

literacy, and pro-environmental actions among younger generations (1). Over the past decades, scholars and policymakers alike have increasingly recognized that the integration of environmental themes into formal curricula is not merely an option, but a necessity to equip students with the competencies required to address complex ecological challenges (2). As such, comparative studies examining how countries incorporate environmental education into their educational systems are vital for understanding global trends, pedagogical innovations, and existing disparities.

Environmental education is not monolithic. Its goals, content, teaching strategies, and assessment methods vary widely depending on national priorities, cultural contexts, and policy frameworks (3, 4). In developed countries such as Finland and Canada, EE is often integrated across disciplines and supported by national education policies emphasizing sustainability, whereas in other contexts—such as Iran—the presence of EE in the formal curriculum remains fragmented or underdeveloped (5, 6). Despite these variations, there is growing international consensus that EE must move beyond the mere transmission of knowledge to foster critical thinking, systems understanding, and active engagement (7, 8). To achieve this, EE needs to be supported by appropriate pedagogical methods, context-sensitive content, and robust evaluation mechanisms (9, 10).

Comparative research on environmental education has increased substantially in recent years, providing a clearer picture of how different nations implement EE in practice. For instance, studies have shown that students in countries where EE is systemically embedded in the curriculum display higher levels of ecological literacy and behavioral change (11, 12). Moreover, interdisciplinary and localized approaches—particularly those that integrate local cultural and ecological knowledge—are seen as especially effective in enhancing learner engagement and relevance (13, 14). However, challenges remain, especially in developing countries, where lack of institutional support, outdated textbooks, insufficient teacher training, and inadequate assessment frameworks undermine the effectiveness of EE programs (15, 16).

Several researchers have emphasized the need for EE to be rooted in clear educational objectives that span cognitive, affective, and behavioral domains. This tri-dimensional approach ensures that students not only learn about environmental issues but also develop positive attitudes and practical skills to address them (17, 18). In countries like the United States and Canada, this model has been adopted in various forms, often supported by project-based learning, outdoor education, and technological tools such as digital simulations and virtual labs (2, 19). In contrast, in countries such as Iran, while policy documents such as the Fundamental Reform Document of Education have highlighted the importance of EE, the practical integration of these goals into teaching methods and materials remains inconsistent and highly dependent on individual schools or instructors (5, 6).

Effective environmental education must also consider the socio-cultural context of learners. For example, studies from Indonesia and Mexico show that EE rooted in local ecological values and traditional practices can lead to stronger community engagement and sustainable behaviors (20, 21). Furthermore, environmental education in ecotourism contexts has demonstrated the power of experiential learning in shaping environmental attitudes among both students and adults (22, 23). This aligns with findings from Huang et al. (2023), who noted that environmental education programs in ecotourism destinations lead to measurable improvements in participants' environmental knowledge and behaviors (24).

The evaluation of EE outcomes is another area of increasing scholarly attention. Traditional assessments often fail to capture the complexity of environmental learning, which involves not only knowledge acquisition but also attitude formation and behavior change (25, 26). As such, researchers advocate for performance-based and formative assessments that include portfolios, peer reviews, project presentations, and reflective practices (27, 28). In Canada, for instance, assessment practices include student-led conferences and written reflections, while in Finland, non-quantitative evaluations are emphasized to foster self-assessment and critical thinking (2, 8). In Iran, more innovative evaluation strategies such as weekly reviews and pyramid discussions are being introduced, though these remain sporadic and are often not formally institutionalized (5).

A fundamental challenge in the comparative analysis of EE curricula lies in the differences in policy environments and educational governance. In centralized systems like Iran, curriculum changes require national-level endorsement, making reform slow and often politically mediated (14). By contrast, decentralized systems such as Canada or the U.S. allow for greater flexibility and innovation at the provincial or state level (3, 25). Moreover, while some countries have adopted EE as a cross-curricular priority, others have introduced it as a standalone subject or elective, resulting in significant variations in depth, integration, and student exposure (7, 26).

There is also increasing recognition that environmental education should not be limited to formal school settings. Informal and non-formal educational environments—such as museums, science centers, community-based programs, and online platforms—play a crucial role in extending EE beyond the classroom (2, 20). Particularly in the digital era, online platforms and multimedia tools have opened new avenues for interactive and personalized environmental learning (10, 19). These tools, however, must be grounded in pedagogical principles to ensure they contribute meaningfully to learning outcomes (2).

In the Iranian context, researchers have highlighted the gaps between policy intentions and actual classroom implementation of EE. Studies show that although national documents recognize the importance of environmental education, there is insufficient integration in textbooks, lack of practical content, and limited teacher training (4, 5). Addressing these issues requires a systemic approach that includes curriculum reform, teacher education, and the development of culturally appropriate educational materials (14, 29).

Ultimately, environmental education must be seen as both an educational and social investment—one that cultivates not just knowledge but the values, attitudes, and skills necessary for sustainability and environmental stewardship. Comparative studies such as this provide valuable insights into best practices and gaps, guiding national reforms and encouraging global alignment around sustainability goals (11, 30). By drawing on cross-national experiences, educators and policymakers can better understand how to construct curricula that are responsive to ecological realities and pedagogically effective for diverse learners (8, 18).

In this study, the environmental education curricula of Iran, Canada, the United States, and Finland are analyzed comparatively in terms of their goals, teaching strategies, content, and assessment practices.

Methods and Materials

This study is categorized as an applied descriptive research, oriented toward resolving a specific, practical educational issue by providing comparative insights into environmental education across different national curricula. The research approach is qualitative and comparative, focusing on providing a coherent, objective, and evidence-based depiction of the environmental education components within the educational systems of Iran, Canada, the United States, and Finland. These countries were intentionally selected due to their exemplary status in global education rankings and their distinct curriculum approaches, especially Finland, which is internationally recognized as having one of the most effective education systems in the world. Furthermore, to ensure global representation, the countries were chosen from different continents with the additional criterion of English-language accessibility to curriculum documents.

The population under study includes the national school curricula of the aforementioned countries, with an emphasis on environmental education. Purposeful sampling was used to select relevant curriculum documents, policy papers, and educational guides, based on predefined criteria such as relevance to integrated curriculum approaches and demonstrated attention to environmental topics. The Iranian documents were drawn from the National Curriculum Document, the Fundamental Reform Document of Education, science and social studies curriculum guides, and research studies published in Persian. For Canada, the United States, and Finland, a wide range of official policy documents, ministry publications, academic

theses, and educational research articles in English were used. Notably, none of the countries had a standalone subject titled "Environmental Education" in their school curricula; therefore, related content was extracted from existing curriculum materials and scholarly studies focused on the integration of environmental themes into various subjects. The final selection of sources represents a curated set of the most authoritative and recent documents available for each country.

The primary tool for data collection was documentary analysis, involving the retrieval and review of policy documents, official curriculum guides, national education strategies, and relevant academic literature. In the case of Iran, documents such as the Fundamental Reform Document of Education (2011), the National Curriculum (2012), science curriculum guides, geography textbooks, and published environmental education strategies were analyzed. For the United States, sources included curriculum frameworks like the *Social Studies Curriculum Framework (2014)*, *Environmental Education Curriculum by Feldman and Nation (2022)*, and various policy and program development guides from state education departments. The Canadian documents encompassed materials from the Ministry of Education in British Columbia and Ontario, including the *Environmental Learning and Experience Guide (2017)*, as well as academic theses addressing environmental education practices. Finland's data were collected from studies such as *Environmental Education in Nature Schools (2009)* and the *Eco-Social Approach to Environmental Education (2023)*, alongside curriculum development plans and early childhood education sustainability frameworks.

The credibility of the collected documents was established through attention to their internal and external validity. Internal validity was ensured by evaluating the accuracy and relevance of the content, while external validity was assessed by confirming the authenticity and official nature of the documents used. Since these sources were primarily published by national education ministries, universities, or official research institutions, they were deemed inherently valid for the purpose of comparative educational research. Additional efforts were made to ensure translation accuracy and conceptual consistency across languages. Persian sources were cross-checked for conceptual equivalence with their English counterparts, and all translated content was reviewed by domain experts to ensure the reliability of the interpretations.

The analysis was conducted using the comparative descriptive analysis model based on George Bereday's four-stage framework. This model involves four progressive stages: description, interpretation, juxtaposition, and comparison. In the descriptive phase, data from each country were compiled through comprehensive note-taking from the documents, recording the main features related to the objectives, content, teaching methods, and assessment strategies in environmental education. These notes served as the foundational layer for subsequent analysis.

In the interpretation phase, the described information was critically examined to assess its coherence, validity, and educational significance. The aim at this stage was to move beyond surface-level summaries and begin to uncover the conceptual meanings embedded in each country's curriculum structure. Drawing on social science analytical frameworks, the interpretation allowed the researcher to identify underlying patterns, policy intentions, and implicit pedagogical values related to environmental education.

The third stage, juxtaposition, involved organizing and categorizing the interpreted data into parallel frameworks. This enabled the identification of thematically similar components and the systematic alignment of curriculum elements across the four countries. By doing so, the study established a foundation for direct comparisons of environmental education emphasis, methodologies, and assessment approaches.

In the final comparison stage, the researcher analyzed the similarities and differences between the selected countries, addressing the central research question regarding the extent to which environmental education is prioritized in the respective curricula. This stage involved structured comparative analysis based on predetermined thematic categories such as learning objectives, subject integration, interdisciplinary approaches, teaching methods (e.g., experiential learning, outdoor education),

and assessment practices. The comparative lens provided insights into the pedagogical diversity and shared challenges among the countries, highlighting best practices and areas for potential curriculum development in the Iranian context.

Ultimately, the four-phase Bereday model proved to be a rigorous and systematic method for analyzing the complex phenomenon of environmental education in varied educational systems. It enabled the researcher to draw meaningful conclusions about curriculum design, environmental literacy, and policy orientations in the countries studied, thereby contributing to a richer understanding of how environmental issues are conceptualized and operationalized in school curricula around the world.

Findings and Results

The findings of this comparative study are derived from the qualitative analysis of national curriculum documents and related educational literature from Iran, the United States, Canada, and Finland. Using Bereday's four-stage comparative model, similarities and differences in environmental education across the countries were systematically examined. The primary focus of the analysis was on the goals, content, teaching strategies, and assessment methods pertaining to environmental education. In this section, we present the comparative findings specifically related to the *goals of environmental education*. These findings highlight both commonalities and divergences in how countries articulate their environmental education objectives, with emphasis on pedagogical intentions, cognitive-emotional domains, and sociocultural perspectives embedded within their curricula.

Table 1. Comparative Analysis of Environmental Education Goals in Selected Countries

Similarities	Differences
All countries emphasize fostering a sense of responsibility toward environmental care and protection.	The United States, Finland, and Canada address educational goals across cognitive, affective, and skill domains, whereas Iran lacks focus on skill-based objectives.
Each country references the importance of understanding concepts like conservation and reducing excessive consumption of energy and natural resources.	Iran and the United States emphasize nurturing curiosity toward the environment, while this goal is not evident in Canada.
All curricula acknowledge the interrelationship between the natural and human environments, stressing the human impact of environmental degradation.	Iran, Finland, and the United States highlight the interconnection between science, technology, and the environment, whereas this linkage is not addressed in the Canadian curriculum.
	The U.S. and Canada promote problem-solving skills in addressing environmental issues, a component not found in Iran or Finland.
	Iran includes a distinct religious or moral perspective in environmental education goals, such as instilling respect for the environment as a value rooted in belief systems, which is absent in the other countries.

The above table provides a structured view of both converging and diverging patterns in the formulation of environmental education goals across the selected countries. In terms of similarities, all four countries recognize the fundamental need to raise environmental responsibility among students. There is a shared commitment to embedding environmental awareness within the broader educational mission, as evidenced by the universal inclusion of conservation-related goals. Additionally, all countries frame environmental issues as inherently human-centric, acknowledging that environmental degradation has direct implications for the quality of human life.

However, the comparative analysis reveals important differences in how these objectives are structured and emphasized. While Western countries such as the United States, Canada, and Finland explicitly frame their goals across three domains—knowledge, attitudes, and skills—Iran's curriculum omits the skill-based dimension, reflecting a more theoretical and value-driven orientation. The inclusion of curiosity as a goal in Iran and the U.S. contrasts with Canada's omission of this affective component, suggesting varying views on the role of intrinsic motivation in environmental learning. Furthermore, while three of the four countries recognize the intersection of science and environmental education, Canada's curricular documents do not

reflect this interdisciplinary linkage. Another notable distinction is the focus on problem-solving skills in Canada and the U.S., which implies a more action-oriented pedagogical approach compared to the more abstract frameworks found in Iran and Finland. Lastly, Iran's unique emphasis on the moral and religious dimensions of environmental care illustrates how cultural and ideological contexts influence curriculum design—this spiritual framing is not observed in the secular approaches of the other nations.

Table 2. Comparative Analysis of Environmental Education Content in Selected Countries

Similarities	Differences
Environmental sciences are referred to as "Living Beings" in Finland and "Biological Sciences" in Canada.	Overall, there were no significant differences observed in the environmental education content across the selected countries.
All countries incorporate thematic strategies addressing earth and space sciences: titled "Earth Sciences" in Iran and the U.S., "Earth and Space Sciences" in Canada, and "Earth Sciences" in Finland.	
Environmental issues, their threats, and protective strategies are included in all curricula.	
All countries heavily emphasize the cognitive aspects of environmental education content.	
All curricula highlight resource conservation and efficient use of natural resources and energy.	

The analysis of curriculum content in environmental education reveals a high degree of similarity across Iran, the United States, Canada, and Finland. Despite differences in terminology and minor variations in thematic organization, the core components of environmental education are consistently present in all four countries. For instance, while Finland uses the term "Living Beings" and Canada uses "Biological Sciences" to describe environmental science topics, the underlying subject matter remains comparable. Similarly, earth and space sciences appear across all curricula under slightly different labels, but they serve a similar educational purpose by fostering ecological literacy and planetary awareness.

Furthermore, every country includes explicit content on environmental threats, pollution, and strategies for environmental protection, indicating a shared concern for cultivating environmentally responsible citizens. A prominent commonality is the focus on cognitive development, with each curriculum aiming to equip students with the knowledge necessary to understand ecological systems and sustainability challenges. Conservation principles, such as reducing consumption and promoting sustainable resource use, are also integral elements universally acknowledged across the curricula.

Importantly, the comparative review found no major differences in the structure or scope of environmental education content among the selected countries. This suggests a converging international trend toward standardizing environmental education around globally recognized issues and knowledge domains. As such, the relative uniformity in curriculum content reflects a shared global commitment to addressing environmental challenges through education.

Table 3. Comparative Analysis of Teaching Methods in Environmental Education in Selected Countries

Similarities	Differences
All countries emphasize teaching methods in which students play an active role.	Canada emphasizes the use of simulation methods, which is not noted in the other countries.
None of the countries limit environmental education to classroom instruction; all support extracurricular activities such as educational field trips.	Iran and Canada refer to the use of interview techniques, which are absent in the U.S. and Finland.
All countries highlight the importance of group-based learning.	The U.S. mentions the use of brainstorming methods, not observed in the other countries.
Lecture, role-play, and project-based learning methods are common across all four countries.	Iran refers specifically to educational games and problem-solving strategies, which are not found in the other curricula.
The U.S. and Finland include laboratory-based instructional methods.	In Iran, storytelling is a prominent teaching strategy, whereas the U.S., Canada, and Finland do not mention this method.
The U.S., Finland, and Canada incorporate multimedia and online resources in teaching.	

The comparative analysis of teaching methods employed in environmental education reveals a consistent emphasis across all four countries on active and experiential learning strategies. A foundational similarity is the prioritization of student-centered methods, where learners are not passive recipients of information but are engaged through interaction, exploration, and collaboration. Group work emerges as a universally endorsed pedagogical approach, reflecting a global understanding of the value of cooperative learning in developing environmental awareness and problem-solving skills.

Across Iran, the United States, Canada, and Finland, curricula extend beyond the classroom, emphasizing the importance of outdoor education and scientific excursions. These out-of-classroom experiences—such as field trips—are seen as essential for cultivating direct engagement with nature and real-world environmental contexts. Similarly, common instructional strategies such as lectures, role-playing, and project-based activities were evident in all countries, providing a balanced mix of traditional and progressive methodologies.

Despite these shared elements, there are notable differences that reflect each country's educational philosophy and resources. For instance, simulation-based teaching is emphasized only in Canada, suggesting a more advanced integration of digital and immersive learning technologies. Laboratory experimentation is included in the U.S. and Finnish curricula, indicating a stronger focus on empirical inquiry and hands-on scientific methods. In contrast, Iran's curriculum uniquely incorporates storytelling and educational games, drawing on cultural and narrative-based learning strategies to convey environmental messages. Additionally, while multimedia and online tools are actively used in the U.S., Finland, and Canada, Iran's curriculum relies more on conventional formats and localized methods such as problem-solving exercises and interviews.

Altogether, while a global trend toward interactive and diverse teaching methods is evident, country-specific adaptations demonstrate how cultural, technological, and pedagogical factors influence the implementation of environmental education in practice.

Table 4. Comparative Analysis of Assessment Methods in Environmental Education in Selected Countries

Similarities	Differences
All countries implement formative, summative, and portfolio-based assessments.	Finland applies non-quantitative evaluation methods not observed in the other countries.
Self-assessment is employed in all countries.	The U.S. uses standardized testing for students, whereas Finland emphasizes qualitative assessment approaches.
Iran and Canada utilize performance-based assessment and behavioral observation.	In Canada, student presentations (conferences) are a method of evaluation, which is not present in the other countries.
	Canada incorporates essay writing as an assessment tool, while this is absent in Iran, the U.S., and Finland.
	Iran uniquely employs weekly review and hierarchical discussion as specific assessment strategies not mentioned elsewhere.

The comparative findings on assessment methods in environmental education show a foundational alignment among all four countries concerning the use of diverse and holistic evaluation techniques. Formative assessments, summative evaluations, and the use of student portfolios are uniformly implemented, underscoring a shared pedagogical commitment to continuous and comprehensive learning evaluation. Self-assessment is also widely used, reflecting the educational value placed on learner autonomy and reflection in environmental learning contexts.

However, when examining specific practices, distinct national approaches become evident. For instance, while both Iran and Canada apply performance-based assessments and behavioral observation to gauge students' environmental competencies in real-life contexts, Canada further supplements this with unique practices such as student-led conferences and academic essay writing. These methods indicate an emphasis on communication, articulation of ideas, and critical thinking as part of the learning outcomes in environmental education.

Finland, diverging from more traditional or quantifiable models, adopts non-quantitative assessment strategies. This qualitative orientation is consistent with Finland's broader educational philosophy that minimizes standardized testing in favor of individualized and descriptive feedback. Conversely, the United States maintains the use of standardized tests as a significant evaluation tool, highlighting a more metrics-driven approach to assessing student performance, which contrasts sharply with the Finnish model.

Iran, meanwhile, introduces culturally tailored techniques such as weekly reviews and hierarchical discussions—methods designed to foster reflective dialogue and incremental learning consolidation. These approaches, although absent in the other countries, suggest an intent to integrate structured review and peer discourse into the evaluation process.

In sum, while global trends in assessment reflect a move toward multi-dimensional and learner-centered approaches, the specific tools and philosophies guiding evaluation practices vary significantly based on each country's educational values and systemic structures.

Discussion and Conclusion

The comparative analysis of environmental education curricula across Iran, the United States, Canada, and Finland reveals both significant commonalities and critical differences in how countries articulate and implement environmental goals, design content, select teaching strategies, and evaluate learning outcomes. These findings reflect broader global trends and localized educational priorities, offering valuable insights into the current state and developmental needs of environmental education (EE) within different sociopolitical contexts.

Regarding the goals of environmental education, the results show a shared emphasis across all four countries on fostering responsibility for environmental protection, promoting energy and resource conservation, and understanding the interdependence of human life and environmental degradation. This consistency aligns with global objectives in environmental education which prioritize the cultivation of pro-environmental attitudes and sustainable behaviors among students (1, 12). However, the divergence lies in the level of comprehensiveness within these goals. The United States, Canada, and Finland structure EE goals around cognitive, affective, and skill domains, suggesting an integrated educational model that equips learners with practical competencies in addition to knowledge and attitudes (26, 28). In contrast, Iran's curriculum, while acknowledging cognitive and attitudinal elements, lacks explicit focus on skill-building, which is critical for behavioral transformation (6, 15).

Another notable distinction is the integration of cultural and moral values in Iran's EE goals. The emphasis on environmental respect as a belief-rooted principle indicates a culturally embedded approach, whereas the Western models remain largely secular and utilitarian in their orientation. This finding is in line with research suggesting that incorporating local beliefs and ethical values into EE can enhance student engagement and contextual relevance (13, 14). Conversely, problem-solving and scientific reasoning are more pronounced in U.S. and Canadian curricula, indicating their emphasis on empowering learners to become active problem solvers in real-life environmental challenges (18, 25).

In terms of educational content, all four countries demonstrate considerable alignment. Each includes content related to biological and ecological systems, environmental threats, earth and space sciences, and sustainable resource use. These thematic convergences reflect a global recognition of the essential components of EE (9, 17). The minor variations in terminology—such as "Living Beings" in Finland and "Biological Sciences" in Canada—do not signify substantive pedagogical differences, but rather contextual adaptations suited to national education systems. Importantly, all curricula prioritize cognitive dimensions, underscoring the importance placed on ecological knowledge. This confirms earlier studies that identify knowledge acquisition as the foundational layer of environmental literacy (11, 30). Nonetheless, the limited

presence of transformative or action-oriented content—especially in Iran—suggests the need for deeper integration of experiential and critical perspectives within EE frameworks (4, 5).

When analyzing teaching methods, the comparative results show widespread endorsement of student-centered and experiential pedagogies. All countries incorporate project-based learning, role-playing, group work, and outdoor activities, which are known to foster deeper engagement and personal relevance in environmental education (2, 12). The emphasis on these interactive strategies supports the argument that active learning is more effective in promoting environmental responsibility than traditional lecture-based instruction (19, 27). However, the countries differ in their use of specific tools. For instance, simulation techniques are emphasized only in Canada, while storytelling is unique to Iran, and digital multimedia resources are more prevalent in Finland, Canada, and the United States. These discrepancies reflect differences in technological infrastructure, teacher training, and cultural preferences in pedagogy (8, 10).

Furthermore, the presence of laboratory-based methods in U.S. and Finnish curricula indicates an effort to integrate scientific inquiry into EE. These methods are consistent with research advocating for hands-on environmental investigations to promote inquiry-based learning and foster critical thinking skills (22, 24). Iran's use of educational games and problem-solving, though less technologically advanced, offers a creative alternative aligned with pedagogical models that prioritize active student participation. Such methods can be highly effective, particularly in contexts with limited access to digital or laboratory resources (29).

With regard to assessment strategies, the study reveals a more complex and differentiated picture. While all countries employ formative and summative assessments, along with portfolio evaluations and self-assessment, there are notable distinctions in supplementary evaluation methods. Canada's use of student presentations and essay writing represents a shift toward reflective and expressive evaluation, which is increasingly seen as vital for measuring deeper learning in EE (25, 28). Finland's reliance on qualitative, non-quantitative assessments aligns with its overall education philosophy, emphasizing personalized feedback over standardized testing (2). In stark contrast, the United States continues to use standardized exams, reflecting a broader national emphasis on measurable educational outcomes (7).

Iran's assessment methods include distinctive elements such as weekly reviews and hierarchical discussions, which, though not systematized across all schools, point to innovative attempts to make assessment a more dialogical and process-oriented component of learning (5). Nevertheless, these methods often lack official policy backing and teacher training, limiting their scalability and consistency (4). The diversity of assessment methods found across the countries supports the view that no single model is universally applicable; rather, assessments must be tailored to fit the curriculum's goals, the educational context, and the developmental level of the learners (9, 18).

Overall, the findings of this study affirm that while there is broad international consensus on the foundational components of environmental education—such as fostering awareness, promoting sustainability, and encouraging personal responsibility—the ways in which countries implement these goals vary significantly. These differences are shaped by educational philosophies, cultural norms, policy structures, and resource availability. The comparative perspective allows for a richer understanding of how EE can be adapted to meet the needs of diverse learning environments while adhering to shared global sustainability goals (1, 11).

While this study offers a comprehensive comparison of environmental education curricula in Iran, Canada, the United States, and Finland, several limitations must be acknowledged. First, the analysis is based exclusively on documentary sources and does not include direct classroom observations, teacher interviews, or student feedback, which would offer deeper insights into the implementation of curriculum guidelines. Second, although an effort was made to select the most up-to-date and official curriculum documents, differences in accessibility, language, and completeness of materials may have introduced bias or

omitted relevant nuances. Third, the study is limited to primary and secondary education, thereby excluding higher education and informal learning contexts where environmental education may also be robustly implemented. Additionally, since environmental education often evolves with changing policies and societal values, the findings represent a snapshot in time and may require continuous updates to reflect current practices.

Future research should adopt a multi-method approach, combining qualitative and quantitative tools to examine how environmental education is practiced in real classrooms. Longitudinal studies tracking the impact of environmental education on student behavior, attitudes, and community engagement would add valuable empirical depth to curriculum-based analyses. Comparative studies could also expand to include more countries from the Global South and Islamic contexts to offer a more balanced and representative picture of global environmental education. Further exploration is needed into teacher training, institutional support, and the role of interdisciplinary collaboration in strengthening the delivery of environmental education. Moreover, investigating how digital technologies, outdoor learning, and project-based methods can be scaled across diverse educational contexts would be instrumental in shaping future pedagogical frameworks.

To enhance environmental education in practice, educational authorities should aim for a more integrated and action-oriented curriculum that includes all cognitive, affective, and behavioral domains. Teacher training programs must be strengthened to ensure educators are equipped with the skills and resources necessary to implement diverse instructional and assessment strategies. Policymakers should consider embedding environmental education as a cross-curricular theme supported by specific national standards and allocated funding. Additionally, schools should be encouraged to collaborate with local communities, NGOs, and environmental institutions to provide experiential learning opportunities that connect classroom instruction with real-world environmental stewardship. By fostering a participatory, context-sensitive, and interdisciplinary approach, environmental education can become a transformative force for ecological responsibility and sustainable development.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adheried in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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