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How to Embed Green Teaching and a Nature-Based Pedagogy in Practice

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المستخلص

تهدف هذه الدراسة إلى إبراز الوعي بدمج التعليم الأخضر في البيئات التعليمية، من خلال استخدام التعليم القائم على الطبيعة والمواد الصديقة للبيئة. وتُسلّط الدراسة الضوء على أهمية استخدام منهج دراسي يشمل الصحة والسلامة والأنظمة البيئية الطبيعية في البيئات الأكاديمية. سيساعد هذا التدريس على تنمية التفكير النقدي لدى الطالب وسلوكه المراعي للبيئة. ويشمل التطبيق العملي استخدام المساحات الخضراء للتعلم بالممارسة، ودمج القضايا البيئية في مختلف التخصصات، وتعزيز مبادرات ترشيد استهلاك الطاقة والنفايات. تساعد هذه الممارسات التعليمية الطلاب على تحقيق نتائج أفضل في دراستهم، وتنمية المواقف والقدرات اللازمة للمواطنة المسؤولة.

الكلمات المفتاحية: التربية الخضراء، الاستدامة، التعليم والتعلم، نموذج تطبيقي.

Abstract

This study aims at showing the awareness of the integration of green teaching within educational settings by using natural-based education and environmentally friendly materials. It highlights the importance of using a curriculum that includes health safety and natural environmental systems within academic settings. Such teaching will help develop a student's critical thinking and more considerate conduct toward the environment. Real-life implementation involves using green areas for learning by doing, integrating environmental issues into different disciplines, and fostering waste and energy conservation initiatives. These educational practices help students achieve better results in their studies and develop the necessary attitudes and abilities for responsible citizenship.

Keywords: green pedagogy, sustainability, teaching-learning, applicable model.

1. Introduction

Educational strategies that meet the indefinite principle of sustainability must demonstrate "long-term effects" and be characterized by sustained utilization, following the eco-friendly standard (cf. Drosdowski,1 1994, pp. 23-38). Thus, as a quality of education, "sustainability"

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means that education has a long-term effect and is continually used. These criteria also apply to the future design of educational situations in the areas of practical application (Forstner-Ebhart, 2018).

Green pedagogy is distinct from education for sustainable development in that it is not a teaching principle derived from educational theories, nor does it have a list of educational objectives, content, knowledge areas, and subjects. Sáez and Carretero (2002) defined it as a concept that developed from a global growth of political decision-making. Rost (2002) interprets it as a task assigned by political officials to teachers and educational philosophers to develop an educational concept that meets the necessities of a sustainable future for humanity. Green education was initially established by the University College of Agrarian and Environmental Pedagogy as a strategy for connecting cultivational, ecological, and educational exercise strengths.

Green pedagogy attempts to implement this mandate by using an educational theory, according to Peterßen (2001), which provides information about educational work and thus performs a pragmatic role. Furthermore, green pedagogy needs to provide guidelines that can serve as a means of legitimizing educational work. The concept of green pedagogy should also refer to the paradigmatic structure of teaching requirements in the sense of ways of thinking and looking at things in a specific way.

Various studies have tackled green education, one of which was presented by Akinsemolu and Onyeaka (2025). According to them, sustainable development can be achieved through behavioral and societal change, which occurs by raising awareness of universal climate change. Serafini et al. (2022) sought to explore how the 2023 Agenda and Sustainable Development Goals have been applied in higher education institutions. It was achieved through long-term planning involving all levels of the hierarchy. For Moallemi et al. (2020), achieving sustainability in different local regions requires a comprehensive review of scientific and policy experiences. In the study by Varela-Candamio et al. (2018), generating green practices throughout society was revealed to be an effective tool in green teaching. The study also shows that protecting ecosystems depends on human behavior. Ibezim (2013) applied e-learning to universities by specifying the needed technologies. The researcher used a survey to achieve the goal of the study. The results showed that identifying technologies is crucial in sustaining e-learning in universities, and universities' administrations should take this (cf. Birgili, (2015); Ekwueme et al. (2016); Fischer et al. (2022); Goldman et al. (2018); Jordan & Chawla (2022); Ramírez Suárez et al. (2023); Zikargae et al. (2022).

Following the above studies, this research explores the awareness of integrating green teaching within educational settings using natural-based education and environmentally friendly materials. It highlights the importance of using a curriculum that includes health safety and natural environmental systems within academic settings. Such teaching will help develop a student's critical thinking and more considerate conduct toward the environment. To achieve the objective of the present study, an applicable model adopted by the University of Exeter was used to analyze.

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2. Sustainability and Development

Pedagogy commonly means educational methodology used as a model to encourage discussions on the theory of teaching and learning. It has allowed teachers to carefully consider their line of work to let them improve their frameworks and understandings (Youth Action for Nature and Wellbeing Pedagogy Design Guide [YAFNAW], 2023). According to Hirst (1975), educators understand teaching as "very much affects what they do in the classroom." There are different strategies for education, such as peer education, which is broadly perceived as the procedure through which training young adults engage in teaching activities with their partners (Lazdane & Lazarus, 2003). It is often used when more classical and controlling teaching structures have failed (Abdi & Simbar, 2013). It tries to make changes in personal conduct. Besides, it is considered an integrated connection between other key theories, such as nature-based therapy, systems thinking, and transformative learning (The AIDS Control and Prevention Project, n.d.). Another dimension that is very important in education for sustainable development is holistic learning. This dimension concentrated on different aspects, such as worldview, social, economic, and ecological. Gaia Education utilized it for 20 years (United Nations, 1987). According to Education for Sustainable Development, the most dominant dimensions are ecological and social aspects and the economy. Unlike the social aspect, the worldview dimension tackles spiritual and cultural perspectives on reality. Many activities are pivotal in building society's understanding of individuals linked to learning processes, projects, or societal initiatives. These activities fall within the worldview dimension, an interactive layer of the sustainability model (YAFNAW, 2023). The four dimensions were inspiring teaching strategies, especially the worldview aspect.

Education for sustainable development comes from studying systems thinking, which is interconnected wholes instead of individual parts such as the planet, the society, the person, and the forest. Ecosystem studies occurred in systems thinking and was the earliest field of science to appear from this holistic science, a field of study that was and still is strongly influenced by traditional ecological knowledge (Inuit Circumpolar Conference, 2020). Furthermore, sustainable development originates in the domain of systems thinking. It is an idea that started to spread for the first time at the beginning of the 1970s by Barbara Ward, the originator of the International Institute for Environment and Development (Ward & Dubos, 1972). After 20 years, it has been widely spread because of the UN conferences IN Rio de Janeiro on green development, establishing a new vision of human progress for global society (UN Conference on Environment and Development, 1992).

An eminent systems thinker, Donella Meadows (2009) is touted to have made some of the best contributions to sociology. She proposed the concept of leverage points in 1997 after observing how societal shifts occur. Meadows delves into the depths of sociology and divides the timespan of a particular shift into three significant points. She labeled specific locations within any system as low-leverage places if they involve only a slight movement within the mechanism. On the other hand, high-leverage points tie in with the idea of making drastic adjustments at compacted times. These leverage points are said to be efficient in social evolution. Additionally, Meadows discussed concepts like adaptability and social functionalism that combine to achieve

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ecological system restoration goals, establish global social balance, and ensure hope for the world's population (Rockström et al., 2023; Reed, 2007).

Adventure-based learning has offered a flexible system to deal with social problems, conduct issues, and the challenges of adolescents affected by addiction (YAFNAW, 2023). Intrapersonal and interpersonal ideas were used in adventure-based learning to establish close connections between societies. The interpersonal is connected with issues related to authority, collaboration, communication, and problem-solving; on the other hand, intrapersonal is connected with the internal functioning of a person, such as self-efficacy and self-concept (Priest, 1990). This dimension is connected to peer education, where challenges are overcome, and leadership skills and confidence are enhanced as learners communicate their views with each other (Sutherland et al., 2011). This aspect is considered one of the most important concepts because it strengthens the connection between the natural world and young people through pro-environmental behaviors (Martin et al., 2020).

Civic participation is another project that works on the participation of individual members or societies in regional, state, and national governance. It includes civic engagement, community service, environmental protection, voting, and political engagement (Michelsen et al., 2002). Eco-learners need to be aware of government and democratic processes to be more effective in engaging with society and traditional political lobbying to create exemplary leaders for the next generation. The partners can use political and non-political processes to advance life in a community (YAFNAW, 2023). Youth Action for Nature and Wellbeing summarized these projects in Figure (1) below.

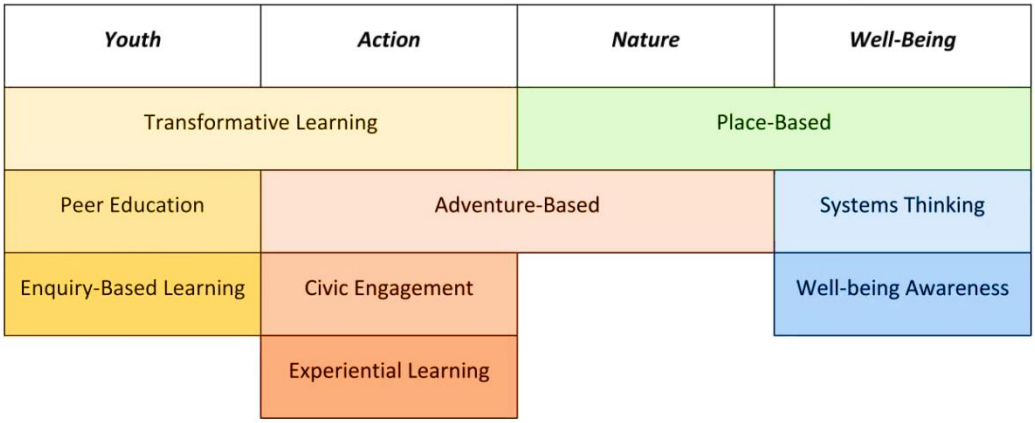

Figure (1): Green Pedagogy Projects adopted from (YAFNAW, 2023)

The above projects establish perspectives on diversity and varied opinions regarding holistic learning and education for sustainable development. The cooperation among eco-activists would promote cross-cultural understanding, enabling them to recognize different cultural factors that could affect the appropriateness of education and messaging. Recognizing the different instructional approaches the activists incorporated into these projects helped build an educational landscape with diverse structures and theoretical perspectives, fostering a holistic approach that unified the methods into a cohesive teaching model (YAFNAW, 2023).

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3. Green Pedagogy

Green education pays attention to educational processes that enable the students to acquire knowledge and participate in green solutions for ecological protection and utilization. Still, it was not easy to spread until 2016. The adjective 'green' connects with nature and sustainability but does not explain the green pedagogy methods carefully established in Vienna (Chatterjee & Gol, 2024). Using reflection, collaboration, analysis, and discussion in Green pedagogy can make a topic that students know a novel, thoughtful topic (Vygotsky & Cole, 1978; Piaget, 1972). According to the theory of conceptual change, before giving new beliefs or views to solve a problem, we need to consider what the students previously knew about it (Posner et al., 1882). For Aithal and Rao (2016), this kind of education tries to make a connection between teaching and sustainability and the economy. Therefore, it indicates the forming of eco-conscious understanding, perspectives, beliefs, and guiding principles for green teaching.

Green pedagogy is a multidisciplinary approach that considers educational material and is associated with environmental and sustainable paradigms. The primary purpose of green teaching is to show and investigate the importance of the learners by urging their emotions and increasing awareness of the natural world. It also tries to go beyond surface-level understanding, skills, and knowledge to direct sustainable thinking (Chatterjee & Gol, 2024). As a result, this kind of teaching allows students to be subjects of their learning style preferences to enhance their active feedback through adequate learning settings. (Giest & Lompscher, 2006). It shows the learners how to decrease the consumption of environmental assets, which helps to lower pollution and ensure sustainable use of resources. The teachers can take their students on a study trip to green spaces to learn more about the different natural systems, such as animals and plants, which encourages learners to have a deeper appreciation for the ecosystem and to know the significance of securing biodiversity. Teachers can also teach their students more about compositing, recycling, the causes and effects of environmental change, and using public transportation, which can help them improve their problem-solving abilities and insights into these topics (Chatterjee & Gol, 2024).

Green education has the everyday purpose and values of teaching green practices and trying to achieve sustainable production techniques for economic sectors, societies, and members once they meet its principles (Ardoin et al., 2020). Green education is put into action by educational processes that promote sustainable development. In this regard, education is not merely a means to accomplish a goal; instead, it seeks to build systemic competence for educational and advisory practice, ultimately leading to a successful life (Forstner-Ebhart, 2018).

3.1. Complex Systems

The continuing attempt to scientifically reduce complexity through linear and causal reasoning was criticized by Foerster (1993), who thinks it ignores the interconnected nature, mutual dependence, and impacts of reality. He also describes the social sciences as "soft sciences" that face "hard problems," where multidisciplinary challenges and conflict resolution with individuals take priority over "nature" and disjointed facts. According to Kriz (2000), humans have not learned to think logically, even though they live in natural surroundings that are components of multiple systems. The implications are errors and shortcomings in the design of residential areas. Consequently, working on this kind of system leads to complexity, which,

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in turn, is needed. Working in complex social systems, therefore, requires a broad competence to design the future (De Haan & Harenberg, 2008), which does not consist only of specialized knowledge in specific fields but provides the expression of diverse dimensions of knowledge in operation and ensures productive interactions in complex social dynamics.

3.2. Knowledge as a Source

Knowledge as a means for effective action in complex systems must conform to principles of advanced knowledge, which is constructed vertically and horizontally to be accessible in a system-oriented and interconnected manner. Knowledge as a resource is conceived in its dimensions: practical knowledge, interactive knowledge, identity knowledge, and orienting knowledge, and must be multidimensional and fostered in ambitious teaching-learning environments. To orient knowledge functionally and practically in green education, the importance of metacognition should be primarily emphasized (Weinert 1996, 1997).

Hasselhorn (2006) denotes metacognition as a methodological cognitive field, which is not limited only to knowledge of functional laws but also includes factors affecting one's knowledge, which helps to consider the strong and weak points of self-acquired knowledge. Self-regulation of thinking consists of understanding the requirements of the problem, developing a strategy, selecting an appropriate one, gradually monitoring progress toward the goal, and possibly adjusting the strategy. Therefore, the possibility of success in the work is often a crucial motivator for knowledge acquisition, and the work produces advanced understanding (Gerstenmair & Mandl, 2000).

3.3. System Competency

De Haan and Harenberg (2008) propose a comprehensive education process for sustainable development, directing attention to understanding the interconnectedness of environmental, economic, and community frameworks and making knowledge-based decisions to achieve sustainability. Proficiency in shaping the future needs analytical skills and educational creativity, a continuous cycle of theory and practice, enriching the concepts of knowledge for adaptation in different contexts. The goal of education should not only be based on understanding systems or regulations but also on recognizing their interconnectedness and applying it in reality.

Green education emphasizes system competence in eco-friendly education and incorporates Luhmann's system theory in social phenomena analysis (Luhmann, 1984). This research is relevant to creative ways. Ossimitz (1995) demonstrated the relevance of integrating time factors in the management of systems. The systemic view enables predicting developments and formulating control actions in environmental, economic, and social spheres. Systems theory, which is cross-disciplinary, allows looking at all three environmentally, socially, and economically sustainable parameters. The complementary consideration of the strengths and weaknesses makes possible change and Stability outside the system boundaries (Forstner-Ebhart, 2018).

3.4. Researching Learning Concepts

Eco-conscious learning, from the perspective of practical education, involves learners' competence to be irritated and ponder differences (Kolb, 1984). Institutional learning is effective because it boosts innovative experiences. Conceptual change is an unconscious

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process often needed when knowledge has become insufficient. Learning is an inquiring process, as learners regularly evaluate the reliability of knowledge. Piaget's theory implies that knowledge reorganization is characterized by conflict between Stability and environmental triggers (Siebert, 2009).

The learning process can involve merging or incorporating new concepts, creating apparent cognitive conflicts. In essence, assimilation cognates new experiences with pre-existent knowledge, whereas accommodation includes learners who cannot fit new experiences into existing schemas and are willing to change or expand existing ones. Inquiry-based learning can cause possible resistance against current concepts, and sustainable education is a theoretical change mainly because of accommodation. This change can develop in stages, with each adaptation giving rise to a considerable restructuring or change of mental representation (Forstner-Ebhart, 2018).

3.5. Development in Learning Processes

Learning is an interactive, independent, constructive, contextual, and social interaction that needs learners' active engagement (Reinmann-Rochmeier &Mandle, 1997). Learning is primarily self-directed and influenced by learners' cognitive insights, processing strategies, aspirations, and feelings (Siebert, 2009). Knowledge acquisition should consider learners' self-management, independence, and competence self-assessment (Deci & Ryan, 1985, as cited in Herkner, 2004). Holistic learning is a self-regulated or independent study where individuals are encouraged to enhance their skills to act through learning, supporting transformative learning for self-improvement and fostering personal and social development (Forstner-Ebhart, 2018).

3.6. Macro-Structuring of Teaching-Learning

Passive knowledge transfer is a central concern of teacher-centered instruction, as it neglects emotional connection and self-guided learning. In this context, inert knowledge is reinforced by "Easter bunny pedagogies" rather than fostering system-competent capabilities. By contrast, empowering didactics enables the acquisition of systematic abilities, which is the goal of green education, grounded in system-theoretical findings (Birbaumer & Schmidt, 2003).

Green education encourages multi-perspectivity, collaborative learning, and interdisciplinary in innovative environments. It promotes fact-based assessment, explorative data surveying, and theory-led interpretation, influencing technical proficiencies and practical evaluation. Some aspects should be considered in a learning-teaching setting: communication, cooperation for network, exemplary learning, and opportunities for action and reflection (Forstner-Ebhart, 2018).

3.7. Competency-Based Education

Green education emphasizes sustainable education in the context of motivators for experiencing complex rule-based, value-based, and standard-based thoughts. Emotional connection is critical to internalizing these rules and norms (Heyse & Erpenbeck, 2008). Complex systems and decision-making require social competencies (Feindt & Meyer, 2010). Competency-based education requires setting goals, applying them flexibly, and co-constructing knowledge. Enduring the development of competence in the educational field requires not only implementation but also reflection and evaluation. Cognitively activating

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teaching generates representative and integrated knowledge via problems and research (Büchter, 2008).

3.8. Micro-Didactic Implementation

The content describes a learning approach that addresses environmental, financial, and social issues through individualized exercises. This approach activates prior knowledge, empowers inquiry, and encourages metacognitive reflection. The learning process is also analyzed to determine what has been achieved, what was successful, and what objectives are set. The settled questions needed to be about different systematic-constructivist criteria, such as subject-related goal, relevance, and emotional involvement, irritation (means learning stimuli), exemplarity, multi-perspective, social exchange and co-construction, modeling, evaluation, and reflection (Forstner-Ebhart, 2018).

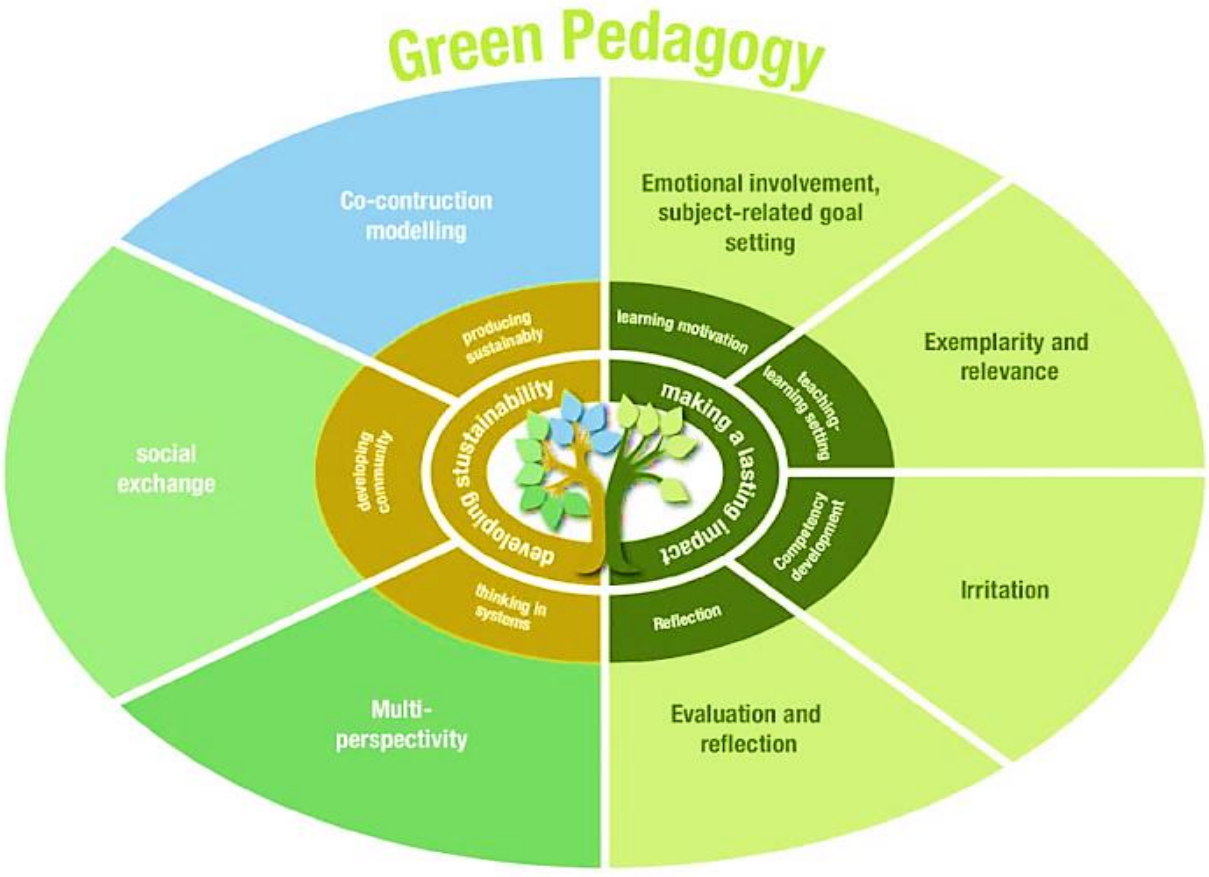

Figure 2: Planning of learning scenarios adopted from (Forstner-Ebhart, 2018)

4. Green Pedagogy in Practice

Individuals and organizations should work together to respond robustly to climate emergencies (Burton, 2019). Being part of global sustainability actions, such as using digital copies instead of hard copies, reducing plastic consumption, and using eco-friendly packaging, is crucial for creating a peaceful climate for learning. Both teachers and students need to work together to find solutions to ecological problems from an educational perspective (Riordan & Klein, 2010).

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Therefore, learners should focus on improving their skills and knowledge and maintaining better environmental settings (Hauschild et al., 2012).

Content-based instruction CBI is broadly utilized and characterized by Garner Borg (2005) as an approach that points to supply a comprehensive representation of interaction in dialect instructional method and environment; CBI is recognized as a comprehensive and worldwide methodology for dialect instruction advancing understudy autonomy and dynamic engagement within the learning prepare (Stryker & Leaver, 1997). According to Cenoz (2015), CBI and Content and Language Integrated Learning (CLIL) exhibit comparable characteristics, facilitating the simultaneous acquisition of language skills and academic content. Consequently, CLIL represents a dual-focused educational strategy that emphasizes the instruction of both language and content knowledge (Coyle et al., 2010; Dalton-Puffer, 2007; Nur et al., 2022).

In this study, the researchers will present the University of Exeter's Environment and Climate Emergency Policy Statement as a model for Iraqi universities and discuss its applicability.

Table 1: A Model of Appling Green Pedagogy

How to apply green education in universities [University of Exeter as a model]

1. Identifying the engagement activities in which teachers, students, suppliers, and partners should be involved:
   i. Highlighting environmental and climate emergency strategies and objectives as a routine task.
   ii. Emphasizing the importance of improving and supporting climate initiatives through governance and risk analysis reporting, particularly carbon scorecard reporting.
   iii. Adopting the policy of significant cultural change across all departments of the University to encourage eco-friendly, economical, and climate-conscious practices.
   iv. Implementing mandatory climate awareness training on carbon for all faculty members and students.
   v. Encouraging the adoption of lifecycle thinking.

2. Utilizing digital information:
   i. Investing in technology to reduce carbon emissions by 50%, such as using virtual conferencing, online lectures, etc.
   ii. Implementing a policy to achieve a carbon-zero impact in digital tools, information processing, and services, including recycling of end-of-life digital tools.
   iii. Reducing paper consumption by 95% for non-essential use.

3. Purchasing sustainable goods and services:
   i. Implementing a policy that ensures all purchasing requests have no environmental impact.
   ii. Establishing a policy that requires domestic, eco-friendly sources and strategies from all suppliers and producers, such as sustainable palm oil.

4. Low Carbon Travel and Local Travel:

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i. Low-carbon alternatives reduce the carbon footprint of non-essential business travel by 50%.
ii. Improvements include improving pedestrian access points, providing safer bicycle parking, creating walking routes, and adding parking for EV vehicles.
iii. Supplying more e-charging points for electric vehicles.

5. Eco-conscious Research:
i. To guide all research practices, students should implement a sustainable research framework.
ii. Implementing Laboratory Efficiency Assessment Framework (LEAF) accreditation

6. Global Sustainability Actions:
i. Building environmentally sustainable global partnership activities with coherent values to help the university achieve a zero-carbon footprint.
ii. Attracting international students and sharing ecological and climate challenge considerations with international partner institutions.

7. Education Courses:
i. Embedding sustainability objectives and the global warming emergency across all programs, including climate awareness training on carbon, into the academic curriculum.
ii. Utilizing blended learning by incorporating digital information and online lectures.

8. Buildings and Work Place:
i. Striving to obtain and generate more renewable energy sources and supplies.
ii. New buildings should adopt an eco-design framework.
iii. Establishing programs to improve the green and energy performance of buildings.

9. Energy and Water:
i. Only products with low WLC (embodied) and high energy efficiency ratings with less environmental impact, should be purchased.
ii. Reduce water consumption by 50%.

10. Waste and Recycling
i. Using fewer disposable items.
ii. Recycling of all items or waste.
iii. Implementing recycling programs.

11. Hospitality, Catering and Retail:
i. Reducing disposable cups by 100%, plastic packaging by 95%, paper by 95%, and recycling waste by 85%.
ii. The impact and benefits of environmental and carbon considerations are necessary for all contracts.

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12. Biodiversity
    i. Establishing a plan that positively affects the environment, such as for wetlands, woodlands, etc.
13. Data analysis and reporting
    i. The eco-friendly and global warming emergency teams should take it.
    ii. Sustainable lifecycle thinking and analysis are adopted to evaluate savings to achieve the lowest climate footprint.

As shown above, it is a complete program that universities could benefit from and apply at their institutions. Still, it does not cover all environmental issues, such as identifying renewable energy solutions or specific measures for biodiversity enhancement and water conservation. We can use this model in Iraqi universities by concentrating on solar panels due to their alignment with Iraq's climate, compatibility with sustainability principles, and long-term cost savings. Before applying this model, we need to check different things, such as:

i. Surveying determining the universities' requirements,
ii. Identifying the most important environmental applications, such as recycling waste and solar panels, which are low-cost and high-impact,
iii. Setting a pilot study in different universities to check whether the selected model is applicable or not through gathering feedback,
iv. Evaluating the success of applying this model by tracking progress,
v. Implementing training courses for all faculty members, including teachers, students, and employees, to adopt green practices.

Conclusion

Pedagogy commonly means educational methodology used as a model to encourage discussions on the theory of teaching and learning. It has allowed teachers to carefully consider their line of work to let them improve their frameworks and understandings (YAFNAW, 2023). It is essential in education for sustainable development is holistic learning, which concentrates on different aspects, such as worldview, social, economic, and ecological (United Nations, 1987). Education for sustainable development comes from studying systems thinking, which is interconnected wholes instead of individual parts such as the planet, the society, the person, and the forest (Inuit Circumpolar Conference, 2020). Based on green teaching and nature-based pedagogy, the study showed the importance of applying a curriculum that includes health safety and natural environmental systems within academic settings and presenting a model by Exeter University. It is a complete program that universities can benefit from and apply to their institutions. We can use this model in Iraqi universities by concentrating on solar panels due to their alignment with Iraq's climate, compatibility with sustainability principles, and long-term cost savings. Before applying it, we need to consider the following steps: conducting a survey, identifying the environmental applications, setting a pilot study and gathering the feedback, evaluating the success of the process, and finally implementing training courses for all members of the institutions. Such teaching and methods help develop a student's critical thinking and more considerate conduct toward the environment.

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