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Explaining and validating the green curriculum's characteristics based on the critical competencies of education for the 21st century

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Abstract

This study aims to explain and validate the characteristics of a green curriculum (GC) based on critical competencies required for 21st-century education. A mixed-methods approach was employed. In the qualitative phase, experts with experience in sustainability within Iran's higher education system were selected through snowball sampling. Data were collected via semi-structured interviews and analyzed using content analysis. The identified GC characteristics were then quantitatively validated using the Lawshe method. For this, 40 faculty members and doctoral students in educational sciences were randomly selected to evaluate the appropriateness of these characteristics on a three-level scale. The results identified 50 characteristics from interviews and documents, with 48 being validated through the Lawshe method. Additionally, the study found that each of the five competencies for 21st-century education (learning to know, learning to be, learning to do, learning to live together, and learning to transform oneself and society) aligns with several GC characteristics. Recommendations for operationalizing these competencies within a GC include integrating environmental management into various academic curricula, defining practical projects for students, and encouraging engagement with environmental organizations and global research communities.

Keywords: Environmental challenges, sustainability, green university, green curriculum.

Introduction

Green University

Due to increasing concern about various environmental issues, universities are expected to contribute to solving these problems by generating relevant knowledge and integrating sustainability into their programs. This expectation has led to the introduction of the concept of a green university (Shu et al., 2024; Khoderchah and Semaan, 2024). Although "green" is a broad

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and complex concept encompassing environmental concerns, protection of the planet and animals, humanitarian concerns, fair trade, clean water, welfare, equality, and sustainability (Nowak, 2023), in higher education, it represents an approach proposed under the concept of sustainable development, highlighting the serious responsibility of higher education in this regard (Deriu and Gallo, 2024). The first thought that comes to mind when hearing about a green university is often a green campus. However, it refers to all human activities in the 21st century that cause the least damage to the environment (Pouramini and Bashokouh, 2024). Following the introduction of the green university concept, several assessment systems have been designed to monitor the activities of green universities worldwide (Figure 1).

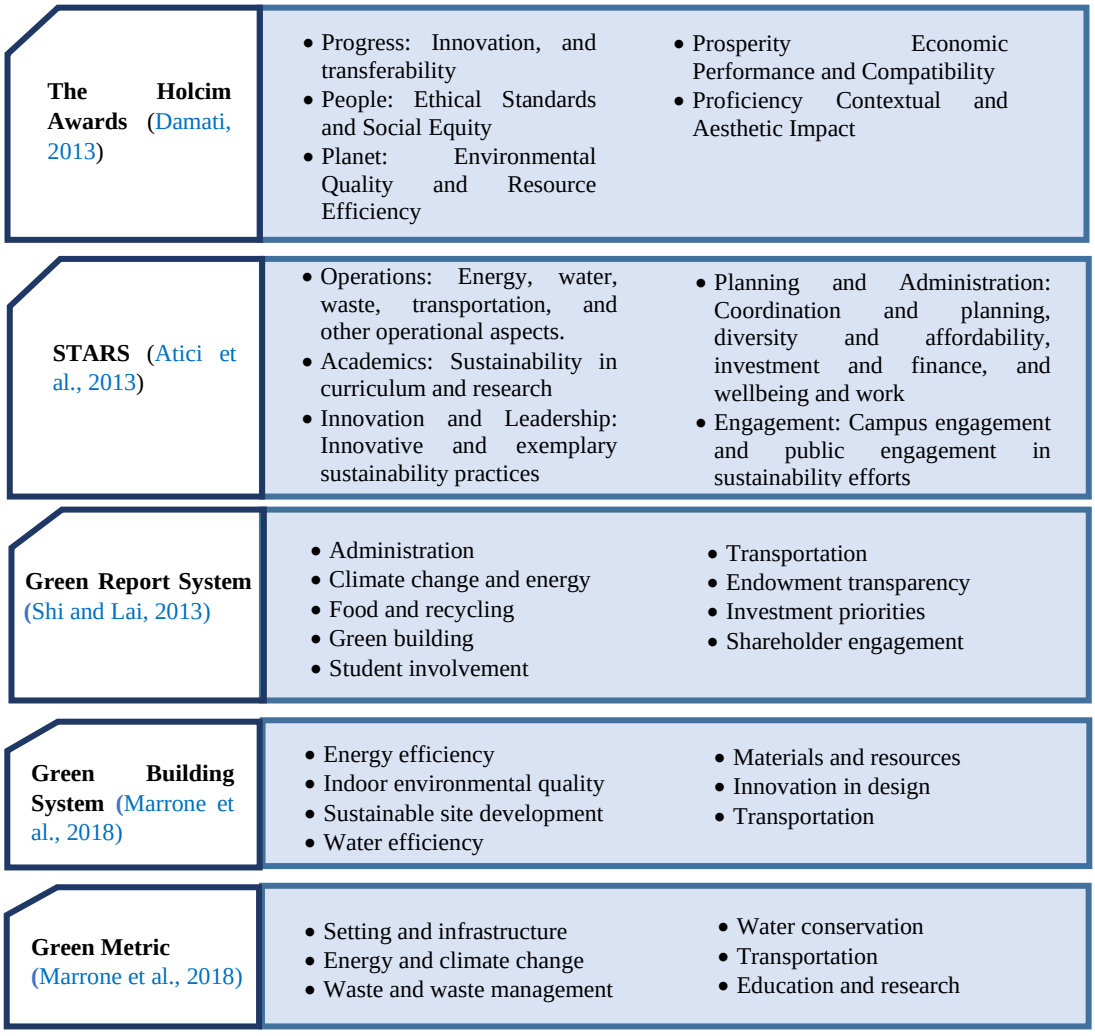

Figure 1. Green Universities Ranking systems.

As shown in Figure 1, among the six ranking systems defined for green universities, only two systems consider education as a criterion: STARS and Green Metric. The former is specifically designed for American and Canadian universities and is not a global ranking system (Atici et al., 2013). The latter system emphasizes the physical environment, with education presented implicitly alongside research. Chankrajang and Muttarak (2017) studied the contribution of education to pro-environmental behavior and confirmed that education significantly increases the probability of taking knowledge-based environmentally-friendly actions. Kountouris and Remoundou (2023) also found that education improves some types of environmentally friendly activities, such as waste recycling. Therefore, educational aspects are underestimated in green university assessments and need more attention.

Despite the increasing emphasis on sustainability in higher education, current green university assessment systems inadequately address the educational aspects of sustainability. Most systems focus primarily on the physical environment, neglecting the critical role of education in fostering pro-environmental behaviors and competencies. This oversight limits the effectiveness of green universities in promoting comprehensive sustainability education.

Addressing this gap is crucial because education is a powerful tool for instilling sustainable practices and mindsets in future generations. Without a strong educational component, green universities cannot fully achieve their potential in driving societal change towards sustainability. This research aims to bridge this gap by validating the characteristics of a green curriculum based on the critical competencies of education for the 21st century.

This study provides a detailed analysis of the educational dimensions of green universities, proposing a framework for integrating sustainability into higher education curricula. By focusing on the critical competencies identified by UNESCO, this research offers practical guidelines for developing green curricula that equip students with the knowledge, skills, attitudes, and values necessary for sustainable living.

Green Curriculum

According to the Illinois Central College Curriculum Committee in the United States, a green curriculum is related to sustainability and equips learners with the knowledge and skills to identify, analyze, and solve problems in various social, economic, and environmental domains (ICC, 2023). The green curriculum aims to integrate sustainability into the teaching process so that learners

obtain sufficient knowledge and skills to become "Sustainability Minded Citizens." The primary purpose of sustainable thinking is to empower individuals to comprehend the complex issues of sustainability and the challenges facing human society at local and global levels, enabling them to seek logical solutions to these problems (Taqipour et al., 2016; Singer-Brodowski et al., 2018). Previous studies related to the green curriculum confirm that this type of curriculum focuses on environmental crises and often aims to empower people to solve these crises.

According to UNESCO's Greening Curriculum Guidance, integrating climate mitigation and adaptation into teaching and learning is essential for fostering a holistic, scientifically accurate, and justice-driven approach to climate change education (UNESCO, 2024). Hays and Reinders (2020) discussed that the concept of sustainable learning and education (SLE) emphasizes creating curricula that instill skills and dispositions necessary for thriving in challenging circumstances. The integration of sustainability in the green curriculum is crucial for developing an environmentally conscious mind-set in students. Gabrys et al. (2020) emphasize problem-solving in a coached apprenticeship system, which can be applied to green education through real-world environmental challenges. Avvisati and Borgonovi (2020) show that problem-solving in mathematics enhances analytical skills vital for sustainability. Rebello et al. (2017) highlight the need for an interdisciplinary approach to address complex scientific problems, stressing the importance of a green curriculum that incorporates sustainability across various subjects. Furthermore, Karami et al. (2020) examined the green curriculum in Iranian universities, emphasizing the water crisis, climate change, and knowledge supply sources. They suggested developing a green curriculum aligned with climate change management in Iran, including creating a department for curriculum development and revision in all universities of the Ministry of Science, Research and Technology according to the country's water conditions, and dedicating part of the lessons to climate change management at different education levels. Another study considered the green curriculum as a tool for sustainable learning, indicating that it should be used to allow people to solve their problems in communities through radical problem-solving initiatives and ideas. Transformative solutions, which are holistic, not only are profitable but also save people and the planet (Louw, 2013). Haigh (2005) indicated that universities should equip all their students with "environmental literacy," and sustainability must be the central point of curricula and all practices of any university worldwide. Greening the curriculum is considered a plan to ensure students' ability to face the challenges of the 21st century, such as global warming and

climate change, social inequalities, unsustainable lifestyles, and the urgent need to move to an economy based on renewable energy (Greenheart Education, 2019). Accordingly, the green curriculum also covers the critical competencies of education for the 21st century. Competency in this context refers to a combination of knowledge, skills, attitudes, and values that students need to effectively navigate and succeed in various aspects of life, including personal, academic, and professional domains (Koeppen et al., 2008). These competencies, which correspond to basic skills and required characteristics for sustainable activities, are identified by UNESCO and presented in Delors's report (1996) as follows:

Learning to know: Obtaining the instruments of understanding or learning how to learn, which can be considered a foundation for lifelong learning.

Learning to do: Applying learned knowledge in daily life to improve the ability to be creative and responsible toward the surrounding environment.

Learning to be: Obtaining universally shared values, developing one's personality, self-identity, and self-knowledge, becoming immersed in one's culture and wisdom, and being empowered to learn about oneself and become more fully human.

Learning to live together: Education for international and intercultural understanding is essential for fostering the social dimension of human development. It serves as the foundation for cohesion and harmony, conflict avoidance, non-violence, and peaceful coexistence. Recognizing that difference and diversity are opportunities rather than dangers, this competency emphasizes the value of diversity as a resource for the common good. It promotes the ability to tolerate, respect, welcome, and celebrate differences in people, their histories, traditions, beliefs, values, and cultures, using this diversity to enrich our lives and classrooms.

Learning to transform oneself and society: This competency focuses on working towards a gender-neutral, non-discriminatory society and acting to achieve social solidarity and international understanding. Above all, it emphasizes living sustainably (Shaeffer, 2007).

Given the above explanations, it is clear that the green university movement is a crucial approach to addressing and mitigating environmental concerns in the contemporary era. However, despite the critical role of education in this journey, current ranking systems for green universities have not sufficiently considered educational aspects. Due to the significance of green education, it aligns well with the critical competencies of education for the 21st century, as introduced by UNESCO. Therefore, this study aims to design and validate a green curriculum model based on these critical

competencies. To achieve this aim, we have formulated two research questions:

What are the characteristics of a green curriculum?

How can we categorize the characteristics of a green curriculum based on the competencies of education for the 21st century?

Methods

Research Design

This study employed a mixed-methods approach, combining qualitative and quantitative paradigms to explore and validate the characteristics of a green curriculum based on the critical competencies of education for the 21st century. The exploratory nature of the initial phase justified the use of qualitative methods, allowing for an in-depth understanding of the research topic. The subsequent phase utilized quantitative methods to validate the content of the green curriculum characteristics.

Qualitative Phase

In the first phase, we conducted semi-structured interviews with 12 experts in education and sustainability. These experts were selected using snowball sampling, ensuring a diverse and knowledgeable participant pool. The interview questions focused on identifying the characteristics and components of a green curriculum. Data collection continued until theoretical saturation was reached, indicating comprehensive coverage of the topic. Additionally, we conducted a documentary analysis of 14 published articles and a dissertation related to green curriculum, using content analysis techniques. The accuracy of this procedure was verified through constant comparison **(**Schilling, 2006**)**. Thus, 10% of all selected documents were examined by two researchers at the same time using research tools (including index cards proposed by Padang et al. (2018) to systematically gather and organize data, ensuring a structured and efficient approach to documentary analysis) and then the results were compared. Since more than 90% of the results were similar, the accuracy of the research tool was confirmed. To analyse the data, content analysis according to Borg and Gall (1984) was used. Accordingly, the texts of both the interviews and documents were carefully studied, and firstly, in the open coding, all statements illustrating characteristics of the green curriculum were extracted. In the next step, categorization was done thorough the axial coding. Considering that the basis of this research was the key competencies of education for the 21st century, therefore, central coding was done on this basis.

Quantitative Phase

In the second phase, we employed the Lawshé method to assess the content validity of the green curriculum characteristics. A questionnaire containing the identified characteristics was distributed to a panel of 40 experts, who evaluated each item as "necessary," "useful but unnecessary," or "unnecessary." The Content Validity Ratio (CVR) was calculated for each item using the following formula:

$$CVR = \frac{ne - N/2}{N/2}$$

Where (ne) is the number of panellists indicating "necessary" and (N) is the total number of panellists. The minimum acceptable value of CVR for a panel of 40 members is 0.29 (Paykari et al., 2018). Items with lower values were omitted.

Additionally, the Content Validity Index (CVI) was calculated to assess the simplicity, clarity, and relevance of the characteristics. The CVI was determined using the following formula:

$$CVI = \frac{\text{The number of experts giving rate 3 or 4}}{\text{Total number of experts}}$$

Panel members rated each item on a 4-point scale, and the minimum acceptable CVI value for the remaining items in the questionnaire is 0.79 (Munro, 2005).

Results

Descriptive Findings

To determine the characteristics of the green curriculum, we conducted interviews with 12 experts in the field of curriculum planning. The total duration of these interviews was 477 minutes, averaging 39.75 minutes per interview. To supplement and enrich the data obtained from the interviews, we also reviewed a set of related documents. These documents included 15 research studies published in national and international databases, predominantly articles in English, along with a doctoral dissertation and a scientific research article in Farsi. Detailed bibliographic information on these sources is provided in Appendix 2.

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196 **Inferential Findings**

197 The content analysis of the interviews resulted in the identification of 38 characteristics of the
198 green curriculum. Table 1 below summarizes the key concepts extracted from the interviews.

199 **Table 1.** Concepts extracted from interviews regarding the green curriculum characteristics.

Concepts extracted from interviews	Number of citations
Emphasis on creating a positive attitude toward environmental issues among students	6
Increasing students' awareness of the current environmental issues in the world	5
Teaching a critical attitude towards behaviors and activities that affect the environment	5
Benefiting from educators who believe in sustainability	5
Considering social responsibility in the content of the green curriculum	5
Considering the principles of sustainability and environmental protection in the curriculum evaluation stage	5
Providing the opportunity for students to respond to environmental challenges in nature	5
Developing a curriculum based on the ecological needs of the society	5
Using teaching-learning approaches based on interaction in order to promote the spirit of empathy in solving environmental hazards among learners	4
Emphasis on problem-oriented education based on solving environmental problems	4
Teaching the operational principles of paying attention to sustainability in any specialized work related to people's profession	3
Improving people's creativity in solving environmental challenges	3
Emphasizing the necessity of environmental protection in the green curriculum	3
Emphasis on minimizing environmental risks	3
Emphasis on systemic thinking and attention to the relationship between environmental components	3
Paying attention to the education of citizenship or global citizen in the content of the green curriculum	3
Considering the principles of sustainability and environmental protection in the curriculum design phase	3
Introducing knowledge resources related to sustainability to learners as auxiliary resources	3
Introducing knowledge resources related to sustainability to learners as main resources	3
Introducing knowledge resources related to sustainability to learners as non-curriculum resources	3
Enabling the students to consider the consequences of personal behaviors and paying attention to the direct effects of these behaviors	2
Enabling the students to consider the consequences of personal behaviors and paying attention to the indirect effects of these behaviors	2
Integrating different aspects of sustainable development in the content of the green curriculum	2
Teaching the sustainability skills to students (students' ability to combine the principles of sustainability with all aspects of life)	2
Considering the issue of social justice (rights of the next generation) in the content of the green curriculum	2
Considering the issue of environmental culture in the content of the green curriculum	2
Encouraging students to learn lifelong environmental issues	2
Focus on changing students' behavior to achieve sustainability in society	2
Using educational resources related to the environment	1
Informing students about political relations effective on environmental risk management	1
Creating an opportunity for students to exchange their experiences related to environmental management	1
Considering topics related to personal adaptation in the content of the green curriculum	1
Emphasizing public interest repeatedly in the curriculum	1
Encouraging students to pursue environmentally friendly trans-sectoral activity	1
Encouraging students to consider sustainability in economic activities	1
Considering the principles of sustainability and environmental protection in the curriculum implementation phase	1
Using environmental symbols and signs in the learning environment	1
Encouraging students to consider future consequences of various activities	1

In the content analysis of the documents related to the green curriculum, 23 characteristics of the green curriculum were extracted. Among these characteristics, there are 11 similar items to those extracted from the interviews, marked with (*) in Table (2).

Table 2. Concepts extracted from documents regarding the green curriculum characteristics.

Concepts extracted from the reviewed documents	Number of citations
Using environmental symbols and signs in the learning environment*	8
Providing environmental knowledge originated from high-quality research	4
Increasing students' awareness of the current environmental issues in the world*	4
Empowering students for addressing real environmental issues or concerns	4
Emphasis on systemic thinking and attention to the relationship between environmental components*	4
Benefiting from educators who believe in sustainability*	3
Teaching the operational principles of paying attention to sustainability in any specialized work related to people's profession*	2
Developing practical guidelines for environmental education	2
Creating a positive attitude toward environmental protection among students	2
Encouraging students to learn lifelong environmental issues*	2
Integrating green concepts into the curriculum	2
Explaining the philosophy and basic concepts of the green curriculum	2
Considering the principles of sustainability and environmental protection in the curriculum evaluation stage*	2
Considering optional courses for students who are interested in gaining expertise in environmental protection	2
Equipping students with the knowledge and skills to monitor environmental problems and concerns	2
Emphasizing the necessity of environmental protection in the green curriculum*	1
Encouraging students to consider sustainability in economic activities*	1
Defining homework related to the environment to encourage students 'short-term achievements	1
Considering the principles of sustainability and environmental protection in the curriculum implementation phase*	1
Explaining sustainability in various industrial processes	1
Explaining sustainability in various social processes	1
Providing the opportunity for students to respond to environmental challenges in nature*	1
Introducing and teaching the use of green technologies	1

* Common concepts in both interviews and documents

**More explanations about the characteristics in Table 1 and Table 2 is provided in the Appendix (2).

In this research, the key competencies of education for the 21st century (Shaeffer, 2007) were used as a theoretical framework. Accordingly, axial coding was performed to check the alignment of all extracted characteristics with these competencies (see Table 3). Subsequently, the values of Content Relevance Value (CRV) and Content Validity Index (CVI) were calculated. In the category of "learning to know," the CRV values for two items were less than 0.29. However, all items had an acceptable CVI value.

Table 3. Adjusting green curriculum characteristics with key competencies of education for the 21st century and the amount of CRV and CVI.

Key competencies of education for the 21st century	Green curriculum characteristics	CRV	CVI
Learning to know	Providing environmental knowledge originated from high-quality research	.900	1
	Using educational resources related to the environment	.944	.875
	Informing students about political relations effective on environmental risk management	.589	.923
	Increasing students' awareness of the current environmental issues in the world	.900	.897
	Integrating green concepts into the curriculum	.850	.925
	Explaining the philosophy and basic concepts of the green curriculum	.487	.900
	Benefiting from educators who believe in sustainability	.589	.925
	Introducing knowledge resources related to sustainability to learners as auxiliary resources	.550	.897
	Introducing knowledge resources related to sustainability to learners as main resources	.650	.950
	Introducing knowledge resources related to sustainability to learners as non-curriculum resources	.250*	.875
	Considering the principles of sustainability and environmental protection in the curriculum implementation phase	.350	.890
	Considering optional courses for students who are interested in gaining expertise in environmental protection	.800	.850
	Considering the principles of sustainability and environmental protection in the curriculum design phase	.250*	.875
	Equipping students with the knowledge and skills to monitor environmental problems and concerns	.800	.925
	Integrating different aspects of sustainable development in the content of the green curriculum	.846	.900
	Considering the principles of sustainability and environmental protection in the curriculum evaluation stage	.500	.875
Learning to do	Developing practical guidelines for environmental education	.894	.950
	Teaching the operational principles of paying attention to sustainability in any specialized work related to people's profession	.857	.951
	Improving people's creativity in solving environmental challenges	.785	.961
	Using environmental symbols and signs in the learning environment	.700	.950
	Encouraging students to learn lifelong environmental issues	.743	.925
	Emphasis on problem-oriented education based on solving environmental problems	.735	.950
	Defining homework related to the environment to encourage students 'short-term achievements	.726	.916
	Providing the opportunity for students to respond to environmental challenges in nature	.722	.980
	Introducing and teaching the use of green technologies	.719	.865
	Focus on changing students' behavior to achieve sustainability in society	.716	.895
	Explaining sustainability in various industrial processes	.700	.975
	Explaining sustainability in various social processes	.641	.925
	Empowering students for addressing real environmental issues or concerns	.600	.975
	Emphasizing the necessity of environmental protection in the green curriculum	.850	.948

Key competencies of education for the 21st century	Green curriculum characteristics	CRV	CVI
	Encouraging students to consider sustainability in economic activities	.478	.923
Learning to be	Teaching a critical attitude towards behaviors and activities that affect the environment	.692	.975
	Enabling the students to consider the consequences of personal behaviors and paying attention to the direct effects of these behaviors	.789	.925
	Enabling the students to consider the consequences of personal behaviors and paying attention to the indirect effects of these behaviors	.700	.925
	Teaching the sustainability skills to students (students' ability to combine the principles of sustainability with all aspects of life)	.750	.950
	Emphasis on creating a positive attitude toward environmental issues among students	.800	.948
Learning to live together	Using teaching-learning approaches based on interaction in order to promote the spirit of empathy in solving environmental hazards among learners	.850	.948
	Creating an opportunity for students to exchange their experiences related to environmental management	.700	.973
	Creating a positive attitude toward environmental protection among students	.750	.925
	Considering social responsibility in the content of the green curriculum	.600	.947
	Emphasis on minimizing environmental risks	.794	.925
	Emphasis on systemic thinking and attention to the relationship between environmental components	.641	.950
	Emphasizing public interest repeatedly in the curriculum	.550	1
	Considering topics related to personal adaptation in the content of the green curriculum	.692	.925
	Considering the issue of social justice (rights of the next generation) in the content of the green curriculum	.692	1
	Considering the issue of environmental culture in the content of the green curriculum	.794	950
Learning to transform oneself and society	Encouraging students to pursue environmentally friendly trans-sectoral activity	.600	.950
	Paying attention to the education of citizenship or global citizen in the content of the green curriculum	.743	1
	Developing a curriculum based on the ecological needs of the society	.743	.923
	Encouraging students to consider future consequences of various activities	.794	.973

To summarize the key findings, it can be mention that this study systematically identified 50 characteristics of a green curriculum through comprehensive expert interviews and an extensive review of relevant literature. These characteristics were meticulously aligned with the key competencies essential for 21st-century education. The validity of each characteristic was rigorously assessed using the Content Validity Ratio (CVR) and Content Validity Index (CVI) as per the Lawshe method. These findings provide a robust framework for the development of a green curriculum that is both contemporary and educationally sound.

Discussion and Conclusions

The growing importance of sustainability necessitates that higher education systems integrate environmental principles into their curricula. Traditionally, universities have focused on sustainability in the physical environment, but the influence of higher education on human resources is equally significant. In today's world, the role of human resources in driving societal progress cannot be underestimated. Therefore, competencies such as learning to know, learning to do, learning to live together, learning to be, and learning to transform oneself and society are essential (Shaeffer, 2007). This study classifies the characteristics of a green curriculum based on these dimensions.

Learning to Know

This competency involves expanding learners' knowledge to create a well-informed, proactive, and engaged population capable of addressing global environmental challenges. For example, empowering learners to identify environmental problems is a key characteristic of the green curriculum, as confirmed by previous research (Pe'er et al., 2007; Otto & Pensini, 2017). This competency includes providing environmental knowledge, encouraging lifelong learning, and introducing reliable sources for acquiring knowledge. Supporting researchers in environmental and curriculum development fields and integrating sustainability content across all academic disciplines are recommended. Additionally, the green curriculum should empower learners to identify, recall, explain, discuss, and evaluate environmental issues, concerns, values, and problems at different levels from local to global society.

Learning to Do

This competency emphasizes the application of knowledge in everyday life, leading to the consolidation of learning and societal benefits from trained human resources. In green learning, which empowers individuals to fulfil their citizenship roles, problem-oriented education is crucial. Teaching through problem-solving methods, as highlighted by various researchers (Gabrys et al., 2020; Avvisati & Borgonovi, 2020; Rebello et al., 2017), involves students in environmental issues and encourages them to find solutions. This approach should be integrated into curriculum design, with practical assignments and projects that have tangible environmental management outcomes.

For instance, arranging scientific short trips to areas impacted by human activities can enhance practical learning.

Learning to Live Together

This competency prepares individuals for a better life by empowering them to make informed decisions and understand the consequences of their behaviors on the environment. Critical thinking and the ability to evaluate personal behaviors are essential. Educational systems should provide opportunities for learners to apply sustainability principles in practical projects and share their achievements with others. Emphasizing responsibility, empathy, systemic thinking, and minimizing environmental risks are key characteristics of the green curriculum. For example, teaching the consequences of personal behaviours and fostering a critical view towards activities affecting the environment are crucial.

Learning to Transform Oneself and Society

This highest level of learning involves seeking positive changes in oneself and society. In the context of environmental and sustainability issues, this means encouraging learners to engage in environmentally friendly extracurricular activities and collaborate with various societal sectors. The green curriculum should prepare students for interdisciplinary and trans-organizational work, fostering self-transformation and societal improvement. For instance, training students to work across sectors and value interdisciplinary thinking can significantly contribute to societal transformation.

The main limitation of our study was the reliance on the opinions of Iranian experts due to constraints in time, budget, and access to international researchers. Despite these constraints, we ensured the comprehensiveness and validity of our findings by reviewing publications from global experts. This approach enriched our study with diverse perspectives, enhancing its overall quality and relevance.

Future Research Directions:

Future research should focus on expanding international collaboration and conducting longitudinal studies to track the long-term impact of green curriculum initiatives. Interdisciplinary approaches and technology integration can enhance curriculum delivery, while policy impact

analysis and cultural context studies can identify best practices. Exploring practical applications of green curriculum principles, methods to increase student engagement, and new assessment methods are also crucial. Additionally, involving the community in green curriculum initiatives can provide valuable insights for curriculum developers. These suggestions aim to build on current findings and further promote sustainability and environmental awareness.

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Appendix 2: Explanation of the Green Curriculum Characteristics

Creating a positive attitude: Encouraging students to develop a favourable view of environmental issues.
Increasing awareness: Educating students about current global environmental problems.
Teaching critical attitude: Instilling a critical perspective on behaviours impacting the environment.
Sustainability-minded educators: Utilizing teachers who prioritize sustainability.
Social responsibility: Integrating social responsibility into the green curriculum.
Sustainability in evaluation: Including sustainability principles in curriculum assessments.
Responding to challenges: Allowing students to address environmental challenges in nature.
Ecological needs-based curriculum: Designing curriculum based on societal ecological needs.
Interactive approaches: Promoting empathy through interactive teaching methods.
Problem-oriented education: Focusing on solving environmental problems through education.
Operational principles: Teaching sustainability principles relevant to professional work.
Creativity in challenges: Enhancing creativity in solving environmental issues.
Necessity of protection: Emphasizing the importance of environmental protection.
Minimizing risks: Focusing on reducing environmental risks.
Systemic thinking: Encouraging understanding of the interconnections within the environment.
Global citizenship: Including global citizenship education in the curriculum.
Sustainability in design: Considering sustainability in curriculum design.
Auxiliary resources: Introducing supplementary sustainability resources.
Main resources: Providing primary sustainability resources.
Non-curriculum resources: Offering non-curricular sustainability resources.
Direct consequences: Teaching students to consider the direct effects of their behaviours.
Indirect consequences: Teaching students to consider the indirect effects of their behaviours.
Sustainable development: Integrating sustainable development aspects into the curriculum.
Sustainability skills: Teaching students to apply sustainability principles in life.
Social justice: Addressing social justice in the curriculum.
Environmental culture: Incorporating environmental culture into the curriculum.
Lifelong learning: Encouraging lifelong learning about environmental issues.
Behaviour change: Focusing on changing behaviours to achieve societal sustainability.
Educational resources: Using environment-related educational materials.
Political relations: Informing students about political factors in environmental risk management.
Experience exchange: Creating opportunities for students to share environmental management experiences.
Personal adaptation: Including personal adaptation topics in the curriculum.
Public interest: Repeatedly emphasizing public interest in the curriculum.
Trans-sectoral activity: Encouraging environmentally friendly activities across sectors.
Economic sustainability: Promoting sustainability in economic activities.
Implementation phase: Considering sustainability in curriculum implementation.
Environmental symbols: Using environmental symbols in the learning environment.
Future consequences: Encouraging consideration of future impacts of activities.
High-quality research: Providing knowledge from high-quality environmental research.
Addressing real issues: Empowering students to tackle real environmental concerns.
Practical guidelines: Developing practical guidelines for environmental education.
Positive attitude: Creating a positive attitude toward environmental protection.
Green concepts: Integrating green concepts into the curriculum.
Philosophy and concepts: Explaining the philosophy and basic concepts of the green curriculum.
Optional courses: Offering optional courses for environmental protection expertise.
Monitoring skills: Equipping students with skills to monitor environmental issues.
Environment-related homework: Assigning environment-related homework for short-term achievements.
Industrial sustainability: Explaining sustainability in industrial processes.
Social sustainability: Explaining sustainability in social processes.
Green technologies: Introducing and teaching the use of green technologies.