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Education for Sustainable Development in Morocco: An Analytical Study in Light of the Indonesian Experience

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Abstract

In recent decades, sustainable development has drawn worldwide attention as economic, social, and environmental challenges grow. Education plays a key role in equipping individuals with the knowledge, values, and skills necessary to achieve the Sustainable Development Goals (SDGs). This study examines the current state of education for sustainable development in Morocco and compares it with Indonesia's recognized successes. We used a mixed-method approach: a systematic literature review focused on three aspects - (1) integrating sustainable development concepts into school curricula, (2) the role of educational institutions in promoting sustainability, and (3) awareness among teachers and students about the SDGs. Findings reveal gaps in the Moroccan education system's application of sustainable development principles compared to Indonesia, particularly showing Morocco lags behind Indonesia in curriculum content, teacher preparedness, and institutional strategy. The study offers

recommendations to improve curricula, raise teacher capacity, and strengthen institutions aiming to create a Moroccan model aligned with international best practices. Education equips people with the knowledge, values, and skills needed to achieve the Sustainable Development Goals (SDGs). This study examines education for sustainable development in Morocco and compares it with Indonesia's recognized successes. We used a mixed-method approach: a systematic literature review focused on three aspects—(1) integrating sustainable development concepts into school curricula, (2) how educational institutions promote sustainability, and (3) awareness among teachers and students about the SDGs. Findings show Morocco lags behind Indonesia in curriculum content, teacher preparedness, and institutional strategy. The study offers recommendations to improve curricula, raise teacher capacity, and strengthen institutions, aiming to create a Moroccan model aligned with international best practices.

KEYWORDS *Education, Sustainable Development, Curriculum, Morocco, Indonesia*

Introduction

In light of growing global challenges, achieving sustainable development goals has become a key priority for the international community, which seeks to secure the foundations for progress and stability in societies and to meet their current needs, whether economic, social, or environmental, without compromising the resources of future generations. [1] [2] To this end, the United Nations Sustainable Development Program has identified 17 development goals and emphasizes the principle of "leaving no one behind." Different sectors interact comprehensively,

[1] Manuel Fischer et al., *Sustainable Business: Managing the Challenges of the 21st Century*, SpringerBriefs in Business (Cham: Springer International Publishing, 2023), doi:10.1007/978-3-031-25397-3.

[2] Victoria Rudevskaya et al., "Genesis of the Concept of Sustainable Development and the Directions of Its Achievement in Society," *Socio-Economic Relations in the Digital Society* 4, no. 46 (December 31, 2022): 37–48, doi:10.55643/ser.4.46.2022.467.

building awareness, responsible behaviors, and sustainable competencies for future generations.[3]

It is worth noting that the 1987 report "Our Common Future" issued by the World Commission on Environment and Development (WCED) served as a fundamental starting point for the concept of sustainable development. This report identified the three pillars of long-term sustainability —economic, social, and environmental— and emphasized that each pillar carries equal weight. Building on this foundation, the concept was later expanded to encompass two additional dimensions: cultural and participatory governance.[4]

Since its independence in 1956, Morocco has undergone a series of structural changes in its social policies, including advancements in rights and freedoms, equality, education, housing, and health. At the same time, Morocco has faced economic challenges, such as the deterioration of citizens' material conditions due to the spread of poverty and unemployment, as well as environmental challenges related to climate change.[5]

To address these challenges and meet citizens' expectations, Morocco has adopted a participatory approach by developing the National Strategy for Sustainable Development 2016-2030 (SNDD), which aims to achieve comprehensive, sustainable development .[6] To improve the current model in the Kingdom of Morocco and address challenges, the government appointed a special committee to review the country's development model. It ratified three agreements resulting from the 1992 Rio

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[3] Zsuzsanna Nagyné Halász, "Competencies for Sustainable Development," in *Társadalom – Gazdaság – Természet: Szinergiák a Fenntartható Fejlődésben (Konferenciakötet)*, ed. Csilla Obádovics et al. (Soproni Egyetem Kiadó, 2023), 391–99, doi:10.35511/978-963-334-450-7_s7_NagyneHalasz.

[4] Carl Folke et al., "Social-Ecological Resilience and Biosphere-Based Sustainability Science," *Ecology and Society* 21, no. 3 (2016): art41, doi:10.5751/ES-08748-210341.

[5] Mustapha Khouas, "Political Transformations in Morocco: From the Saadi Dynasty to the Present Day," *Heritage Magazine*, no. 10 (December 2013): 36–47, doi:10.12816/0004243.

[6] Soraya Elhamdouni et al., "Beginning of Participatory Urbanism and the Sustainable City: Case of Rabat, Morocco," *Civil and Environmental Engineering* 19, no. 1 (June 1, 2023): 234–47, doi:10.2478/cee-2023-0021.

Conference. These agreements cover combating climate change, protecting biodiversity, and combating desertification. Morocco also committed to the United Nations 2030 Agenda for Sustainable Development.[7] To demonstrate the Kingdom's commitment to achieving the Sustainable Development Goals, Morocco hosted the COP22 climate conference in Marrakesh in 2016, during which organizations recognized the country's efforts in climate action, including climate finance, adaptation, capacity building, and technology transfer.[8] In a further step, Morocco signed a partnership agreement with UNESCO in 2021 entitled "Towards Education for Sustainable Development in Morocco", and regularly participates in the High-Level Political Forum to follow up on the implementation of the 2030 Sustainable Development Goals.[9]

In education, sustainable development plays a crucial role for learners, shaping their perspectives and preparing them for a sustainable future by promoting responsible values, civic participation, and critical thinking.[10] Conducting regular studies to assess learners' understanding of sustainable development concepts at primary, secondary, and university levels is essential.[11] These studies identify knowledge gaps, raise awareness, and foster the adoption of sustainable behaviors. Furthermore, they enable

[7] Abdellah Mouttaqi, "Le Développement Durable Au Maroc : Une Analyse Croisée Selon La Triple Performance Dans Un Contexte de Dérèglement Climatique et de Crise Systémique Induite Par La Pandémie de La Covid-19," n.d.

[8] A. Ghezloun, A. Saidane, and H. Merabet, "The COP 22 New Commitments in Support of the Paris Agreement," *Energy Procedia* 119 (July 2017): 10–16, doi:10.1016/j.egypro.2017.07.040.

[9] Mohammed VI Foundation for Environmental Protection, *Annual Report 2021 – Mohammed VI Foundation for Environmental Protection*, 2021, https://fm6e.org/wp-content/uploads/2022/10/FM6-Rapport-Annuel-2021-Ang-1.pdf.

[10] H. Müderrisoglu and A. Altanlar, "Attitudes and Behaviors of Undergraduate Students toward Environmental Issues," *International Journal of Environmental Science & Technology* 8, no. 1 (December 2011): 159–68, doi:10.1007/BF03326205.

[11] Gamze Hastürk, Merve Urhanoğlu, and Yasin Gökbulut, "Examination of the Environmental Awareness Primary School Students and Their Attitudes Towards the Environment," *European Journal of Education Studies* 10, no. 7 (June 13, 2023), doi:10.46827/ejes.v10i7.4885.

educational institutions to refine curricula and programs, advancing sustainable development goals.[12]

Given Morocco's lack of clear educational policies to instil the principles and values of sustainable development in young people, and the need for more work to steer sectoral developments and strategies towards sustainability [13], there is a need to revise educational curricula and enable them to integrate the social and cultural contexts in which schools exist, so that they are consistent with the identities and characteristics of this school reality. [14] From another perspective, integrating sustainable development into the core of the educational process is now essential: designing curricula that embody culture and social awareness in all their dimensions not only raises societal awareness but also equips future generations with the necessary skills to build a more sustainable and prosperous future.[15]

In comparison, Indonesia has adopted a set of laws and policies to achieve sustainable development goals. However, the effectiveness of these frameworks remains limited due to structural challenges, including weak implementation mechanisms, insufficient human and financial resources, inadequate institutional coordination, as well as increasing pressures from rapid industrial development and urbanization. [16] In this context,

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[12] Arba'at Hassan, Tajul Ariffin Noordin, and Suriati Sulaiman, "The Status on the Level of Environmental Awareness in the Concept of Sustainable Development amongst Secondary School Students," *Procedia - Social and Behavioral Sciences* 2, no. 2 (2010): 1276–80, doi:10.1016/j.sbspro.2010.03.187.

[13] Aaron Benavot, "Education for Sustainable Development in Primary and Secondary Education" (University at Albany-SUNY, 2014), doi:10.13140/RG.2.1.1978.9283.

[14] Keriffe R. Clark, "Education for Sustainable Development, Curriculum Reform and Implications for Teacher Education in a Small Island Developing State," *Discourse and Communication for Sustainable Education* 13, no. 1 (June 1, 2022): 145–53, doi:10.2478/dcse-2022-0011.

[15] Raphael R. Kelani, "Integration of Environmental Education in Science Curricula in Secondary Schools in Benin, West Africa: Teachers' Perceptions and Challenges," *Electronic Journal of Science Education*, 2015.

[16] Francisca Rachel Alicia, "Implementation of Environmental Pollution and Damage Prevention Instruments in Indonesia: Issues and Challenges," *Indonesian Journal of Environmental Law and Sustainable Development* 3, no. 1 (January 31, 2024), doi:10.15294/ijel.v3i1.78892.

education for sustainable development emerges as a strategic tool for addressing these imbalances by promoting environmental awareness, building human capacity, and instilling values of ecological citizenship in both learners and teachers. Strengthening regulatory frameworks and implementing effective education policies will be essential for Indonesia to fully realize its sustainable development objectives and overcome existing challenges.[17]

Indonesia's rich biological resources and rapid industrialization make it hard to balance economic growth, environmental protection, and social stability, even with international agreements and civil society support.[18] This highlights the pivotal role of educational institutions, particularly schools and universities, in establishing a culture of sustainability and promoting positive environmental behaviors through curricula, educational activities, and community partnerships.[19] [20]

Based on the above, we can learn lessons from the Indonesian experience, where scientific studies show how educators integrate education for sustainable development into policies and practices. This approach improves learners' environmental and social awareness and skills by adopting strategies such as problem-based learning and projects that align with the pillars of sustainability and demonstrate their effectiveness in educational contexts.[21]

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[17] Elliott Mokski et al., "Education for Sustainable Development in Higher Education Institutions: An Approach for Effective Interdisciplinarity," *International Journal of Sustainability in Higher Education* 24, no. 1 (January 5, 2023): 96–117, doi:10.1108/IJSHE-07-2021-0306.

[18] Muhammad Azhary Bayu Saputra, Ega Rijal Mahardika, and Siti Almiraa Kariim, "Political Direction of Environmental Management Law in Indonesia," *Indonesian Journal of Environmental Law and Sustainable Development* 2, no. 1 (January 31, 2023), doi:10.15294/ijel.v2i1.66100.

[19] Wiwik Okta Susilawati et al., "Urgency of Adiwiyata School for Education as Sustainable Development," *Journal of Education and Learning (EduLearn)* 14, no. 4 (November 1, 2020): 543–49, doi:10.11591/edulearn.v14i4.15584.

[20] Tini Adiatma, "Integration Education for Sustainable Development in Indonesia," *Universitas Gadjah Mada, Yogyakarta-Indonesia*, 2017.

[21] Alfan Thoriq and Fitri Nur Mahmudah, "Education for Sustainable Development (Esd): A Systematic Literature Review on Curriculum Development Strategy Design,"

Recent years have witnessed a significant surge in publications, authors, and journals focused on education for sustainable development, indicating momentum in this field and greater understanding and collaboration among scientists and researchers worldwide.[22] However, there appears to be a gap between theories and the actual practices of sustainable development, highlighting the importance of previous reviews, which pave the way for understanding the context and identifying gaps by guiding research.[23]

This research paper examines the current state of education for sustainable development in Morocco by investigating the interaction between the national education system and the requirements of sustainable development. The analysis incorporates the Indonesian experience as an international model for comparative purposes. The study employs a systematic review of scientific research on education for sustainable development in Morocco, comparing its findings with those from Indonesian studies to extract lessons and adapt them to the Moroccan context. Accordingly, the central research question is: How can education for sustainable development in Morocco be advanced by drawing on the Indonesian experience?

This study is scientifically important because it provides a clear picture of the reality of education for sustainable development in Morocco. It analyses how sustainability principles are integrated into curricula and educational institutions and assesses public awareness, using the Indonesian experience as a comparative model. The study provides an analytical framework to understand the strengths and weaknesses of the Moroccan education system. It supports policy development and

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European Journal of Education Studies 10, no. 5 (April 29, 2023), doi:10.46827/ejes.v10i5.4803.

[22] Nigel Brissett and Radhika Mitter, "For Function or Transformation? A Critical Discourse Analysis of Education under the Sustainable Development Goals," *Journal for Critical Education Policy Studies*, 2017, 15 edition, http://www.jceps.com/archives/3326.

[23] Gabriela Grosseck, Laurențiu Gabriel Țîru, and Ramona Alice Bran, "Education for Sustainable Development: Evolution and Perspectives: A Bibliometric Review of Research," *Sustainability* 11, no. 21 (2019): 6136, doi:10.3390/su11216136.

reinforces scientific research to guide education towards the Sustainable Development Goals and prepare future generations for challenges.

Literature review

The literature indicates that the integration of education for sustainable development into the Indonesian education system is progressing gradually but varies across educational levels. At the higher education level, studies emphasize a dual approach: integrating sustainability concepts into existing curricula and developing independent, specialized academic programs, while also promoting environmental research and utilizing technology and e-learning.[24] At the secondary level, although integration remains partial, there are opportunities to develop critical thinking skills and encourage environmental engagement, especially in science and social science subjects, despite challenges related to teacher competence, weak digital infrastructure, and a lack of standardized assessment tools.[25] At the primary level, studies have revealed disparities in teachers' understanding of the Sustainable Development Goals, primarily due to limited professional training and the absence of supportive curricula, both of which affect efforts to raise learners' awareness of global environmental and social issues.[26]

At the institutional level, the literature emphasizes the critical role of schools and universities in fostering sustainability values and cultivating positive environmental behaviors among learners. This is achieved through educational activities, context-based learning, and collaboration with

[24] Mokski et al., "Education for Sustainable Development in Higher Education Institutions."

[25] Nida' Farah Abiyya et al., "Understanding Education Sustainable Development (Esd) in High School Students." 1 (2025).

[26] Muhamad Afandi and Reza Rachmadtullah, "Teachers' Perceptions of Sustainable Development Goals (SDGB) Based Education to Increase Students' Social Awareness Through Social Studies Learning in Elementary Schools," *Journal of Innovation and Research in Primary Education* 4, no. 3 (August 11, 2025): 1451–60, doi:10.56916/jirpe.v4i3.1866.

community partners.[27] Studies also indicate that schools are not merely spaces for knowledge transfer, but comprehensive educational environments that instill sustainability values and develop positive behaviors in learners, thereby promoting the development of environmentally conscious personalities and supporting their institutional role in achieving sustainability .[28] In this context, the literature confirms that universities are strategic actors in supporting sustainable development through national policies, comprehensive academic programs, and the promotion of scientific research, thereby preparing students to bring about positive social change.[29]

Regarding awareness of the Sustainable Development Goals, studies show a noticeable discrepancy in the Indonesian context between teachers and learners, due to a number of interrelated factors, most notably professional experience, approved pedagogical practices, and the nature of the educational tools used. Although teachers actively express a positive commitment to sustainability principles, the results show a lack of conceptual understanding and technological competence, which limits their ability to transform this awareness into effective, transformative educational practices and underscores the need for continuous, targeted professional development programs.[30] At the learner level, applied studies demonstrate that adopting digital modules based on education for sustainable development is an alternative or complement to traditional educational materials, as they have contributed to noticeable improvements in critical thinking skills, raised environmental awareness,

[27] Universitas Kristen Satya Wacana et al., "Delevoping Green Behaviour in Indonesia: Why Does Adiwiyata School Matter?," *Journal of Sustainability Science and Management* 18, no. 5 (May 31, 2023): 33–51, doi:10.46754/jssm.2023.05.003.

[28] Susilawati et al., "Urgency of Adiwiyata School for Education as Sustainable Development."

[29] Adiatma, "Integration Education for Sustainable Development in Indonesia."

[30] Yenny Anwar et al., "Education for Sustainable Development Based on Technological Pedagogical Content Knowledge in Biology Education: Assessing Teachers' Readiness," *Jurnal Pendidikan IPA Indonesia* 14, no. 3 (September 11, 2025), doi:10.15294/jpii.v14i3.22908.

and promoted active participation in the classroom. [31] However, inadequate professional training for some teachers remains a significant obstacle to mainstreaming sustainability practices in preparatory education; this challenge manifests as limited integrated learning and insufficient implementation of school sustainability projects.[32]

Accordingly, the literature review highlights that promoting education for sustainable development in Indonesia requires a comprehensive, integrated approach that supports educational policies, develops teacher competencies, and expands the use of digital tools to ensure a sustainable educational impact raises learners' awareness and guides their behavior towards sustainability.

Materials and methods

To ensure comprehensive scientific research, a mixed-method approach was adopted for its ability to accurately interpret results and provide a deeper understanding of the phenomena under study. This approach provided a comprehensive overview of the current research questions and clarified aspects that had been unclear, thereby enhancing the quality of previous studies. Systematic review procedures for scientific literature were then followed in accordance with accepted standards, based on several reference works, including the study by N. M. Ardoin and A. W. Bowers (2010) [33], in addition to employing some of the bibliometric review principles as described in (G. Grosseck et al., 2019). [34] The reference search strategy focused in general on the following concepts: education, awareness, curricula, educational activities, school and

[31] Sri Wulandari and Rizqa Alfajri Husna, "Implementation of an Education for Sustainable Development (ESD)-Based Electronic Module to Improve Critical Thinking Skills and Environmental Awareness Among Students in the Wetland Ecology Course" 9, no. 6 (2025).

[32] Gita Nurul Puspita et al., "The Integration ESD and Ethnoscience to Merdeka Curriculum: Study on Junior High School," *Indonesian J. Integr. Sci. Education* 6 (2024).

[33] Nicole M. Ardoin and Alison W. Bowers, "Early Childhood Environmental Education: A Systematic Review of the Research Literature," *Educational Research Review* 31 (November 2020): 100353, doi:10.1016/j.edurev.2020.100353.

[34] Grosseck, Țîru, and Bran, "Education for Sustainable Development."

university clubs, and educational institutions. This conceptual approach narrowed the research scope to the keywords "sustainable development" and "Morocco." An extensive, cross-referenced search was conducted across over 37 scientific databases to identify as many studies as possible related to the research topic.

However, based on the quality and quantity of documents collected, the most prominent databases used in the initial research phase were ScienceDirect, Scopus, HAL.science, and Web of Science. During this phase, three main languages were used: Arabic (the official language), French (the first foreign language), and English (the second foreign language). The research was not restricted to a specific time frame, given the topic's relative novelty and rapid development in education for sustainable development. Accordingly, a set of methodological steps was adopted, which are presented below:

Step 1: Eligibility check and quality assessment:

During this step, duplicate documents (121 documents) were removed by manually renaming and categorizing the documents. The documents were then examined using a decision tree (Figure 1), a unidirectional diagram used to select optimal decisions by avoiding bad choices, following a clear strategy to achieve the study's intended goal.[35] The research team members read all 286 documents, assigning a technical card to each citation that included (title, year of publication, language of publication, research center, country, document type, journal of publication, abstract, methodology, conclusions, and recommendations). Using a decision tree, important studies that met the following criteria were retained:

- **Geographic scope:** Only research related to Morocco (studies from within or outside Morocco) was retained.
- **Target group:** Only documents covering those actually involved in the teaching-learning process (teacher – learner – knowledge) were retained.

[35] JunYi Xu, "Systematic Analysis and Application Prospect of Decision Tree," *Highlights in Science, Engineering and Technology* 71 (November 28, 2023): 163–70, doi:10.54097/hset.v71i.12687.

- **Educational settings:** The focus was on higher education institutions (universities, training centers, and research centers), as well as schools and educational institutions (primary, middle, and high schools).

After conducting a quality assessment of all studies, the research team agreed to exclude 45 studies that did not meet quality standards, as they did not provide precise, accurate results or data directly relevant to the topic.

Step 2: Data coding:

The data was coded and classified in an Excel spreadsheet to facilitate the classification of publications according to several criteria, including:

- **Publication information:** date of publication, language of publication, authors and researchers, etc.
- **Place of publication:** university, research center, organization, etc.
- **Field of study:** educational curricula, educational institutions, awareness, and behavior.
- **Methodology:** quantitative (questionnaire, literature review), qualitative (content analysis, interviews, field study, comparative study, survey).

After a complete review, it was found that only 55 documents met the decision tree criteria, while 25 documents failed due to indirect impact.

Step 3: Data analysis:

In our data analysis, we used both inductive and deductive approaches.[36] The most common results concerned the role of educational institutions in implementing sustainable development, accounting for 46% (27 documents). Studies related to the implementation of sustainable development within school curricula were found to a slightly lesser extent, accounting for 41% (24 documents). Finally, among the lowest percentages (14%), we find only eight documents related to awareness of the Sustainable Development Goals.

[36] Paula Gonçalves Serafini et al., "Sustainable Development Goals in Higher Education Institutions: A Systematic Literature Review," *Journal of Cleaner Production* 370 (October 2022): 133473, doi:10.1016/j.jclepro.2022.133473.

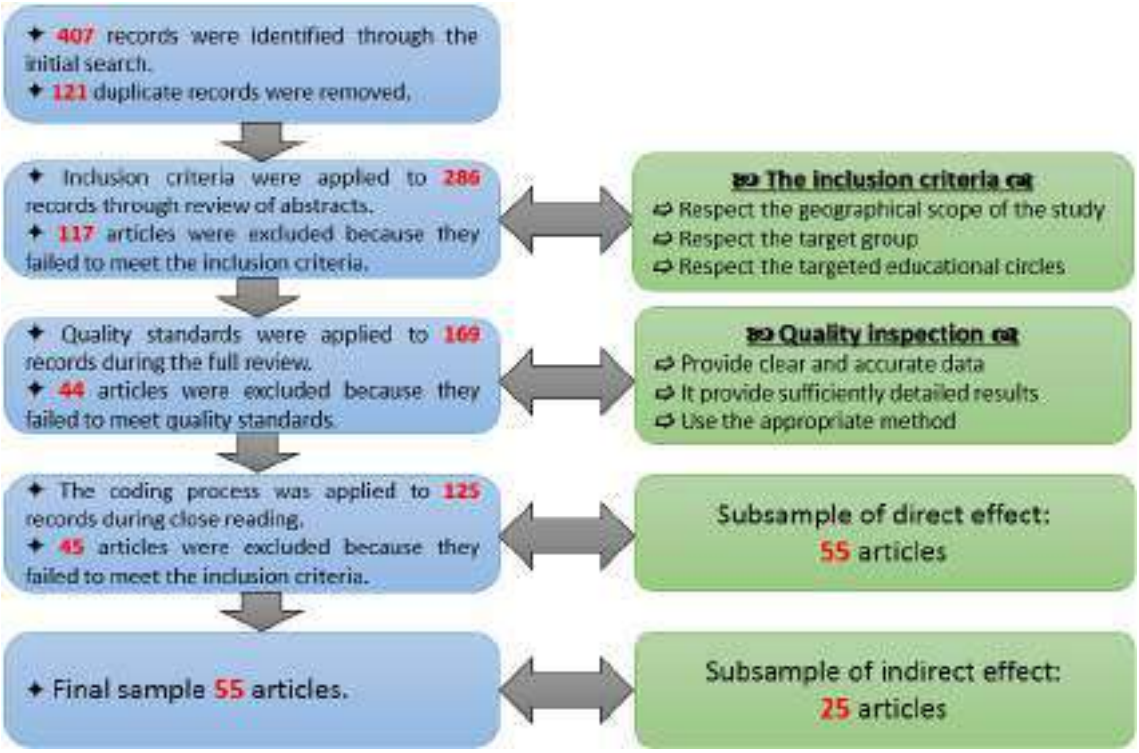
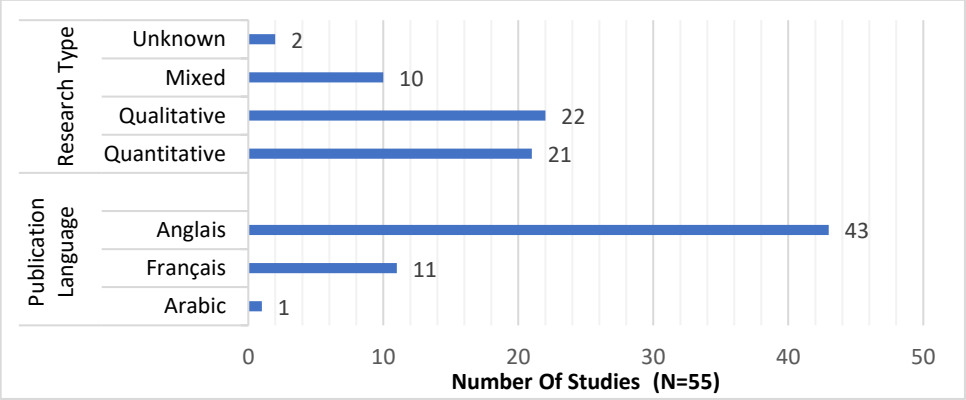


Figure 1. Flowchart of the research process using the decision tree

4.1. General characteristics of the study:

The final sample, selected for its close relevance to the study topic, consists of 55 scientific articles distributed across 42 journals. Figure 2 summarizes the study's characteristics.

Figure 2. Summary of the characteristics of the study



Based on the analysis of the study's characteristics, there appears to be diversity in the research approaches used: 22 studies adopted a

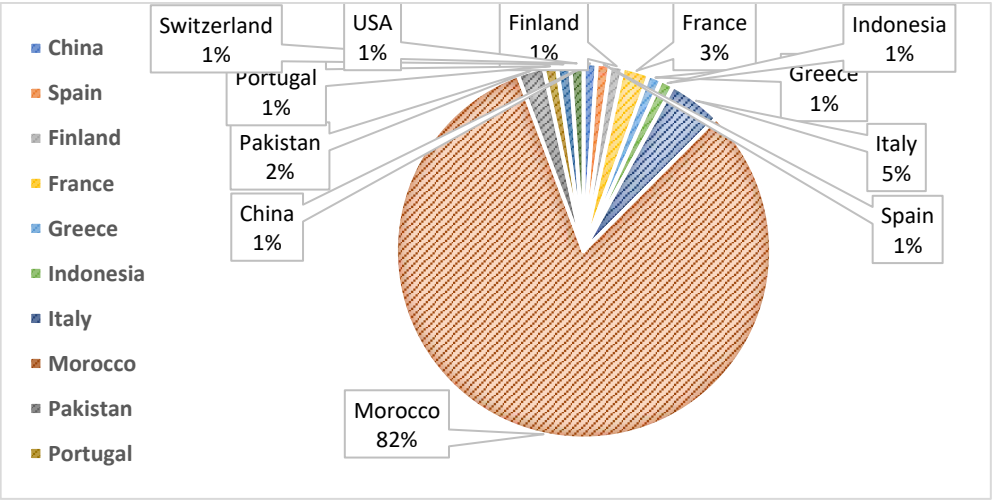
qualitative approach and 21 a quantitative approach. It is noteworthy that only 10 studies adopted a mixed approach, while the remaining studies did not use any specific approach. The results also indicated variation in language use, with a greater abundance of results in cases where English was used. 43 (forty-three) studies relied on English, 11 (eleven) studies on French, and 1 (one) on Arabic.

4.2. Geographic distribution:

Regarding geographic distribution, some articles were co-authored by a group of diverse research centers from different countries. Regarding the geographic distribution of countries, the research papers analyzed included contributions from 12 countries. Figure 3 shows the global geographical distribution.

There is an apparent disparity by country: Morocco contributed the most studies (82%), which is appropriate given the study's focus. Italy followed with four studies (5%), then France and Pakistan with two each (3%). The United States, Portugal, Switzerland, China, Spain, and Finland each had one study (1%). Notably, other Arab and African countries were not represented in the Morocco-related research.

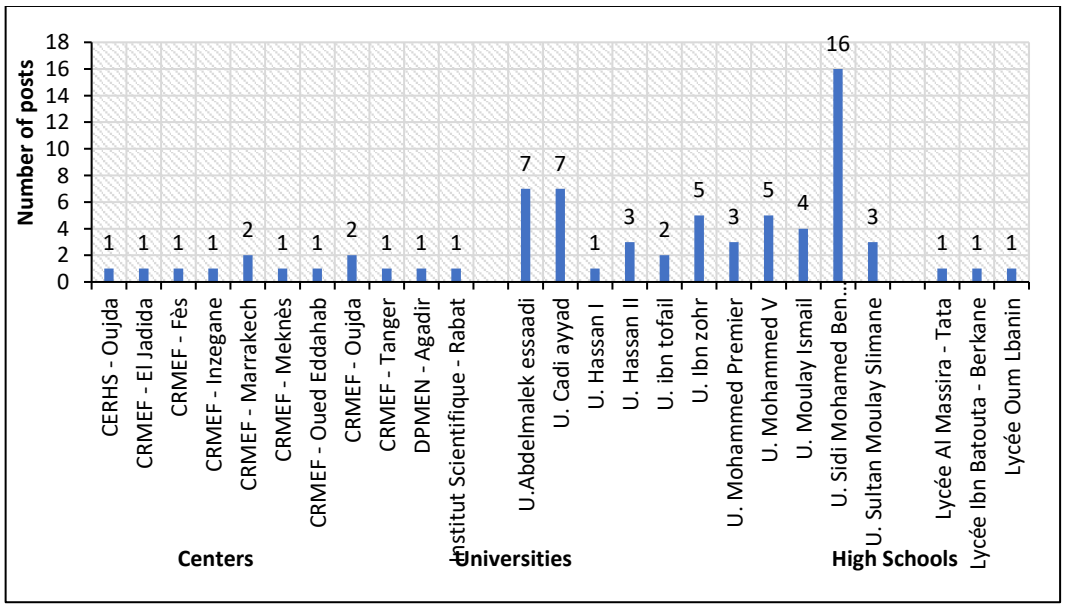
Figure 3. Geographical distribution (globally)



Research centers play a vital role in promoting scientific research and supervising the editing of research articles. They are institutions owned by

the public or private sectors. Figure 4 shows the geographical distribution of research centers, including universities, regional education and training centers, and vocational high schools.

Figure 4. Geographical distribution (national)



The results showed that Moroccan universities' participation in document editing reached 80%. In this context, Sidi Mohammed Ben Abdellah University ranked first with sixteen contributions, followed by Abdelmalek Essaadi University and Cadi Ayyad University with seven contributions each. Ibn Zohr University and Mohammed V University recorded five contributions, while Moulay Ismail University contributed four research papers. They were followed by Hassan II University, Mohammed I University, and Sultan Moulay Slimane University, each with three contributions. Ibn Tufail University came in second-to-last with two contributions, while Hassan I University made the only contribution.

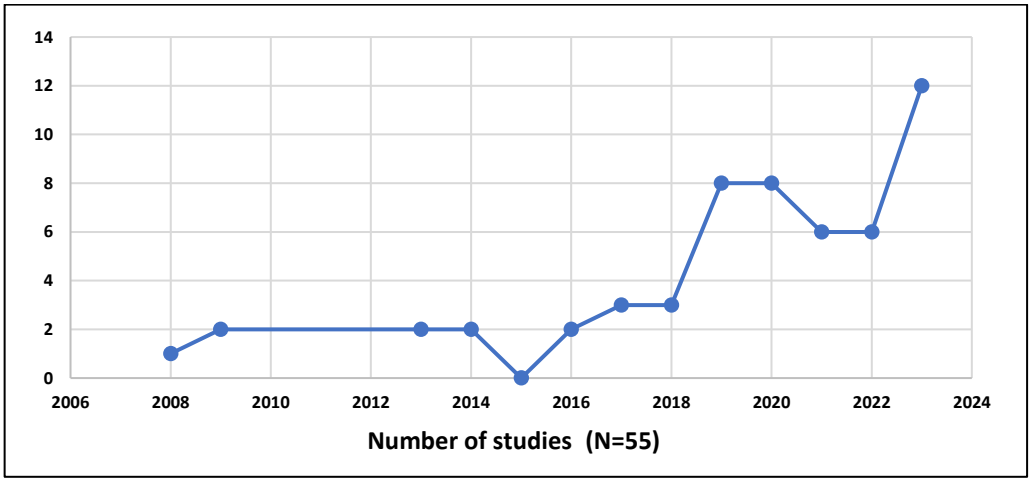
As for the regional centers for education and training, their participation rate was 16%. The centers in Marrakesh and Oujda were most interested in the topic, while the other centers recorded very low participation. Finally, there were teachers' interaction in three secondary schools, with a participation rate of 4%, namely Amal Benin Secondary

School in Fez, Ibn Battuta Secondary School in Berkane, and Al Masira Secondary School in Tata.

4.3. Annual trends in publications:

Regarding the research dates, the time period was considered open. Figure 5 shows the distribution of the number of publications on education for sustainable development from 2008 to 2023.

Figure 5. Number of publications on education for sustainable development during the period 2008-2023

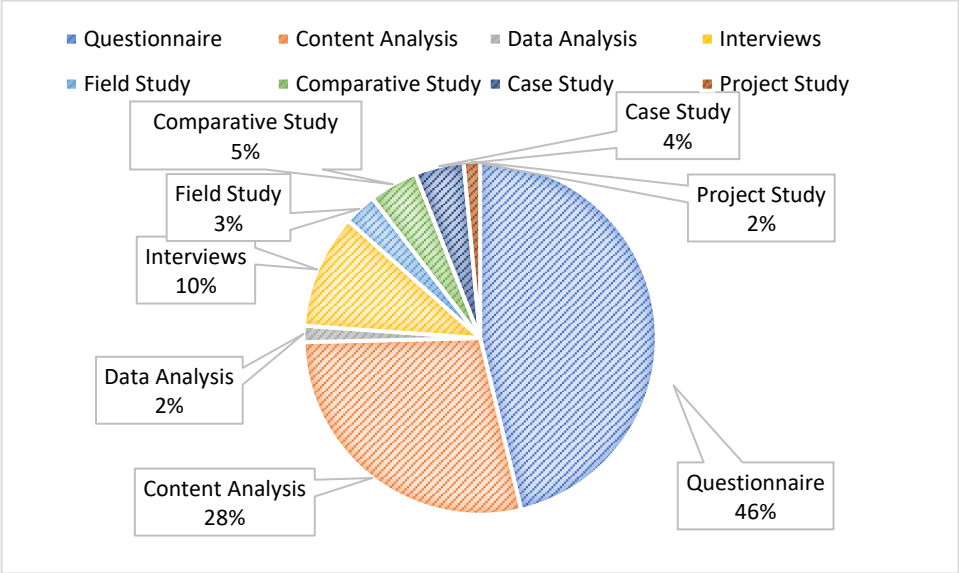


There has been a gradual increase in publications on education for sustainable development in Morocco, which can be divided into two phases. The first phase (2008-2015) was characterized by stability and consistency, while the second phase (2016-2023) saw remarkable growth, especially in 2023, when 12 studies were published.

4.4. Methodology used:

The methodology of the study refers to the methods and steps researchers use in scientific research to obtain reliable, accurate results. Figure 6 shows the distribution of methods used in education for sustainable development topics.

Figure 6. Methods used in education for sustainable development topics



Based on the results shown above, various methods are used in research. Questionnaires were used 31 times (46%) to collect information from individuals, followed by content analysis, which was used 19 times (28%) to evaluate a set of school curricula in Morocco. Interviews were used in 7 cases (10%), while comparative and case studies were used in 3 cases each (5%), and field studies were used twice (3%). Finally, a project study and data analysis were conducted once (2%).

5.1. Key features of the scientific output under review

The results of this systematic review reveal that scientific research on education for sustainable development in Morocco is characterized by diverse study designs, a concentration of research in specific regions, noticeable changes in output over time, and varied research methodologies.

Regarding the general characteristics of the studies, it is noted that there is still an apparent variation in methodological approaches. Qualitative and quantitative approaches dominate at the expense of the mixed approach, which has only been adopted in a limited number of studies, despite its potential for deeper interpretation, especially in complex issues such as education for sustainable development. This

relative weakness of the mixed approach can be explained by barriers such as time constraints, increased complexity in study design, or the lack of specialized methodological training among some researchers.

The linguistic disparity and the dominance of English reveal researchers' desire to publish in international journals with high impact factors. In contrast, there is a limited presence of Arabic in such publications. This raises a fundamental problem: educational decision-makers and practitioners at the local level have limited access to scientific research results. As a result, the practical impact of this research on the development of educational policies and practices may be reduced.

In terms of geographical distribution, the results show a clear concentration of research in Morocco, which is logical given that the Kingdom is the subject of study. However, few Arab and African countries participate, revealing weak regional comparative approaches. This may limit the sharing of experiences and the building of common knowledge. On the other hand, the participation of some European countries remains indicative of the openness of Moroccan research to the international academic space. However, this openness remains limited in terms of quantity and diversity.

At the national level, Moroccan universities play a central role in producing knowledge related to education for sustainable development, accounting for the largest share of publications. This reflects the concentration of scientific research within universities, compared to the limited participation of regional centers for education and training and the very weak participation of school institutions. This points to a gap between academic research and educational practice in the field. To address this, it is important to strengthen action research programs and actively support teachers and educational institutions in initiating and sharing sustainability-related knowledge projects.

Regarding annual publication trends, the results show a gradual increase in interest in the subject, with a notable jump during 2016–2023. This rise appears to be connected to several factors: the growing global interest in the Sustainable Development Goals following the adoption of the 2030 Agenda spurred national education policy changes, which, in turn, led to reforms in the Moroccan education system. These developments fostered greater awareness of the importance of integrating

sustainability into educational curricula and practices, ultimately contributing to the increase in publication activity during this period.

In terms of methodologies and tools, the results indicate a wide range of approaches, reflecting the diversity of perspectives used to understand the phenomenon. Specifically, there is a predominance of questionnaires, highlighting a heavy reliance on quantitative data collection from individuals. While this allows for broad monitoring of trends, knowledge, and attitudes, it may limit the contextual and experiential understanding of behaviors and practices. In addition, content analysis comes second, demonstrating interest in examining school curricula and assessing the extent to which sustainability concepts are integrated. Meanwhile, the use of interviews, comparative and case studies, and field studies represents a smaller proportion, indicating a limitation in qualitative and applied research that could provide a deeper understanding of the practical challenges and institutional successes in sustainable education. Finally, the use of project studies and one-off data analysis highlights the need for more applied studies that link theory to practice.

Based on the above, scientific research on education for sustainable development in Morocco is undergoing remarkable quantitative and qualitative growth. However, it still needs greater methodological diversification, stronger applied and comparative dimensions, and an expanded base of research actors to ensure the production of scientific knowledge that is more in-depth and relevant to the desired educational and developmental transformations.

5.2. Integrating sustainable development into curricula, institutions, and environmental awareness in Morocco

The literature review demonstrates that school curricula serve as a primary avenue for incorporating sustainable development concepts into the Moroccan education system. Analysis of 24 studies indicates a predominant emphasis on life and earth sciences, given their direct relevance to environmental issues and sustainability.[37] These studies

[37] Asma Id Babou et al., "Education for Sustainable Development and Teaching Biodiversity in the Classroom of the Sciences of The Moroccan School System: A Case Study Based on the Ministry's Grades and School Curricula from Primary to

address topics such as biodiversity, environmental education, and the promotion of environmental awareness and environmentally responsible behaviors.[38] They also highlight the significance of teachers, as well as the use of technology and field activities, in enhancing learning outcomes [39]. Furthermore, textbook analyses across educational levels reveal varying degrees of coverage of subjects such as pollution, biodiversity, and energy efficiency.[40] [41]

In contrast, studies in the physical sciences and mathematics reported a limited number of research papers, despite emphasizing the importance of integrating environmental education, particularly in the context of renewable energy, and its positive impact on learners' interest and understanding of scientific subjects. [42] [43] As for geography, family education, and English language curricula, the results showed varying levels of sustainability topics, underscoring the need for careful planning and conscious selection of content and activities to ensure alignment with

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Secondary School and Qualifying," *British Journal of Education* 8, no. 2 (February 28, 2020): 13–21, doi:10.37745/bje/vol8.no2.pp13-21.2020.

[38] Asma Id Babou et al., "Teaching Biodiversity: Towards a Sustainable and Engaged Education," *Education Sciences* 13, no. 9 (September 12, 2023): 931, doi:10.3390/educsci13090931.

[39] Noureddine Ameziane, "Place de l'environnement dans les curricula marocains des Sciences de la Vie et de la Terre au cycle secondaire," *The Journal of Quality in Education* 8, no. 11 (April 4, 2018): 19, doi:10.37870/joqie.v8i11.153.

[40] ARFAOUI Mustapha et al., "Biodiversity in Moroccans Textbooks: Implications for Action-Oriented Environmental Education," 2016.

[41] Adesuwa Vanessa Agbedahin, "Sustainable Development, Education for Sustainable Development, and the 2030 Agenda for Sustainable Development: Emergence, Efficacy, Eminence, and Future," *Sustainable Development* 27, no. 4 (July 2019): 669–80, doi:10.1002/sd.1931.

[42] Abdelwahab El Azzouzi, Abdelrhani Elachqar, and Fatiha Kaddari, "Exploring the Evolution of Student Interest: Investigation of the Scientific Aspects of Learning Physics towards Renewable Energy," ed. S. Bourekkadi et al., *E3S Web of Conferences* 412 (2023): 01001, doi:10.1051/e3sconf/202341201001.

[43] Abdelwahab El Azzouzi, Abdelrhani Elachqar, and Fatiha Kaddar, "L'éducation Environnementale et Les Enjeux Scientifiques de l'apprentissage Des Sciences Physiques : Recherche Sur l'évolution de l'intérêt Des Apprenants," ed. S. Bourekkadi et al., *SHS Web of Conferences* 175 (2023): 01001, doi:10.1051/shsconf/202317501001.

educational objectives.[44] [45] Overall, these results point to the need to adopt a systematic, integrated approach to incorporating sustainable development principles across all curricula, moving beyond a partial or descriptive treatment to achieve transformative, enduring learning outcomes. A deliberate, comprehensive curriculum reform is therefore essential to ensure that all learners are equipped with the knowledge, skills, and values necessary to address current and future sustainability challenges.[46]

Regarding educational institutions, a review of the literature highlights their pivotal role in consolidating education for sustainable development in Morocco by developing learners' knowledge, skills, and civic values. Of the 23 studies reviewed, the key findings show that universities lead in scientific output, particularly through contributions to regional development[47], the promotion of green entrepreneurship[48], the delivery of sustainability-focused training, and the implementation of innovative pedagogical approaches (such as project-based, experiential,

[44] H. Laaloua, "The Role of Education in Addressing Environmental Challenges: A Study of Environmental Education Integration in Moroccan Geography Textbooks," *International Journal of Social Science and Human Research* 06, no. 04 (April 19, 2023), doi:10.47191/ijsshr/v6-i4-41.

[45] Mliless Mohamed and Larouz Mohammed, "An Ecolinguistic Analysis of Environment Texts in Moroccan English Language Teaching Textbooks," *International Journal of Research in Environmental Studies* 5 (2018): 103–16.

[46] Hassan Laaloua and Youssef Tamer, "Promoting Environmental Education in Moroccan High School ELT Textbooks," *International Journal of Language and Literary Studies* 4, no. 1 (March 30, 2022): 317–30, doi:10.36892/ijlls.v4i1.860.

[47] Ibtissam Slimani and Mostafa Abakouy, "From Protecting the Environment to Fostering Innovation: Moroccan Universities in the Era of Territorial Competitiveness," ed. S. Bourekkadi et al., *E3S Web of Conferences* 412 (2023): 01018, doi:10.1051/e3sconf/202341201018.

[48] ELMOUKHTAR Mohamed, TOUHAMI Fatima, and TAOUABIT Othmane, "La promotion de l'entrepreneuriat vert : Quel rôle pour l'université marocaine ? Cas de l'Université Sultan Moulay Slimane," January 31, 2022, doi:10.5281/ZENODO.5919199.

and e-learning).[49] Additionally, universities drive applied projects in areas like the environment, air quality, and renewable energy.[50]

The results indicate a persistent gap between the institutionalization and practical implementation of sustainability initiatives within universities, as well as an uneven distribution of environmental units across academic disciplines. This disparity restricts the broader dissemination of sustainability's educational impact. In school education and vocational training, studies report limited integration of environmental education into classroom practices and applied activities, a continued reliance on traditional teaching methods, and insufficient pedagogical support and extracurricular opportunities, despite widespread recognition of schools' role in transmitting environmental knowledge.[51] [52] Furthermore, research highlights the significance of parallel activities, such as environmental clubs, volunteering, and educational theater, in promoting awareness and fostering behavioral change.[53] [54] Overall, the results emphasize three key

[49] Malak Bouhazzama and Said Mssassi, "The Impact of Experiential Learning on Environmental Education during a Moroccan Summer University," ed. S. Bourekkadi et al., *E3S Web of Conferences* 234 (2021): 00031, doi:10.1051/e3sconf/202123400031.

[50] Hasna MHARZI, "Education for sustainable development using project-based pedagogy : A Case Study of National School of Electricity and Mechanics - Morocco," *Journal of Educational and Training Paths* 3 (November 4, 2020), doi:10.48403/IMIST.PRSM/MASSALEK-V3I2.22657.

[51] Bouchta El Batri et al., "Teaching Environmental Themes within the 'Scientific Awakening' Course in Moroccan Primary School: Approaches, Methods and Difficulties," *Education Sciences* 12, no. 11 (November 20, 2022): 837, doi:10.3390/educsci12110837.

[52] Ahmed Sayad et al., "The Status of Environment in Educational Institutions: High Schools of The City of Fez, Morocco, As A Case Study," *Procedia - Social and Behavioral Sciences* 191 (June 2015): 2598–2604, doi:10.1016/j.sbspro.2015.04.687.

[53] Bouamama Cherai et al., "Les Clubs D'environnement Dans Les Établissements Scolaires Au Maroc: Une Voie Prometteuse Pour L'ancrage De L'éducation À L'environnement," *European Scientific Journal* 13, no. 13 (May 31, 2017): 337, doi:10.19044/esj.2017.v13n13p337.

[54] Lotfi Houmam and Ibourk Aomar, "Effects of School-Based Environmental Clubs: Fostering Environmental Awareness and Strengthening Eco-Citizen Behaviors Among Students," *Journal of Law and Sustainable Development* 11, no. 12 (December 5, 2023): e1775, doi:10.55908/sdgs.v11i12.1775.

recommendations: (1) adopt a comprehensive institutional approach that promotes coordination among actors ; (2) strengthen training programs in sustainability; and (3) expand the scope of practical applications. These measures will help ensure a sustainable and effective impact of education for sustainable development.[55]

The most recent eight studies examined environmental awareness and monitoring, focusing on the behaviors of different stakeholders in the educational process using quantitative methods, including questionnaires and statistical data analysis. Findings indicate that teachers generally possess positive awareness of environmental education [56], although there remains a need to enhance their competencies and support the practical application of their skills. Additionally, research focusing on school principals demonstrates that the integration of information and communication technology fosters sustainable practices within educational institution. [57] Learners showed increased interest and sensitivity to environmental issues, despite limited integration of these concepts into curricula and practical activities [58], highlighting the need to strengthen applied knowledge and encourage participation in innovative, sustainable projects .[59]

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[55] Youssef SADIK and Widad Jodie BAKHELLA, "Environmental and Sustainable Development Education Challenges Faced by Civil Society Actors in Morocco. A Case Study of the Association of Life and Earth Science Teachers (AESVT)," *International Social Sciences & Management Journal* 2 (2019).

[56] Courant Menebhi Amina, "Lifelong Learning of Environmental Education and Sustainable Development: Representations and Discursive Analysis Within the Educational Community," *Annals of the University of Craiova, Psychology - Pedagogy* 41 (2019): 133–45.

[57] Abdelkader Sbai et al., "Conceptions of The Baccalaureate Students of The Eastern Region of Morocco on the Environment and Sustainable Development," *European Journal of Engineering Research and Science* 5, no. 10 (October 17, 2020): 1235–42, doi:10.24018/ejers.2020.5.10.2134.

[58] H. Laaloua, "The Status of Moroccan High School Students' Environmental Knowledge," *International Journal of Multidisciplinary Research and Analysis* 05, no. 08 (August 14, 2022), doi:10.47191/ijmra/v5-i8-26.

[59] Hassan Laaloua, "Teachers' Perceptions of the Integration of Environmental Awareness and Knowledge in High School Curricula in Morocco," *International*

5.3. Sustainable Development in Indonesian Education Policy

Research demonstrates that the integration of education for sustainable development in Indonesia is advancing incrementally and exhibits variation across educational levels. At the higher education level, integration involves embedding sustainability concepts into the establishment of specialized programs, promoting environmental research, and utilizing technology and e-learning platforms. In secondary education, integration is still limited but supports the cultivation of critical thinking and environmental engagement, although it faces obstacles such as teacher competence and inadequate infrastructure.[60] [61] At the primary level, teachers' comprehension of the Sustainable Development Goals is inconsistent, primarily due to limited professional development opportunities and a lack of supportive curricula.[62]

Educational institutions play a crucial role in promoting sustainability values and fostering positive behaviours through educational activities and experiences connected to the local context and community partnerships. Schools and universities serve as comprehensive educational environments that facilitate the development of environmentally conscious individuals.[63] [64] [65]

Awareness of the Sustainable Development Goals varies among teachers and learners, depending on professional experience, pedagogical practices, and the tools used. Despite teachers' commitment, there is a lack

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Journal of Social Science and Human Research 05, no. 05 (May 19, 2022), doi:10.47191/ijsshr/v5-i5-25.

[60] Mokski et al., "Education for Sustainable Development in Higher Education Institutions."

[61] Abiyya et al., "Understanding Education Sustainable Development (Esd) in High School Students."

[62] Afandi and Rachmadtullah, "Teachers' Perceptions of Sustainable Development Goals (SDGB) Based Education to Increase Students' Social Awareness Through Social Studies Learning in Elementary Schools."

[63] Universitas Kristen Satya Wacana et al., "Delevoping Green Behaviour in Indonesia."

[64] Susilawati et al., "Urgency of Adiwiyata School for Education as Sustainable Development."

[65] Adiatma, "Integration Education for Sustainable Development in Indonesia."

of conceptual understanding and technological competencies, underscoring the need for continuous professional development programs [66]. As for students, studies have shown that digital modules improve critical thinking and environmental awareness, but their application is limited due to inadequate professional training.[67] [68]

Promoting education for sustainable development necessitates a comprehensive approach that integrates supportive educational policies, the development of teacher competencies, and the expansion of digital tool usage to achieve a lasting educational impact that fosters sustainable behaviors among learners.

5.4. Comparative analysis between Morocco and Indonesia in education for sustainable development

A comparison between Morocco and Indonesia shows that both education systems aim to integrate sustainable development concepts, but differ in the level of implementation and the strategies pursued. In Morocco, sustainability integration is mainly concentrated in life and earth science curricula, with limited attention to other scientific and literary subjects. Education relies primarily on traditional methods, with some experimental initiatives such as project-based learning, field activities, and environmental clubs. However, the distribution of these initiatives is uneven across disciplines and educational levels.[69] [70] [71]

In contrast, in Indonesia, a more comprehensive approach is evident, particularly in higher education, where sustainability is integrated into

[66] Anwar et al., "Education for Sustainable Development Based on Technological Pedagogical Content Knowledge in Biology Education."
[67] Wulandari and Husna, "Implementation of an Education for Sustainable Development (ESD)-Based Electronic Module to Improve Critical Thinking Skills and Environmental Awareness Among Students in the Wetland Ecology Course."
[68] Puspita et al., "The Integration ESD and Ethnoscience to Merdeka Curriculum: Study on Junior High School."
[69] Asma Id Babou et al., "Education for Sustainable Development and Teaching Biodiversity in the Classroom of the Sciences of The Moroccan School System."
[70] Id Babou et al., "Teaching Biodiversity."
[71] Ameziane, "Place de l'environnement dans les curricula marocains des Sciences de la Vie et de la Terre au cycle secondaire."

existing curricula, specialized programs are created, environmental research is supported, and e-learning is used. Primary and secondary education, however, face challenges related to teacher competence and digital infrastructure.[72] [73]

At the institutional level, evidence from Morocco shows universities as strategic actors through applied projects in the fields of environment, renewable energy, and green entrepreneurship. However, there is a gap between institutionalization and implementation, and schools play a limited role due to the adoption of traditional methods and a lack of pedagogical support.[74] [75] In contrast, in Indonesia, schools and universities play a central role in instilling sustainability values through educational activities rooted in local contexts and community partnerships. However, the limited professional training of some teachers limits the impact of these initiatives.[76] [77]

Regarding environmental awareness and behavior, Moroccan studies indicate positive awareness among teachers and students, but a need to strengthen practical applications and encourage participation in innovative, sustainable projects. Meanwhile, students and teachers in Indonesia face constraints related to professional experience and a lack of specific digital tools, although digital learning modules have contributed

[72] Mokski et al., "Education for Sustainable Development in Higher Education Institutions."
[73] Abiyya et al., "Understanding Education Sustainable Development (Esd) in High School Students."
[74] Slimani and Abakouy, "From Protecting the Environment to Fostering Innovation."
[75] MHARZI, "Education au développement durable par la pédagogie de projet."
[76] Universitas Kristen Satya Wacana et al., "Delevoping Green Behaviour in Indonesia."
[77] Abiyya et al., "Understanding Education Sustainable Development (Esd) in High School Students."

to raising critical thinking skills and promoting environmental participation. [78] [79] [80] [81] [82]

From this analysis, Morocco has a good base of practical initiatives. However, they are not homogeneous and require greater coordination between curricula, institutions, and training. At the same time, Indonesia offers a more strategic and comprehensive model, with a focus on policy development and digital support, although partial implementation at lower levels remains a challenge. Morocco could therefore benefit from Indonesia's experience in adopting a systematic, integrated approach encompassing policies, vocational training, and digital technologies to enhance the sustainable impact of environmental education.

Despite contextual differences between Morocco and Indonesia, both experiences underscore the pivotal role of educational institutions in promoting education for sustainable development through curriculum development, environmental awareness-raising, and skills refinement. A persistent challenge is translating policies and initiatives into effective, inclusive educational practices that address resource availability, infrastructure, teacher expertise, and learner needs. Indonesia demonstrates progress by integrating digital environmental education modules, experiential learning, and applied projects. In contrast, Morocco encounters obstacles such as limited resources, inconsistent environmental content, and reliance on traditional teaching methods. These challenges emphasize the necessity of a comprehensive strategy that incorporates teacher training, curriculum development, and the adoption of digital and experiential learning tools. Furthermore, this comparison demonstrates the significance of sustained scientific research to improve the efficacy of

[78] Anwar et al., "Education for Sustainable Development Based on Technological Pedagogical Content Knowledge in Biology Education."
[79] Puspita et al., "The Integration ESD and Ethnoscience to Merdeka Curriculum: Study on Junior High School."
[80] Courant Menebhi Amina, "Lifelong Learning of Environmental Education and Sustainable Development: Representations and Discursive Analysis Within the Educational Community."
[81] Abderrahim, "Teacher Education for Sustainable Development."
[82] H. Laaloua, "The Status of Moroccan High School Students' Environmental Knowledge."

environmental education, foster academic innovation, and connect research outcomes to educational policy and practice. Such efforts are crucial for preparing students to become responsible and engaged citizens capable of advancing the Sustainable Development Goals in dynamic local and global contexts.

Conclusion

This study concluded that education for sustainable development is a fundamental pillar for addressing current economic, social, and environmental challenges, given its pivotal role in promoting environmental awareness, instilling responsible values, fostering positive behaviors, and preparing future generations to contribute effectively to achieving of the Sustainable Development Goals.

The study found that Moroccan school curricula, schools, and universities are key in instilling sustainability concepts and promoting positive environmental behaviors among learners. However, the Moroccan education system still faces several challenges, most notably the dominance of traditional curricula, the weakness of practical and extracurricular activities, the lack of educational resources, and the need to strengthen teachers' competencies in education for sustainable development. In contrast, the Indonesian experience offers an advanced model that integrates sustainability into educational policies, the use of modern technologies, experiential learning, and interactive activities, thereby raising awareness and fostering sustainable practices among learners.

In conclusion, this study opens new research horizons for researchers and decision-makers. It emphasizes the strategic role of education in achieving sustainable development. The study calls for more field and experimental research to assess the effectiveness of education programs for sustainable development and enhance their contribution. These efforts align with the 2030 Agenda and aim to build a more aware and sustainable Moroccan society.

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