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TEACHER READINESS, SYSTEMIC BARRIERS, AND ADAPTIVE STRATEGIES IN IMPLEMENTING ISLAMIC ECOTHEOLOGY IN ISLAMIC ELEMENTARY SCHOOLS

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Abstract

Although Islamic ecotheology frames environmental stewardship as a religious responsibility, how teachers' perceived readiness, systemic barriers, and reported adaptations coexist in Islamic elementary schools remains insufficiently understood. This study examined these dimensions using a predominantly quantitative, convergent mixed-methods survey of 200 teachers, purposively recruited through professional networks and voluntary participation, between 25 May and 12 July 2026. The questionnaire included 16 readiness items, 20 barrier indicators, and five open-ended questions; descriptive statistics and qualitative content analysis were integrated through an aggregate joint display. Results indicated high perceived readiness ($M = 4.15$, $SD = 0.36$; $\alpha = .909$), with ethics highest ($M = 4.40$) and lesson planning ($M = 3.88$) and material development ($M = 3.86$) comparatively lower. Limited green facilities and consumerist norms were each selected by 69% of respondents, followed by perceived increasing device exposure (63%) and low parental involvement (60%). Reported strategies included communication (63.5%), material reuse (56%), and curriculum integration (53.5%), whereas assessment or reflection was explicitly mentioned by 4%. The findings indicate descriptive coexistence rather than causal associations and suggest priorities for pedagogical support, school resources, and family partnerships; the nonprobability sample does not support national prevalence estimates.

Keywords: Islamic Ecotheology; Teacher Readiness; Systemic Barriers; Adaptive Strategies; Islamic Elementary Schools
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INTRODUCTION

Environmental change has intensified calls for education that connects ecological understanding with ethical judgment and opportunities for action (Rieckmann, 2018; UNESCO, 2020). In this process, teachers interpret sustainability goals, select learning experiences, and decide how to integrate environmental concerns into everyday instruction. Research on education for sustainable development (ESD) identifies professional competence and continuing learning as important, while whole-institution studies emphasize curricula, leadership, material resources, and organizational routines (Corres et al., 2024; Fischer et al., 2022; Holst et al., 2024). Reviews of ecoliteracy similarly suggest that ecological knowledge requires opportunities for application and participation (Murti et al., 2025). Therefore, examining teacher preparedness independently of its institutional setting provides an incomplete account of environmental education.

Indonesian Islamic elementary schools (Madrasah Ibtidaiyah (MI)) offer a distinctive context because ecological learning can connect scientific explanations with religious meanings. Islamic ecotheology is understood here as an ethical-pedagogical orientation that interprets stewardship through tawhid (the unity of divine creation), khalifah (responsible stewardship), amanah (entrusted responsibility), mizan (balance), and restraints against israf (excessive consumption) and fasad (destruction) (Alhinai & Ringer, 2025; Bsoul et al., 2022; Muhamad et al., 2020). These principles do not substitute for scientific evidence. Instead, they can give moral significance to conserving water, limiting waste, caring for plants, and examining human impacts on ecosystems. The survey operationalized this orientation through teachers' perceived understanding of Qur'anic and hadith-based environmental responsibility, ethical commitments, and confidence in translating these principles into teaching. It did not assess the theological accuracy of lessons or pupils' ecological outcomes.

Previous studies address components of this problem but rarely bring them together in a single sample of Islamic elementary school teachers. Mustofa et al. (2025) examined ecological initiatives of Indonesian Muslim organizations rather than MI teachers' planning and instruction. Taufiqurrochman (2025) identified limited explicit environmental themes in the Arabic-language curriculum of madrasahs and pesantren, pointing to a curricular entry point without measuring teachers' readiness or adaptive responses. Cholil and Parker (2021) documented eco-theological education in Indonesian Franciscan schools, illustrating the importance of religious and social context in another school tradition. In broader ESD research, Corres et al. (2024) examined links among educator competence, motivation, and challenges, while Holst et al. (2024) analyzed whole-institution conditions. Walshe and Rushton (2026) and Rushton, Walshe, and Quiroz-Martinez (2026) further demonstrate the relational, context-dependent nature of teacher agency in English secondary schools. Their insights are relevant, but they cannot substitute for evidence from Indonesian Islamic elementary school teachers.

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Two key distinctions guide the current analysis. First, endorsing ecological values does not necessarily mean one possesses the skills to plan, teach, and assess those values effectively. Reviews of teacher education indicate that achieving sustainability requires not only awareness but also competence in learning design, reflection, and curricular opportunities (Casanova et al., 2023; Fischer et al., 2022; Wakefield et al., 2022). Additionally, research on the environmental value-action gap cautions against assuming that stated commitments will translate into observable behaviors (Portus et al., 2024). In this study, "readiness" refers to self-reported preparedness across key areas: cognition, ability, vision, and ethics. The four scales measure respondents' perceptions but do not confirm classroom performance, ecological behavior, or student learning outcomes.

Second, environmental learning is influenced by a variety of interconnected factors. Utilizing ecological systems theory (Bronfenbrenner, 1979), this study categorizes respondents' perceived obstacles into different systems: a microsystem focusing on immediate teaching resources, a mesosystem that examines school-home and collegial relationships, an exosystem addressing issues like budgets, workload, and training, a macrosystem reflecting broader social norms, and a chronosystem considering perceived changes over time. These categories help organize survey questions but are not five validated causal factors. For instance, while students' device usage might be expected to fall under the chronosystem, the relevant survey item specifically asked about perceived increases in screen time. Since the study is cross-sectional, respondents' insights into changes over time cannot confirm longitudinal trends. Taking a whole-institution perspective highlights the importance of considering the relationships among these levels and emphasizes that no single layer is sufficient on its own (Holst, 2022; Holst et al., 2024).

A situated account of teacher agency provides a third analytical lens. Agency is not simply a personal trait; it emerges as teachers use professional knowledge within particular curricular, relational, and material conditions (Biesta et al., 2015; Priestley et al., 2015). Primary-school research also shows that curriculum and assessment requirements can enable or constrain teacher discretion (Poulton, 2020), while studies of sustainability-oriented teaching emphasize opportunities for teachers and pupils to move beyond awareness toward meaningful action (Sheldrake et al., 2025). Islamic elementary school teachers may respond by reusing materials, adapting familiar subjects, inviting parents, or suggesting institutional policies. However, brief written responses can document only what participants say they do or propose. They cannot establish the quality, duration, or effectiveness of those actions, and this study does not treat adaptive agency as an independently validated outcome.

The research gap is not simply an absence of work on Islam, sustainability, or teacher agency. What is less visible in the cited literature is an integrated description, within a single sample of Islamic elementary school teachers, of whether relatively strong religious-ethical self-

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ratings accompany equally strong pedagogical preparation, which barriers teachers identify across system levels, and which practical responses they report. Earlier reviews distinguish between pedagogical and institutional pathways to environmental action (Portus et al., 2024), but evidence specific to Islamic elementary schools can make the intersection between them more concrete. Bringing the three domains into one descriptive account can identify patterns of alignment and tension without implying that readiness causes adaptation or that a reported strategy resolves a particular barrier.

This study explores three key questions: (1) How do Islamic elementary school teachers involved in this research assess their own readiness in terms of ecotheology across various dimensions, including cognition, ability, vision, and ethical considerations? (2) What systemic barriers do these educators face as they navigate the five ecological levels within their teaching environment? (3) What specific pedagogical, curricular, and relational strategies do they describe in their open-ended responses, reflecting their experiences and insights? By addressing these questions, the study provides a detailed and evidence-based description of the moral and pedagogical readiness profile of these teachers. It also uncovers the complex relationship between identified barriers and the strategies they employ in response. The aim is to offer a nuanced descriptive and interpretive understanding rather than to assert causal claims or attempt to represent the entirety of Indonesian Islamic elementary schools.

METHODS

This study employed a quantitatively dominant convergent parallel mixed-methods design (Creswell & Creswell, 2023). Quantitative and qualitative data were collected concurrently through an online questionnaire, analyzed separately, and integrated through an aggregate joint display to identify convergence, expansion, and tension (Fetters et al., 2013). The qualitative strand complemented the quantitative findings through content analysis of open-ended responses. Responses to the three principal strategy questions (D2–D4) were available from all 200 participants, with median lengths of 20, 19, and 18 words, respectively. Given their brevity, these responses provided contextual insights rather than interview-level evidence. Integration occurred at the indicator and thematic levels without testing individual-level associations or causal relationships.

Data were collected between May 25 and July 12, 2026, from 200 active Islamic elementary school teachers recruited through purposive sampling based on eligibility and voluntary response sampling via professional networks and online platforms. Standardization identified 194 distinct reported institutions, comprising 188 with one respondent and six with two respondents, although institutional affiliations were not independently verified. Geographic locations were identifiable for 116 respondents across at least 18 provinces, predominantly Central Java (n = 57) and West Java (n = 24), while 84 respondents (42.0%) could not be

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confidently located. Most participants were women (79.5%), aged 30–39 years (73.5%), held undergraduate qualifications (97.5%), and had 10–15 years of teaching experience (53.0%). The individual teacher was the unit of analysis, and the nonprobability sample was not nationally representative.

The questionnaire comprised 16 five-point Likert-scale readiness items, 20 multiple-response barrier indicators, and five open-ended questions. Readiness covered cognition, ability, vision, and ethics, with four items per dimension. Each dimension score was calculated as the mean of its four corresponding items, while the overall score was computed as the mean of all 16 items. Following an equal-interval classification approach adapted from Alkharusi (2022), mean scores were categorized as very low (1.00–1.79), low (1.80–2.59), moderate (2.60–3.39), high (3.40–4.19), or very high (4.20–5.00). These categories described perceived preparedness rather than demonstrated competence. Barriers were assigned a priori to five ecological levels, each containing four indicators: microsystem (immediate learning conditions), mesosystem (school–home and collegial relationships), exosystem (institutional resources and administration), macrosystem (cultural norms), and chronosystem (perceived temporal changes) (Abu-Shawish, 2024; Bronfenbrenner, 2004). These levels served as interpretive categories rather than validated causal factors.

Content validity was assessed by four language specialists and two ecotheology education specialists who evaluated 18 aspects of the questionnaire using five-point ratings. The mean Aiken's V was .894 (range = .833–.958), supporting the content appropriateness of the assessed aspects (Aiken, 1985). Expert feedback informed revisions to item sequencing, demographic categories, contextual examples, and pedagogical wording. The appraisal concerned the questionnaire as a whole rather than separate validation of individual readiness items. Internal consistency was high for the overall readiness scale (Cronbach's α = .909) and satisfactory for cognition (.787), ability (.765), vision (.769), and ethics (.844).

Quantitative data were summarized using frequencies, percentages, means, and standard deviations. The barrier checklist generated 1,590 selections; normalized endorsement rates used 800 possible selections per ecological level (200 respondents × four indicators), whereas individual barrier percentages used N = 200. Additional open-text barriers were analyzed separately. Open responses underwent deductive–inductive content analysis across five domains: formative experiences (D1), pedagogical adaptation (D2), curricular integration (D3), collaboration (D4), and proposed policies (D5). Subthemes distinguished material reuse, ecological activities and routines, subject integration, contextual or religious explanations, assessment and reflection, and stakeholder collaboration. Multiple codes were permitted per response, but each respondent was counted once per subtheme. Strategy percentages were calculated using N = 200, and quotations were traceable through anonymous identifiers (R-1–R-200). As independent coding agreement was not documented, no intercoder reliability

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coefficient was reported. Finally, quantitative patterns and qualitative themes were integrated through a joint display, with interpretations limited to reported experiences rather than verified practices or outcomes.

RESULTS AND DISCUSSION

Teacher Readiness for Islamic Ecotheology Implementation

The 16-item readiness scale indicated high overall perceived readiness (M = 4.15, SD = 0.36). Of the 200 teachers, 114 (57.0%) scored in the high category, 82 (41.0%) in the very high category, and 4 (2.0%) in the moderate category. Table 1 summarizes dimension scores, internal consistency, and item-level results; the values describe self-reported preparedness rather than observed teaching competence.

Table 1. Teacher Readiness Across Four Dimensions of Islamic Ecotheology

Dimension	Score and Reliability	Readiness Indicators
Ethics	M = 4.40; SD = 0.45; α = .844; very high	Preserving nature is part of religious teaching (M = 4.46); feeling compelled to correct environmentally harmful behavior (M = 4.45); avoiding excessive resource use (M = 4.36); concern for preserving the madrasah environment (M = 4.34)
Ability	M = 4.09; SD = 0.38; α = .765; high	Providing concrete examples of environmentally responsible behavior (M = 4.24); using madrasah facilities to promote ecotheology (M = 4.23); designing experiential learning (M = 4.04); incorporating ecotheology into lesson plans (M = 3.88)
Vision	M = 4.06; SD = 0.44; α = .769; high	Viewing ecotheology integration as important for developing an environmentally concerned future generation (M = 4.25); viewing it as a way to mitigate environmental damage (M = 4.23); commitment to becoming an agent of change (M = 3.89); developing creative ideas for globally oriented environmental learning materials (M = 3.86)
Cognition	M = 4.04; SD = 0.46; α = .787; high	Understanding the link between environmental problems and human behavior (M = 4.17); understanding ecotheology as the integration of Islamic teachings and environmental conservation (M = 4.03); understanding Qur'anic and hadith teachings on ecological responsibility (M = 4.02); understanding khalifah fi al-ard and mizan as moral foundations for protecting nature (M = 3.93)

Note. M = mean; SD = standard deviation; alpha = Cronbach's internal-consistency coefficient. Categories use the prespecified score intervals (high = 3.40–4.19; very high = 4.20–5.00).

As shown in Table 1, ethics scored highest (M = 4.40, SD = 0.45), followed by ability (M = 4.09, SD = 0.38), vision (M = 4.06, SD = 0.44), and cognition (M = 4.04, SD = 0.46).

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The most strongly endorsed items concerned stewardship as a religious and moral responsibility (M = 4.46) and the correction of harmful environmental behavior (M = 4.45). Comparatively lower ratings were observed for the development of globally oriented learning materials (M = 3.86), integration into lesson plans (M = 3.88), and becoming an agent of change (M = 3.89). The highest and lowest item means differed by 0.60 points. The four readiness dimensions were positively correlated in the separate-scale analysis ($r = .519–.678$, all $p < .001$); these correlations pertain only to readiness dimensions, not to associations with barriers, strategies, or implementation.

Responses to D1 contextualized these ratings through teachers' accounts of family upbringing, formal learning, and religious education. One respondent stated, "My parents' habits of planting trees and conserving water at home shaped the ecological discipline I bring to teaching" (R-19, translated from Indonesian). Another explained, "Formal education gave me a scientific understanding of the importance of environmental protection [...] while pesantren education provided a spiritual and moral foundation for caring for nature" (R-47, translated). These retrospective accounts illustrate perceived formative influences but do not establish their relative contributions to readiness.

Systemic Barriers Across Ecological System Levels

The 20-item multiple-response barrier checklist produced 1,590 selections. Each of the five ecological levels contained four indicators, giving 800 possible selections per level (200 teachers × four items). Table 2 reports the level-specific normalized endorsement rates and the proportion of teachers selecting individual indicators. These rates represent item selection frequencies, not the percentage of distinct teachers affected by an entire level or the severity of the obstacles.

Table 2. Teacher-Reported Systemic Barriers Across Ecological Levels

Ecological Level	Selections/800 Options; Rate	Illustrative Indicators: n/200 (% of respondents)
Exosystem	353/800; 44.1%	High teaching/administrative workload 51.5%; limited formal education/training 46.0%; limited program budget 45%; cognitive-test orientation 34%
Macrosystem	322/800; 40.3%	Consumerist social culture 69.0%; tolerance of environmental neglect 37.5%; religion-world dichotomy 31%; unclear technical implementation rules 23.5%
Microsystem	309/800; 38.6%	Limited green infrastructure 69%; lack of theology-environment literature 49.5%; difficulty linking subject matter to ecotheology 23.5%; limited teacher-student action interaction 12.5%

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Ecological Level	Selections/800 Options; Rate	Illustrative Indicators: n/200 (% of respondents)
Chronosystem	305/800; 38.1%	Children's dependence on digital devices 63%; family busyness 56.5%; reduced instructional time 20.5%; continuity risk from leadership/policy change 12.5%
Mesosystem	301/800; 37.6%	Low parental involvement 60%; weak parent communication 49.5%; differing priorities with school leadership 27.5%; weak peer support 13.5%

Note. Level endorsement rate = selections / 800 × 100; individual-indicator percentage = respondents selecting the indicator / 200 × 100. Items grouped under chronosystem capture perceived change over time, not measured longitudinal trends.

As shown in Table 2, teachers reported barriers across all five ecological-system levels. Endorsement rates were 44.1% for the exosystem (353/800), 40.3% for the macrosystem (322/800), 38.6% for the microsystem (309/800), 38.1% for the chronosystem (305/800), and 37.6% for the mesosystem (301/800). The two most frequently selected individual indicators were limited access to green facilities and consumerist norms (138 respondents; 69.0% each), followed by perceived increasing dependence on devices (126; 63.0%) and low parental participation (120; 60.0%). Family busyness (113; 56.5%), teaching/administrative workload (103; 51.5%), limited environmental literature (99; 49.5%), and weak school–home communication (99; 49.5%) were also commonly selected. The chronosystem classification reflects the temporal wording of the device item, not independently verified change.

The open-ended responses "other barriers" field yielded additional context: 56 respondents (28.0%) provided descriptions, 48 of which were coded into 64 meaning units; 36 units (56.3%) extended the corresponding closed-item categories. R-39 mentioned "a lack of waste-management facilities at the madrasah and limited student awareness of separating organic and inorganic waste," illustrating an immediate learning constraint. R-193 described "so much work besides teaching," while R-180 referred to "limited communication between teachers and parents" because both were busy. R-181 observed that "it is not only children who disregard ecotheology; adults also carelessly dispose of waste," and R-53 described children's mobile-phone use as "the greatest challenge today" (all translated from Indonesian). These quotations illustrate perceived contexts rather than independently verified barrier severity or temporal trends.

Adaptive Strategies Reported by Islamic Elementary School Teachers

The D2, D3, and D4 questions each yielded 200 non-empty answers. At least one strategy was coded for 195 respondents (97.5%) in low-cost pedagogy, 191 (95.5%) in curricular integration, and 181 (90.5%) in relational activities. Figure 1 presents selected subthemes. Percentages indicate the share of respondents who mentioned each theme; they do not indicate

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how frequently or effectively activities were carried out, and multiple codes could be assigned to a single response.

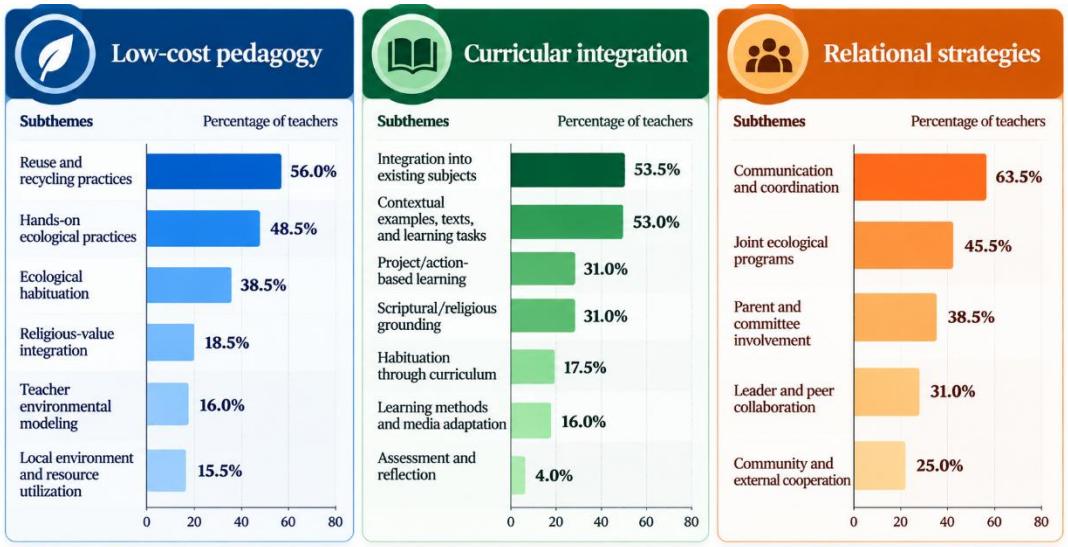


Figure 1. Adaptive Strategies for Islamic Ecotheology Implementation

As shown in Figure 1, for low-cost pedagogy (D2), 112 teachers (56%) mentioned reusing discarded or recyclable materials, 97 (48.5%) described hands-on projects or direct environmental actions, and 77 (38.5%) described ecological habituation. An anonymized example illustrates the resource-sensitive code: R-151 described 'using plastic waste to make mats, sorting organic and inorganic waste, and collecting bottles that can be sold' (translated from Indonesian). For curricular integration (D3), integration into existing subjects (107; 53.5%) was distinguished from contextual examples or religious-text framing (106; 53.0%); the former indicates where ecological learning is located in the curriculum, whereas the latter specifies how content is contextualized. Thus, R-200 said, 'When explaining plant reproduction, we connect it to relevant Qur'anic verses' (translated). Only eight responses (4.0%) explicitly referred to assessing or reflecting on environmental learning. This is a low frequency of spontaneous mentions, not evidence that 96% of teachers never assess such learning. Figure 1 retains this small subtheme, which supports treating ecological learning assessment as an area meriting closer investigation.

For relational strategies (D4), communication and coordination were mentioned by 127 teachers (63.5%), joint programs or activities by 91 (45.5%), and parent/committee engagement by 77 (38.5%). R-20 gave a concrete collaboration example: 'I invite parents to plant trees on vacant madrasah land—at least one tree per pupil' (translated from Indonesian). In contrast, R-1 answered 'None' when asked about collaboration, one of six negative cases in the coding summary. The first quotation supports an interpretation of reported relational outreach; the second shows that collaboration was not universal. Quotations were selected for clarity and traceability, not to represent a statistically typical or verified school practice.

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Integrated Findings on Teacher Readiness, Systemic Barriers, and Adaptive Agency

After the separate analyses, quantitative indicators and qualitative themes were compared in the aggregate joint display (Table 3). Each row juxtaposes a readiness or barrier result with relevant coded responses and a bounded interpretation. Convergence refers to compatible content, expansion to contextual detail supplied by another strand, and tension to the coexistence of apparently divergent patterns. The comparison was conducted at the level of indicators and themes, not through matched teacher profiles; person-level associations and causal pathways were not tested.

Table 3. Joint Display of Aggregate Evidence and Bounded Meta-Inferences

Quantitative Evidence (N = 200)	Open-Response Evidence	Aggregate Meta-Inference and Limit
Ethics M = 4.40; consumerist norms 138/200 (69%).	Recycling 112 (56%) and ecological routines 77 (38.5%); R-151: "using plastic waste to make mats" (translated).	Moral endorsement and resource-light responses coexist with perceived consumerist culture; no measured value-to-action transition.
Limited green facilities 138 (69.0%); lesson-plan item M = 3.88.	Recycling 112 (56%); existing-subject integration 107 (53.5%); R-200 linked plant reproduction to Qur'anic verses (translated).	Substantive thematic alignment between types of constraints and pedagogical responses; no person-matched evidence of barrier resolution.
Low parental involvement 120 (60%); weak communication 99 (49.5%).	Communication 127 (63.5%); parent/committee engagement 77 (38.5%); R-20 invited one tree per pupil with parents; R-1 reported none.	Reported outreach coexists with perceived low participation; collaborations vary, and actual effectiveness is untested.

As shown in Table 3, the joint display supports three cautious interpretations. First, strong ethical self-ratings coexist with perceived consumerist norms and reported habits, but do not verify changes in behavior. Second, reports of inadequate facilities and lower confidence in lesson planning sit alongside examples of reused materials and context-based curriculum integration, without establishing that the same teachers experienced and resolved those specific obstacles. Third, substantial communication-related activity is reported even while parental participation is selected as a common barrier, suggesting a potentially unresolved coordination challenge. Finally, the small number of explicit assessments/reflections mentions (8/200) indicates a useful question for future observational research, not proof that such evaluation is absent from classrooms.

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DISCUSSION

The implementation of Islamic ecotheology cannot be adequately explained by teachers' moral commitment alone. The participating teachers expressed high perceived readiness alongside material, institutional, cultural, and relational barriers, while reporting pedagogical, curricular, and collaborative adaptations. Together, these results identify complementary dimensions of faith-based environmental education rather than a causal sequence linking readiness, constraints, and responses. Sustainability education research similarly distinguishes professional competence, learning opportunities, and institutional conditions (Corres et al., 2024; Evans et al., 2026; Fischer et al., 2022). The contribution of the present study is a context-specific diagnosis of where ethical endorsement appears stronger than selected pedagogical self-ratings and where implementation support may be needed.

The readiness profile indicates a descriptive moral–pedagogical asymmetry. Ethics scored highest (M = 4.40), whereas lesson planning (M = 3.88) and material development (M = 3.86) received lower self-ratings; the extreme item means differed by 0.60 scale points. This variation does not establish a statistically significant competence gap or demonstrate that teachers act inconsistently with their values. Item wording, the complexity of pedagogical tasks, and social-desirability effects may also contribute to the pattern. Research on environmental value–action relationships and preservice teachers likewise cautions against treating favorable attitudes as evidence of observed competence or behavior (Crespo-Martín et al., 2025; Portus et al., 2024). Therefore, the relevant question is how ethical commitment becomes teachable, assessable learning rather than whether teachers possess sufficient concern.

Religious ethics may help explain why stewardship attracted strong endorsement. Principles of *khalifah*, *amanah*, *mizan*, and restraint against *israf* frame ecological care as a moral responsibility (Alhinai & Ringer, 2025; Bsoul et al., 2022; Mustofa et al., 2025). Questions of D1 accounts linked this orientation to family practices, formal education, and religious learning, but their retrospective character precludes attributing readiness to any single source. Understanding Islamic environmental teachings is also distinct from designing inquiry, sequencing activities, and evaluating pupil reasoning. Sustainability competence frameworks make a comparable distinction between value orientation and enactment through pedagogical decisions (Lenziardi et al., 2025). The implication is not to replace religious values with scientific content but to connect both through explicit learning objectives and evidence-based tasks.

This interpretation has implications for teacher professional development. Rather than concentrating primarily on raising environmental awareness, professional learning should strengthen teachers' capacity to translate Islamic ecological principles into learning objectives, instructional sequences, contextual activities, and appropriate assessment. For example, the principle of moderation in resource consumption could be integrated into mathematics by measuring water use, into science by investigating environmental consequences, and into Islamic

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education by reflecting on responsible stewardship. Such interdisciplinary learning would allow religious meanings to complement scientific explanations rather than replace them. Recent research emphasizes the importance of sustained, practice-oriented professional development that enables teachers to design, implement, and refine sustainability learning experiences (Casanova et al., 2023; Dittrich, 2024; Zhang et al., 2025). Studies of primary-school sustainability curricula similarly highlight the value of contextualized activities supported by coherent instructional planning and accessible resources (Rudd et al., 2026; Saraç et al., 2026). These approaches offer relevant directions for strengthening ecotheological pedagogy, although their effectiveness was not evaluated in the present study.

The limited explicit mention of assessment or reflection (8/200; 4.0%) raises a separate question about how ecological learning is evidenced. The prompt did not systematically ask about assessment, and brevity may explain why many respondents omitted it; the result cannot be interpreted as a 96% absence of assessment. Nevertheless, reported activities alone cannot demonstrate gains in ecological understanding, judgment, or action. Recent scholarship calls for assessments that value reflection, critical thinking, and action-oriented competencies (Fischer et al., 2025; Sass et al., 2025). For Islamic elementary schools, observing practical tasks, examining pupils' explanations, and using reflective responses may help make the connection between ecological activities and learning more visible. Lesson-plan reviews and classroom observation are needed before any assessment deficit can be established.

The barrier profile further challenges an individual-centered explanation of implementation difficulties. Although the exosystem had the highest normalized endorsement rate (44.1%), all five ecological levels attracted substantial selections. These are frequencies of offered options, not severity scores or measures of institutional effects. Frequent reports of limited green facilities, consumerist norms, increasing device exposure, and low parental involvement suggest that teachers locate difficulties across material and social environments. Whole-institution research similarly emphasizes alignment among curriculum, leadership, resources, and organizational routines (Holst, 2023; Holst et al., 2024). A recent climate-education review also identifies structural and curricular barriers that can remain salient despite educators' willingness to act (Morrissey Gleeson & Morrissey, 2025). Because the conditions were self-reported, this comparison supports contextual interpretation rather than independent verification.

Ecological levels should also be read as interconnected analytical categories rather than discrete causal pathways. Inadequate green facilities may affect the microsystem of teaching but originate in exosystem budget decisions; limited parental involvement lies in school–home relations yet intersects with work patterns and cultural expectations. The digital-device indicator was assigned to the chronosystem because it referred to a *perceived increase* in screen exposure, not because technology is inherently harmful. Cross-sectional data cannot confirm change over

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time, and digital resources may also support ecological learning. Evidence concerning parental involvement in primary digital education underscores the diversity of household capacities and support arrangements (Li & Rahman, 2025). More detailed school-level evidence is needed to explain how these constraints intersect.

Reported adaptations illuminate the possibilities and limits of situated teacher agency. Respondents described recycled teaching materials, ecological activities, connections between scientific topics and Qur'anic teachings, and outreach to families. These examples align with research locating agency within professional relationships, curriculum arrangements, and material opportunities (de Sousa et al., 2025; Rushton et al., 2025; Rushton & Bird, 2024). However, the absence of collaboration in some accounts shows that such opportunities were not universal. The questionnaire did not observe teachers' decisions, establish repeated implementation, or assess pupils' learning. Accordingly, *adaptive strategies* denote a coded repertoire of reported actions or intentions, not a verified measure of agency or intervention success.

The distinction between curricular placement and pedagogical contextualization helps specify what adaptation might require. Incorporating ecotheology into an existing subject identifies where ecological content appears, and linking it to a local issue or a Qur'anic source explains how it is framed. Neither step alone demonstrates that pupils evaluate evidence, consider alternatives, or reflect on consequences. Taufiqurrochman (2025) similarly calls attention to explicit environmental content in madrasa-related curricula. Research on sustainability education in local contexts and on justice-oriented pedagogy emphasizes relevance, participation, and shared responsibility (Hermanussen & Uda, 2026; Rushton, Walshe, & Johnston, 2026; Soysal et al., 2026). Thus, the pedagogical promise of Islamic ecotheology is strongest when ethical interpretation is integrated with scientific inquiry and assessed learning rather than limited to symbolic references.

The findings concerning parental participation and relational strategies reveal another important tension. Limited parental involvement was reported by 60% of respondents, while communication and coordination were mentioned by 63.5% as adaptive strategies. These findings do not establish that communication efforts were unsuccessful or that the same respondents necessarily experienced both conditions. Instead, they suggest a conceptual distinction between initiating communication and establishing sustained participation. Teachers may communicate environmental messages without necessarily obtaining regular parental involvement in related activities. Similarly, inviting families to participate in school-based environmental programs does not guarantee that ecological practices will be maintained at home. Research on whole-school sustainability initiatives highlights the importance of institutional continuity and meaningful participation among students, teachers, families, and communities (Jones & Wenham, 2025; Rudd et al., 2026). Consequently, strengthening school–

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family collaboration may require more than information sharing. Joint planning, accessible opportunities for participation, mutual feedback, and continuity in shared environmental practices are potential components of more substantive partnerships. However, their effectiveness remains to be tested in Islamic elementary school settings.

At the integrative level, the joint display brings together three kinds of evidence: comparatively strong ethical self-ratings and lower planning-oriented items; barriers endorsed across ecological levels; and accounts of resource-sensitive pedagogy and relational outreach. The strands demonstrate aggregate coexistence, contextual expansion, and tension, not respondent-level prediction, barrier resolution, or causal mechanisms. This bounded inference is compatible with contemporary accounts of agency and curriculum making as relational and contingent (Rushton, Walshe, & Quiroz-Martinez, 2026; Rushton & Walshe, 2025). Therefore, the theoretical contribution is an Islamic-elementary-school-specific empirical mapping of moral–pedagogical asymmetry and reported response repertoires alongside perceived constraints, rather than a new tested model of implementation.

These findings suggest three complementary directions for strengthening Islamic ecotheology education. First, teacher professional development should integrate Islamic environmental ethics with practical competencies in lesson planning, contextual inquiry, instructional material development, and formative assessment. Second, school leadership should consider how accessible environmental resources, collaborative planning opportunities, and institutional routines can support teachers' efforts to implement ecological learning. Third, partnerships among schools, families, and communities should emphasize sustained participation and shared responsibility rather than communication alone. These directions align with recent work on sustainability-oriented teacher competence, collaborative curriculum making, and learning assessment (Evans et al., 2026; Fischer et al., 2025; Lenziardi et al., 2025). They remain recommendations, not interventions tested here. Likewise, participants' suggestions concerning school policies, waste reduction, and environmental programs should be treated as proposals rather than verified existing practices.

These interpretations are bounded by nonprobability recruitment, geographically uneven and partly unverifiable affiliations, and the self-reported nature of readiness, barriers, and strategies. Selection, recall, social desirability, and common-method biases are possible. Content appraisal covered the questionnaire as a whole, whereas internal-consistency estimates cannot independently verify classroom competence or the dimensional structure. Many qualitative answers were brief, and the retained records did not establish independent coder agreement. The joint display did not link individual readiness scores to their qualitative codes, and no school audit, classroom observation, or student-outcome measure was undertaken. Consequently, reported adaptations and perceived temporal changes should not be read as verified implementation or longitudinal trends.

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Future research should verify institutional and geographic sampling, link quantitative and qualitative responses at the participant level where ethically appropriate, and directly examine lesson plans, assessments, classroom practice, and school–home collaboration. Interviews, observations, and pupil work could clarify how Islamic ecological ethics inform inquiry and assessment. Intervention studies could test professional development and institutional-support options, while longitudinal comparisons could evaluate claims about changes in screen exposure, resources, and participation. Such designs would move the present descriptive diagnosis toward explanations of implementation and its educational outcomes.

CONCLUSION

This study provides an integrated account of teachers' perceived readiness, systemic barriers, and reported adaptive strategies for implementing Islamic ecotheology in Indonesian Islamic elementary schools. The findings reveal high overall perceived readiness, particularly in ethical commitment, alongside comparatively lower ratings for lesson planning and instructional material development. Teachers also reported barriers across multiple ecological-system levels while describing low-cost pedagogical practices, curricular integration, and stakeholder collaboration as adaptive strategies. These patterns highlight a descriptive moral–pedagogical asymmetry and demonstrate that strong ecological values coexist with contextual constraints and reported professional adaptations. However, their coexistence does not establish causal relationships or confirm the effectiveness of particular strategies.

The study contributes to faith-based sustainability education by providing empirical evidence that connects Islamic ecological commitments with perceived pedagogical capacities, multilevel institutional constraints, and context-sensitive teacher responses. Its findings suggest that strengthening Islamic ecotheology education requires moving beyond ethical awareness toward practical instructional competence, supportive school environments, and sustained school–family partnerships. Therefore, professional development should prioritize contextual lesson design, experiential learning, and formative assessment, supported by accessible resources and collaborative institutional practices. Given the voluntary sampling, reliance on self-reported data, and cross-sectional design, these implications remain evidence-informed recommendations rather than demonstrated interventions. Future research should incorporate classroom observations, longitudinal investigations, and student learning assessments to examine how Islamic ecological values are translated into sustained educational practices and measurable outcomes.

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AUTHOR CONTRIBUTION

HHB led the conceptualization, study design, instrument development, methodology, data analysis, and the integration and interpretation of findings. He also drafted and revised the original manuscript. NH contributed to participant recruitment, data collection and curation, preliminary quantitative analysis, interpretation of results, and provided critical revisions of the manuscript. LS was responsible for data verification, literature synthesis, preparation of tables and figures, interpretation of findings, and also contributed critical revisions to the manuscript. All authors approved the final manuscript and agreed to be accountable for the work..

CONFLICT OF INTEREST

All authors declare that there are no conflicts of interest, whether financial, personal, or academic, that have influenced the conduct of the research, the analysis of the data, or the publication of this article.

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