PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title page – "Systematic Review of Environmental Education in Morocco: Policies, Practices, and Post-Pandemic Challenges in the Context of the Sustainable Development Goals."
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract – , summarizing rationale, objectives, methods (PRISMA-based), main findings, and conclusions.
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Section 1: Introduction – Presents the theoretical background and situates environmental education in Morocco within international frameworks (UNESCO, SDGs, post-COVID context). Explains the need for a systematic synthesis of studies conducted between 2000 and 2024 to identify trends, strengths, and gaps in EE practices.
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Section 1.2: *Objectives and Research Questions* – States that the review aims to analyse policies, practices, and post-pandemic challenges of environmental education in Morocco, addressing: (i) conceptual and operational frameworks; (ii) COVID-19 impacts; and (iii) implications for EE reform.
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Section 3.3: Eligibility Criteria – Defines inclusion (peer-reviewed, Moroccan context, 2000–2024, environmental education) and exclusion (duplicates, non-educational, non-Moroccan, or incomplete) criteria. Grouped studies by institutional, pedagogical, and pandemic-related themes for synthesis.
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Section 3.2: Search Strategy and Information Sources – Searches conducted between January and March 2024 on Scopus, Google Scholar, Web of Science, and institutional repositories (USMBA, ENS, UNESCO, UNDP, etc.).
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Section 3.2: Search Strategy + Table S1 (Supplementary Materials) – Provides keywords

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			("environmental education", "Morocco", "COVID-19", "sustainability", "school", "policy"), Boolean operators, and time filters (2000–2024).
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Section 3.4: Study Selection and Inter-Rater Agreement – Two reviewers independently screened titles, abstracts, and full texts; Cohen's kappa was used to ensure inter-rater reliability. No automation tools used.
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Section 3.5: Data Extraction – Two reviewers independently extracted data using a standardized grid validated by consensus; missing data were verified via institutional reports.
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Section 3.5: *Data Extraction* – Outcomes include type of EE program, actors, approaches, tools, obstacles, and COVID-19 impacts; all relevant indicators were retained.
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Section 3.5: Data Extraction – Variables include study year, region, level of education, methodological design, and institutional framework. Missing values were imputed qualitatively when possible.
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Section 3.6: Quality Appraisal and Risk of Bias – Evaluation based on validity, reliability, transparency, and contextual clarity; a 5-criterion grid adapted from UNESCO (2020) and PRISMA 2020.
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Section 3.7: Data Synthesis and Analyses – Frequency, percentage distributions, and thematic weighting were used to assess trends and effects (no meta-analysis due to qualitative diversity).
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Section 3.7: Data Synthesis and Analyses – Studies were grouped thematically and visualized in tables and figures; synthesis was narrative and interpretative; heterogeneity was assessed qualitatively.
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	

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	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Section 3.6 + Section 5: Limitations – Reporting bias discussed as potential under-representation of grey literature and francophone sources.
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Section 3.6: *Quality Appraisal* + Section 5: *Limitations* – Confidence assessed through triangulation across data sources, reviewer consensus, and methodological rigor.
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Section 3.4: Study Selection and Inter-Rater Agreement — flow and counts; Figure 1: PRISMA flow diagram (312 → 198 → 78 → 35).
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Section 3.4: reasons for exclusion at full-text (e.g., not Moroccan n=15; low methodological transparency n=12; insufficient analytical depth n=9; out of EE/ESD scope n=7).
Study characteristics	17	Cite each included study and present its characteristics.	Section 4: Table 2 — characteristics and summary of the 35 included studies.
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Section 3.6: Quality Appraisal and Risk of Bias + Table 1 (MMAT/CASP/AACODS; quality distribution by study type).
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Section 4: Table 2 and narrative synthesis of individual studies across themes (policy, pedagogy, barriers, COVID-19).
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Section 4 (Results & Discussion) — thematic syntheses aligned to RQs; quality considerations referenced from Section 3.6.
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical	Section 4: descriptive/statistical summaries (e.g., distributions, cross-tabs); no meta-analysis due to

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		heterogeneity. If comparing groups, describe the direction of the effect.	heterogeneity of designs/measures (as framed in Section 3.7).
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Not applicable — no formal meta-analytic heterogeneity tests; heterogeneity addressed narratively by study type/context within Section 4.
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Section 3.6 (Quality Appraisal): sensitivity analysis excluding low-quality studies did not change the patterns observed.
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Section 3.6 + Section 5 (Limitations): language/publication biases addressed (Arabic full texts excluded; abstracts screened).
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Section 3.6 (quality tools, double review) + Section 5 (*Limitations*): confidence grounded in tool-based appraisal, triangulation, and reviewer agreement.
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Section 5: *Discussion and Implications* – Compares findings with regional and international studies (UNESCO 2020; Tilbury & Wortman 2018; Boiral et al. 2021). Highlights the alignment of Moroccan environmental education trends with global post-COVID ESD frameworks and identifies context-specific gaps.
	23b	Discuss any limitations of the evidence included in the review.	Section 5.2: *Limitations of Included Evidence* – Notes heterogeneity of study designs, uneven geographic distribution, limited quantitative studies, and under-representation of grey literature or non-English sources.
	23c	Discuss any limitations of the review processes used.	Section 5.3: *Methodological Limitations* – Mentions possible selection bias, restricted database coverage (Scopus, Google Scholar, WoS), and subjective judgments in thematic coding despite double reviewer validation.

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	23d	Discuss implications of the results for practice, policy, and future research.	Section 6: *Conclusion and Recommendations* – Suggests strengthening institutional coordination in EE, embedding post-pandemic health-environment interlinkages in curricula, expanding teacher training and longitudinal studies to assess behavioral impact.
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Section 3.1: *Review Design and Rationale* – The review was not formally registered in PROSPERO; methodological transparency ensured through full adherence to PRISMA 2020 and inclusion of Supplementary Table S2.
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Section 3.1: *Review Design and Rationale* – A formal protocol was not published, but the methodological framework (eligibility, extraction grid, appraisal, and synthesis steps) is fully detailed in Section 3 and Supplementary Table S1.
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Section 3.1 – No amendments were made after the initial methodological plan; the synthesis structure remained consistent from data collection to reporting.
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	*Funding Statement: "This research received no external funding".*
Competing interests	26	Declare any competing interests of review authors.	*Conflicts of Interest: "The authors declare no conflicts of interest."*
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	*Data Availability Statement:* "All data used in this study are available upon request; Supplementary Tables S1–S2 provide the search strategy, retrieved counts, and PRISMA checklist."

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