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Instructional Material Adaptation & Recontextualization Model (IMARM): A Simulation Study

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Abstract: *This study demonstrates the Instructional Material Adaptation & Recontextualization Model (IMARM) through a simulation using Andy Smith's Native Trees from Seed. The simulation applies five IMARM stages—decoding, adaptation, recontextualization, reconstruction, and validation—to transform temperate-ecosystem content into materials relevant to Indonesia's tropical context while integrating Islamic environmental ethics. The adapted module, "Harvesting Wisdom from a Single Seed," illustrates IMARM's capacity to modify terminology, examples, and instructional methods, and to reconstruct meaning aligned with local ecology, culture, and spiritual values. The findings indicate that IMARM is clear, flexible, and pedagogically effective, though it requires expert judgment and substantial time investment. Overall, IMARM shows strong potential for contextualizing global instructional resources and supporting the development of localized Islamic-ecological curricula, with further research recommended for classroom implementation, cross-disciplinary use, and digital tool development.*

Keywords: *Instructional adaptation; recontextualization; IMARM; contextual learning*

Introduction

In an increasingly interconnected world, educators have access to diverse global instructional materials, yet their direct use is often limited because such resources are shaped by the ecological, cultural, and social environments in which they were produced. Contextualized education research emphasizes that learning materials must align with learners' lived experiences to foster deep understanding and sustainability-oriented thinking (Walsh et al., 2020; Barth et al., 2023). This need becomes especially pronounced in ecological education—where biodiversity, climate, and environmental challenges differ across regions—and in Islamic-based education, which requires the integration of ecological knowledge with ethical-spiritual values grounded in the Islamic worldview (Ibrahim et al., 2024; Firmansyah et al., 2025).

However, global materials frequently assume climates, cultural norms, and pedagogical preferences that do not match the target setting. Studies on the knowledge transfer gap show that materials developed in particular environments often lose clarity and relevance when moved into different ecological and cultural contexts (Cheraghi et al., 2010;

Wang et al., 2023). For instance, temperate-based ecological examples may not correspond to tropical ecosystems, and Western pedagogical assumptions may conflict with local learning cultures or Islamic expectations. Without recontextualization, such materials risk being technically accurate yet pedagogically ineffective, highlighting the need to reinterpret examples, methods, and ecological assumptions so they resonate with learners' local realities and cultural–spiritual frameworks (Zaki, 2023).

These challenges underscore the necessity of a systematic framework that helps educators analyze, modify, and reconstruct global materials for local relevance. Research in curriculum and adaptation processes confirms that adaptation and recontextualization are essential when instructional reforms or materials move across diverse contexts (Stiller et al., 2017; Aderet-German & Lefstein, 2021), and that educational tools must align with local values, ecological conditions, and pedagogical orientations (Pöllänen, 2019; Bossér, 2024). To address this need, the Instructional Material Adaptation & Recontextualization Model (IMARM) is introduced as a structured mechanism for transforming external instructional resources into culturally, ecologically, and spiritually appropriate learning materials.

This study presents IMARM as a conceptual model and demonstrates its application through a simulation adapting content from Andy Smith's *Native Trees from Seed*—a resource grounded in temperate ecological knowledge (Smith, 2025)—into a tropical Islamic-ecological learning module. The simulation provides an initial evaluation of IMARM's clarity, practicality, and usefulness in bridging ecological, cultural, and spiritual differences while preserving the core insights of the original material (Burge & Brown, 2002; Cates et al., 2014).

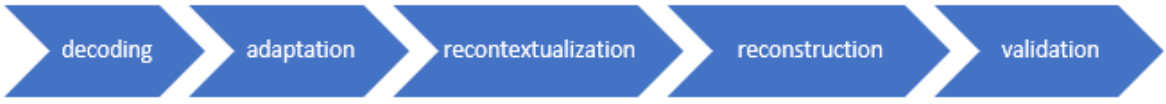

Diagram 1. IMARM Five Stages Framework

The theoretical foundation of IMARM draws from multiple bodies of literature. Instructional adaptation studies emphasize the need for instructional materials to undergo pedagogical, cultural, and contextual reshaping to maintain relevance and accessibility (Tonawanik & Donavanik, 2019; Michel & Kouadio, 2018; Leufer et al., 2019; Johnson, 1988). Recontextualization theories explain how educational knowledge is transformed as it moves across institutional and cultural boundaries, shaping the conceptual demands and disciplinary emphases of learning materials (Aderet-German & Lefstein, 2021; Kitson, 2020; Stiller et al., 2017; Galian, 2011; Barab & Luehmann, 2003; Barth et al., 2023). Local ecological

learning research stresses the importance of region-specific environmental knowledge, particularly in tropical ecosystems where biodiversity, rainfall, soil composition, and decomposition cycles differ sharply from temperate systems (Aswani et al., 2018; Farr et al., 2018; Barab & Luehmann, 2003). Complementing this, Islamic ecological perspectives provide an ethical–spiritual foundation that frames environmental stewardship as a Qur'anic mandate and moral responsibility (Ibrahim et al., 2024; Arauf, 2021; Heba Hasan, 2022; Duh, 2010).

Synthesizing these perspectives, IMARM functions as a comprehensive model for decoding, adapting, and reconstructing global instructional content—such as temperate tree cultivation knowledge—into learning resources that are culturally grounded, ecologically accurate, and spiritually meaningful within tropical Islamic educational contexts.

Methodology

Research Design

This study uses a simulation-based conceptual research design to examine how the Instructional Material Adaptation & Recontextualization Model (IMARM) operates when applied to a global instructional resource. Instead of a classroom trial, the simulation enables systematic exploration of IMARM's clarity and feasibility in a controlled environment, free from the variability of real-time instruction (Beheshta et al., 2022; Martis, 2006; Novak, 2013). This approach isolates the adaptation and recontextualization processes, allowing researchers to evaluate IMARM as both a conceptual and procedural tool for curriculum development (Ozden et al., 2020; Mahmudi et al., 2019).

Source Material

The simulation uses Andy Smith's *Native Trees from Seed*—a detailed repository of practical, experiential knowledge on temperate-climate tree propagation. Its ecological assumptions, such as winter dormancy and stratification cycles, differ sharply from tropical conditions, making it an ideal case for testing IMARM (Aydın & Aytekin, 2018; Hansen & Gissel, 2017). Because its content reflects long-term empirical trials and context-specific ecological knowledge, significant adaptation and reinterpretation are required when transferring it into a tropical and Islamic educational framework (Mahmudi et al., 2019).

Simulation Procedure

The simulation follows IMARM's five sequential stages:

1. **Decoding**—analyzing the source material to identify core concepts, ecological assumptions, pedagogical structures, and implicit values.

2. **Adaptation**—modifying terminology, examples, organization, and instructional methods to fit Indonesian learners and curriculum structures while preserving original meanings.
3. **Recontextualization**—reconstructing meaning by embedding tropical ecological realities, local species, soil types, environmental issues, and Islamic ecological ethics.
4. **Reconstruction**—reorganizing adapted content into a coherent instructional module with learning objectives, hands-on activities, assessments, and reflective practices.
5. **Validation**—assessing internal coherence, contextual alignment, scientific accuracy, and pedagogical feasibility to ensure readiness for potential implementation.

This five-step simulation aligns with established practices for testing conceptual models before field use (Beheshta et al., 2022; Fejzic & Barker, 2015; Ozden et al., 2020).

Analytical Instruments

Two analytical instruments are used:

1. **Content analysis**, examining depth, accuracy, and coherence across all IMARM stages. This method enables systematic classification and interpretation of qualitative transformations, ensuring essential ideas are retained, modified, or reinterpreted appropriately (Roller, 2019; Mayring, 2019; Pollock et al., 2023).
2. **Descriptive assessment of completeness and relevance**, evaluating alignment with tropical ecological conditions, integration of Islamic environmental values, and pedagogical appropriateness. This assessment supports examination of IMARM's practical capacity to generate contextually meaningful learning materials (Aydın & Aytekin, 2018; Hansen & Gissel, 2017; Mahmudi et al., 2019).

Together, these instruments provide a coherent basis for evaluating IMARM's effectiveness as both a conceptual model and a practical tool for adapting global resources into locally grounded educational modules.

Results And Discussion

Results

The simulation demonstrates how the IMARM framework systematically transforms Andy Smith's *Native Trees from Seed* into learning materials aligned with Indonesian tropical ecology and Islamic environmental ethics.

Decoding reveals the richness of the original temperate-based resource—its empirical observations, stratification techniques, and winter-dependent germination assumptions—while identifying contextual gaps requiring reinterpretation for tropical climates.

Table 1. Summary of Decoding Results

Aspect	Findings
Core Themes	Seed collection, stratification, germination, ecological observations
Author Orientation	Experiential, empirical, long-term ecological practice
Ecological Context	Temperate climate (North America), winter dormancy, frost cycles
Structural Strengths	Clear step-by-step methods, detailed species notes, practical illustrations
Embedded Assumptions	Cold stratification, seasonal growth cycles, temperate soil dynamics

Adaptation introduces technical and semantic adjustments by modifying climate references, terminology, and seed-handling methods. Processes such as cold stratification and frost-related dormancy are replaced with techniques suitable for Southeast Asian ecosystems, including warm stratification, soaking, and mechanical scarification.

Table 2. Summary of Adaptation Adjustments

Category	Original (Temperate)	Adapted (Indonesia/Tropics)
Climate References	Frost, winter cycles	Monsoon cycles, humidity, year-round warmth
Seed Handling	Cold stratification (weeks–months)	Warm stratification, water soaking, scarification
Terminology	Dormancy due to freezing	Dormancy due to hard seed coat / moisture imbalance
Examples	Oak, maple, pine	Trembesi, jambu air, mahogany, nangka

Recontextualization reconstructs meaning by embedding local ecological conditions—tropical species, soil variations (volcanic, peat, lateritic), monsoon cycles—and integrating Islamic ecological ethics such as stewardship (*khalifah*), conservation, and planting as *sadaqah jariyah*. This stage aligns scientific concepts with cultural and spiritual frameworks relevant to Muslim learners.

Table 3. Local Ecological and Islamic Recontextualization

Dimension	Recontextualized Content
Local Species	Trembesi, ketapang, suren, kemiri, jambu air, mahoni
Soil Types	Volcanic (Java), peat (Kalimantan), lateritic (Sulawesi)
Climate	Monsoon rainfall, high humidity, no winter dormancy
Islamic Values	Stewardship (*khalifah*), avoiding corruption (*fasād*), planting as sadaqah jariyah
Ecological Ethics	Responsibility, conservation, sustainability

Reconstruction results in the prototype module *"Harvesting Wisdom from a Single Seed,"* presenting a problem-based and project-based learning pathway. Students engage in local seed collection, germination trials, seedling care, and reflective activities connecting ecological practices with Islamic teachings.

Table 4. Prototype Module Components

Component	Description
Title	"Harvesting Wisdom from a Single Seed"
Approach	Problem-Based + Project-Based Learning
Core Activities	Local seed collection, germination, seedling care
Reflections	Islamic ecological ethics, personal responsibility
Output	Seedling ready for transplanting to a suitable habitat
Duration	Multi-week or multi-month project

Effectiveness analysis indicates that IMARM is clear, flexible, and capable of producing deeply contextualized instructional modules. Its strengths include transparency of stages, adaptability across domains, and suitability for integrating scientific, cultural, and spiritual dimensions. Limitations include its time-intensive nature, reliance on expert interpretation, and the possibility that some global content may require substantial reconstruction rather than straightforward adaptation.

Table 5. Strengths and Limitations of IMARM

Aspect	Strengths	Limitations
Clarity	Clear multi-stage process	Requires expert content analysis
Usability	Applicable across subjects	Time-intensive
Flexibility	Can integrate cultural, ecological, spiritual factors	Not all global content is easily transferable
Output Quality	Produces deeply contextualized modules	Depends on educator's interpretive skill

Discussion

The results affirm IMARM's contribution as a structured model for transforming global materials into contextually grounded resources. Unlike adaptation approaches focused solely on translation or surface-level modification, IMARM provides multilayered transformation—decoding, adaptation, recontextualization, reconstruction, and

validation—allowing educators to realign both explicit content and implicit assumptions with local realities (Roller, 2019; Mayring, 2019; Pollock et al., 2023).

A key strength is IMARM's emphasis on meaning reconstruction, addressing ecological, cultural, and value-based mismatches that traditional models often overlook. This is crucial when transferring temperate-based ecological content into tropical contexts, where assumptions about climate, soil, and growth cycles differ fundamentally.

The model offers particular value for Islamic-ecological education, enabling scientific concepts—such as seed dormancy and germination—to be harmonized with principles of stewardship (*khalifah*), balance, and ethical responsibility. This produces learning experiences that cultivate ecological literacy and spiritual consciousness.

IMARM's flexibility also positions it for broader curriculum innovation, including applications in disaster mitigation, sustainable agriculture, water management, and community resilience. Its structured process supports the development of culturally responsive and locally grounded curricula while maintaining scientific integrity.

However, effective application requires sufficient expertise in ecology, cultural interpretation, and instructional design. The recontextualization stage is especially demanding, as it calls for reflective judgment rather than procedural execution. Time constraints and contextual diversity across regions further reinforce the need for training, collaboration, and iterative refinement.

Conclusion

This study demonstrates that the Instructional Material Adaptation & Recontextualization Model (IMARM) provides a clear and systematic framework for transforming global instructional resources into contextually grounded learning materials. Through the simulation adapting *Native Trees from Seed* into a tropical Islamic-ecological module, the model proved effective in guiding the transition from temperate-based assumptions to Indonesian ecological realities while integrating relevant cultural and spiritual values. Each IMARM stage—decoding, adaptation, recontextualization, reconstruction, and validation—contributed to producing a coherent and pedagogically meaningful output that aligns with local biodiversity, climate conditions, and Islamic ethical perspectives.

The findings indicate that IMARM supports deep contextualization by enabling educators to retain essential scientific insights from the source material while reconstructing meaning to fit the learner's environment and worldview. The resulting prototype module illustrates how global knowledge can be reshaped into locally relevant curriculum components that foster ecological literacy, cultural resonance, and value-based reflection.

While the model requires careful interpretation and adequate expertise, its structured approach offers substantial potential for broader educational applications beyond ecological learning. IMARM can serve as a valuable tool for curriculum developers seeking to bridge global resources with local needs, and future research may expand its implementation through classroom trials, subject-area diversification, and digital support tools.

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