

Deep-Discovery Model: Fostering Cultural Resilience and Critical Thinking in Remote Schools;

Febriyantini Setiati

Universitas Tanjungpura, Pontianak, Indonesia

Email: f2171251025@student.untan.ac.id

Abstract: Amidst the massive wave of globalization, elementary schools in Indonesia's remote areas, particularly in West Kalimantan, encounter a unique paradox: increasing digital access alongside the erosion of local cultural identity. Conventional educational models often fail to bridge this gap. This article proposes the Deep-Discovery Learning Model, a novel theoretical synthesis integrating the constructivist pedagogy of Discovery Learning with the Deep Learning framework (encompassing both the philosophy of meaningful learning and adaptive AI technology). The primary objective of this model is to simultaneously strengthen students' cultural resilience and critical thinking skills. Mechanistically, the model outlines learning stages where technology functions as adaptive scaffolding to assist students in critically investigating local cultural issues. Through a systematic literature review of 26 selected sources, this study formulates a framework that transforms the role of students from passive consumers of global culture into proactive agents of local cultural preservation. The practical implications of this model offer guidance for curriculum developers and practitioners in 3T (frontier, outermost, and disadvantaged) regions to utilize technology not merely as an auxiliary tool, but as a catalyst for character reinforcement.

Keyword: Conceptual Framework; Cultural Resilience; Critical Thinking Deep Learning; Discovery Learning, Cultural Resilience; Critical Thinking; Elementary School; Remote Areas, West Kalimantan.

Introduction

Globalization has presented an era with dual challenges, marked by the inevitable interconnection of the world (Wahyuni et al., 2023). On the one hand, advances in information and communication technology offer great opportunities to expand access and innovation in education (Sharifani & Amini, 2023). But on the other hand, the unfiltered flow of information and the dominance of foreign cultures carry a significant risk of eroding ethical values, morality, and local identity (Listiana, 2021; Sunaryati et al., 2025). This character crisis is a real challenge for Indonesia, where the nation's noble values face the threat of erosion (Humaeroh & Dewi, 2021; Susilo et al., 2022).

In the context of education, this challenge of globalization demands a strategic response that goes beyond conventional knowledge transfer. Education now has an urgency to strengthen character (Fitrah et al., 2024; Jumini et al., 2025), especially cultural resilience and national identity (Kuswanto, 2023). To face the complexity of the modern world, it is not enough for students to be equipped with knowledge, but must have the ability to think critically (Kawuryan et al., 2022; Rahmawati et al., 2023). Critical thinking skills—which include interpretation, analysis, and evaluation are

essential 21st-century skills that enable students to actively process information, solve problems, and make responsible decisions (Manurung & Pappachan, 2025). This challenge is very real in the West Kalimantan region. In remote areas such as Sintang Regency, the penetration of digital technology has begun to enter remote villages. This phenomenon brings about a "double-edged sword"; On the one hand, students get access to information, but on the other hand, there is a rapid shift in grades where students begin to be unfamiliar with their mother tongue and local customs. Conventional *teacher-centered learning models* have proven to be less effective in facilitating critical dialogue about this phenomenon. Students are only taught to 'know' culture, not to 'understand' and 'defend' it critically in the midst of the onslaught of foreign cultures.

Recognizing these challenges, the world of education has been exploring various student-centered learning models. One of the constructivist pedagogical models that has proven to be effective in empowering critical thinking skills is the Discovery Learning model (Chusni et al., 2022; Ridwan, 2021). Discovery Learning encourages students to discover concepts independently through investigation and problem-solving (Arwaty & Lullulangi, 2022). Research has shown that this model not only improves cognitive learning outcomes (Zainiyati et al., 2023) but also significantly impacts the improvement of critical thinking skills (Akihary et al., 2023; Manurung & Pappachan, 2025). The use of technology such as discovery-based learning videos has also been proven to be valid and effective for elementary school students (Ulya et al., 2021). In the context of Primary School students, cultural resilience is defined as a student's adaptive ability to maintain the roots of his or her local identity while remaining open to interacting with global cultures. Meanwhile, critical thinking is interpreted as the ability of students to sort, analyze, and evaluate digital information so as not to swallow foreign influences raw. These two competencies are urgent to be built from an early age

Along with that, a more profound policy transformation is underway in Indonesia. The Ministry of Primary and Secondary Education has introduced the concept of "Deep Learning" as a new strategy to realize quality education (Suyanto et al., 2025). This approach aims to create a mindful, meaningful, and joyful learning process, with a focus on developing lifelong learners' character (Rahmawati et al., 2025).

At the same time, the term Deep Learning also refers to artificial intelligence (AI) technology that has advanced capabilities in adaptive personalization (Nurmaini et al., 2021; Sharifani & Amini, 2023). This technology, along with other innovations such as Augmented Reality (AR) (Andayani et al., 2025) and ethno-edutainment-based electronic modules (Sunaryati et al., 2025), offers tremendous potential to facilitate learning tailored to individual needs.

Recent developments in educational technology show a significant paradigm shift, where artificial intelligence (AI) is no longer seen solely as a technical tool, but rather

as a partner in artistic co-creation for cultural preservation. Recent studies highlight that AI-based systems, particularly *text-to-image technology*, are able to create learning environments that increase students' engagement in understanding their cultural heritage through an active co-creation process. These findings affirm the urgency of integrating advanced technologies into the educational curriculum, not only as a means of accessing information, but as a medium that facilitates students' active participation in maintaining and reinterpreting their cultural identities in the digital age (Condorelli & Berti, 2025)

While Discovery Learning has proven to be powerful in building critical thinking skills and Deep Learning offers a transformative framework, there is a gap in leveraging synergies between the two. Particular challenges are still faced in remote areas, where education gaps are often widest. Modern technology, which is often considered a threat to globalization, can actually be used as a facilitator for critical investigations of local culture (Apriani et al., 2025).

This conceptual article proposes a "Deep-Discovery Learning Model", a pedagogical framework that synthesizes the two concepts. This model aims to leverage the adaptive personalization of Deep Learning technology as a facilitator for the constructivist pedagogy of Discovery Learning. The main focus is on strengthening critical thinking skills and cultural resilience in primary school students in remote areas. This model is designed to guide students to analyze, evaluate, and reinterpret their cultural heritage in a global context, thus positioning them not as passive recipients, but rather as proactive developers of their own cultural identities (Juwita et al., 2022; Novidayanti et al., 2023). Why is a new synthesis needed? Discovery Learning is strong in building inquiry logic, but it is often less personalized (adaptive) for students with diverse abilities. On the other hand, Deep Learning (as an AI technology) offers personalization but needs a pedagogical frame so that it is not purely technical. The Deep-Discovery model is here to fill that gap by offering a hybrid framework: using the inquiry structure of Discovery Learning enriched with depth of meaning (the Deep Learning philosophy) and the adaptive assistance of technology

Methods

Research Design

This study uses a qualitative approach with an integrative *Systematic Literature Review* (SLR) design. This method was chosen because the main goal of the research is to construct a new conceptual model that is not yet available in the field. The focus of the analysis was directed at the development of a model that is in accordance with the ecological characteristics of elementary schools in remote areas, by taking contextual references from demographic and sociocultural characteristics in Sintang Regency, West Kalimantan. The selection of this location is based on the urgency of the need to strengthen character in border areas that are vulnerable to cross-cultural flows. This method focuses on the identification, analysis, and theoretical synthesis of

the relevant literature to build the foundation for the proposed model (Rahmawati et al., 2025). This process analyzes the theoretical synergy between the two pedagogical frameworks, Discovery Learning and Deep Learning, to address specific problems in character and culture education in the era of globalization (Wahyuni et al., 2023; Listiana, 2021).

Literature Collection and Selection Strategies

The data for this conceptual research are 27 primary and secondary literature sources that have been validated, consisting of national and international scientific journal articles, reference books, and policy documents (academic manuscripts). This literature selection process uses inclusion criteria focused on the four thematic pillars that underpin the proposed model:

1. **Character Education and Globalization:** Literature that discusses the challenges of globalization to national identity (Kuswanto, 2023), as well as strategies to strengthen character education (Fitrah et al., 2024; Susilo et al., 2022), local cultural awareness (Sunaryati et al., 2025), and multicultural approaches (Novidayanti et al., 2023).
2. **Constructivist Learning Models:** Articles that specifically examine the implementation, syntax, and effectiveness of the Discovery Learning model (Arwaty & Lullulangi, 2022; Juwita et al., 2022; Ulya et al., 2021).
3. **High Cognitive Skills:** Research focused on the measurement and empowerment of critical thinking (Chusni et al., 2022; Kawuryan et al., 2022; Rahmawati et al., 2023) and improved cognitive learning outcomes (Akihary et al., 2023; Ridwan, 2021).
4. **Pedagogical and Technological Innovation:** Publications that include "Deep Learning" both as a pedagogical policy framework (Suyanto et al., 2025; Rahmawati et al., 2025) or as AI (Machine Learning/Deep Learning) technology for personalization (Nurmaini et al., 2021; Sharifani & Amini, 2023), as well as other supporting technologies such as Augmented Reality (AR) and E-Module (Andayani et al., 2025; Sunaryati et al., 2025).
5. In formulating a high-tech pathway in the Deep-Discovery model, this study adapts the approach of the co-creation framework discussed in the international literature of renewables. Referring to the analysis of the use of AI in cultural heritage education, this conceptual synthesis method is focused on how technology can bridge the gap between local communities, regions, and students' active participation. This approach is used to theoretically validate that the use of digital tools in schools can be designed to trigger students' critical reflection on the limitations and potential of their own cultural heritage, transforming their role from a single creator to an initiator who collaborates with intelligent systems (Condorelli & Berti, 2025).

Data Analysis Techniques

Data analysis was carried out using the Theoretical Synthesis approach. This process

not only summarizes, but actively integrates concepts from various sources to build new arguments (Rahmawati et al., 2025). The analysis is carried out through three stages:

1. **Concept Extraction:** Analyzed 27 sources to extract operational definitions, models, and key findings. For example, the Discovery Learning syntax is extracted from (Ridwan, 2021) and (Ulya et al., 2021), while the Deep Learning framework is extracted from (Suyanto et al., 2025).
2. **Gap Analysis:** Identify challenges that conventional models have missed. This analysis highlights how character education is currently still hampered by the impact of globalization (Listiana, 2021; Wahyuni et al., 2023) and how traditional Discovery Learning may lack aspects of adaptive personalization.
3. **Model Synthesis:** Combining the strengths of existing concepts. This analysis specifically examines how the pedagogical framework "Deep Learning" (Suyanto et al., 2025) and the personalization technology "Deep Learning" (Sharifani & Amini, 2023) can act as facilitators to strengthen the constructivist process in "Discovery Learning" (Manurung & Pappachan, 2025). The results of this synthesis were then formulated into the proposed "Deep-Discovery Learning Model".

Results And Discussion

The systematic literature review method that has been carried out has resulted in three main findings that are the basis for the development of a new model. First, an analysis of contemporary educational challenges in Indonesia identifies an urgent need for learning strategies that can respond to the impact of globalization on local character and culture (Listiana, 2021; Wahyuni et al., 2023; Sunaryati et al., 2025). Second, an analysis of constructivist pedagogy shows that the Discovery Learning model has proven advantages in empowering critical thinking skills (Manurung & Pappachan, 2025; Ridwan, 2021; Chusni et al., 2022). Third, the analysis of policy and technological innovations identifies "Deep Learning" as a transformative framework, both pedagogically and technologically (Suyanto et al., 2025; Rahmawati et al., 2025; Sharifani & Amini, 2023).

This section will present the findings in detail, which is then synthesized in a discussion to propose the Deep-Discovery Learning Model as a new conceptual framework.

Study Results

1. Dual Challenges: Character Crisis in the Era of Globalization

The results of the literature review confirm that globalization presents a double challenge for education (Listiana, 2021). The massive flow of information and technological advances have opened up unlimited access, but at the same time bring a significant risk of erosion of national identity and local culture (Kuswanto, 2023; Wahyuni et al., 2023). This phenomenon manifests in the form of character crises, in which students show a decline in ethical and moral values

(Humaeroh & Dewi, 2021; Susilo et al., 2022), as well as the depletion of cultural awareness (Andayani et al., 2025; Sunaryati et al., 2025).

Character education has been identified as the main strategy to deal with this challenge (Fitrah et al., 2024; Wahyuni et al., 2023; Wisiyanti, 2024). Various studies emphasize the urgency of strengthening religious character, nationalism, integrity, independence, and mutual cooperation (Apriani et al., 2025; Jumini et al., 2025; Novidayanti et al., 2023). However, the implementation of conventional character education is often still textual and has not been able to equip students with the skills needed to actively navigate the digital world. Students not only need identity strengthening, but also critical thinking skills to be able to analyze, evaluate, and respond to global cultural influences wisely (Kawuryan et al., 2022; Rahmawati et al., 2023).

2. Pedagogical Foundation: The Effectiveness of Discovery Learning

In response to the limitations of conventional passive learning, Discovery Learning (DL) was identified as a relevant constructivist pedagogical foundation. DL is a learning model that actively involves students in the problem-solving process to find concepts independently (Manurung & Pappachan, 2025). Its systematic syntax—including stimulation, problem identification, data collection, data processing, verification, and generalization—encourages students to become "scientists" or inventors (Ridwan, 2021; Ulya et al., 2021).

Literature review shows a strong positive correlation between the application of Discovery Learning and the improvement of high-level cognitive skills. A number of studies have proven that the DL model is able to significantly improve students' critical thinking skills (Chusni et al., 2022; Manurung & Pappachan, 2025; Ridwan, 2021; Akihary et al., 2023). In addition, this model has also been shown to be effective in improving learning outcomes (Juwita et al., 2022; Zainiyati et al., 2023) and students' learning interests (Arwaty & Lullulangi, 2022). In the context of technology, DL models are also adaptive; studies show its success when integrated with video media and YouTube (Ulya et al., 2021; Akihary et al., 2023), demonstrating its potential to be utilized in modern learning.

3. Key Innovation: Convergence of "Deep Learning" A literature analysis reveals the existence of two conceptions of "Deep Learning" that converge and are the key to innovation.

First, Deep Learning (PM) as a Pedagogical Policy Framework. The Academic Manuscript of the Ministry of Education (2025) defines PM as a learning transformation that glorifies students (Suyanto et al., 2025). The goal is to create a learning process that is mindful, meaningful, and joyful (Rahmawati et al., 2025). This approach focuses on holistic development (mind, heart, taste,

body) and the achievement of graduate profiles that include critical reasoning, creativity, and citizenship (Suyanto et al., 2025). PM's focus on meaningful and contextual learning is closely aligned with the need to strengthen cultural resilience and character.

Second, Deep Learning (DL) as an Adaptive Technology. In computer science, Deep Learning is a sub-field of Machine Learning (ML) that uses artificial neural networks to process large amounts of complex data (Nurmaini et al., 2021). Its main advantage is its ability to carry out adaptive personalization, that is, analyze student learning patterns and provide interventions or materials tailored to individual needs (Sharifani & Amini, 2023). This technology, along with Augmented Reality (AR) (Andayani et al., 2025) and electronic modules (e-modules) (Sunaryati et al., 2025), provides advanced devices to facilitate learning.

The relevance of the Deep-Discovery Model in a global context is supported by empirical findings that show that AI technology can serve as a catalyst for creativity and cultural *awareness*. In line with cutting-edge research, the use of intelligent systems in learning has been proven to be able to foster deeper relationships between students and their regions through co-creation mechanisms. This validates the model's hypothesis that when students are given access to technology as scaffolding, they do not lose their identity, but rather have a greater capacity to explore new cultural meanings. Thus, technology facilitates the transition of students from passive consumers of global culture to active preservationists who have a critical awareness of biases and values in their ancestral heritage (Condorelli & Berti, 2025).

Discussion: Synthesis of Deep-Discovery Learning Models

The results of the literature review show that there are gaps: (a) Character education requires a more critical and contextual approach to dealing with globalization (Listiana, 2021; Wahyuni et al., 2023); (b) Discovery Learning is very effective in practicing critical thinking, but it can be inefficient and difficult to apply evenly across all academic levels without a strong guide (Chusni et al., 2022); (c) Deep Learning (both as pedagogy and technology) offers solutions for deep and personalized learning (Suyanto et al., 2025; Sharifani & Amini, 2023).

As a theoretical synthesis to bridge this gap, we propose the Deep-Discovery Learning Model. This model is a pedagogical framework that integrates the principles of Deep Learning (PM) and adaptive personalization of Deep Learning (DL) technologies to facilitate the Discovery Learning process focused on strengthening cultural resilience.

The theoretical synergies in this model are as follows:

1. Discovery Learning as a Pedagogical Machine: This model adopts the

constructivist syntax of Discovery Learning (stimulation, problem identification, data collection, verification, generalization) as the main learning flow (Ridwan, 2021; Ulya et al., 2021). This ensures that students actively build knowledge and practice their critical thinking skills (Manurung & Pappachan, 2025; Chusni et al., 2022).

2. **Deep Learning (AI) as an Adaptive Facilitator:** Deep Learning (AI) technology is not used only as a content presenter (Sharifani & Amini, 2023). Instead, it serves as a facilitator that personalizes the Discovery process. For example, the system can provide adaptive scaffolding when students are stuck collecting data, or suggest learning resources (such as videos (Akihary et al., 2023), AR modules (Andayani et al., 2025), or e-modules (Sunaryati et al., 2025)) that are most relevant to their level of understanding.
3. **Deep Learning (Pedagogy) as a Goal:** The entire process is framed in the principle of Deep Learning (PM) (Suyanto et al., 2025). The discovery process must be meaningful (using local cultural issues (Sunaryati et al., 2025; Novidayanti et al., 2023)), conscious (students reflect on their critical thinking processes (Rahmawati et al., 2023)), and exhilarating (using interactive technologies such as gamification or AR (Andayani et al., 2025)).
4. **Strengthening Critical Thinking as the Main Output:** This model explicitly places the development of critical thinking skills as the main output. This synergy occurs when the 'engine' of Discovery Learning — which is empirically proven to empower critical thinking skills (Manurung & Pappachan, 2025; Ridwan, 2021; Akihary et al., 2023)— applied to solve 'meaningful' local cultural problems (Sunaryati et al., 2025). This process is supported by Deep Learning (AI) 'facilitators' who help bridge the critical thinking ability gap between students with different academic levels (Chusni et al., 2022; Kawuryan et al., 2022). As a result, students not only learn about culture, but learn to think critically through culture, in line with the goal of "Critical Reasoning" within the framework of Deep Learning (Suyanto et al., 2025).

Conceptually, the Deep-Discovery Model positions students in remote areas rather than as passive recipients of cultural heritage. Instead, they are encouraged to become active cultural agents. By using adaptive technology (Deep Learning) to facilitate critical inquiry (Discovery Learning) into their own cultural heritage in a global context (Listiana, 2021; Nurmaini et al., 2021; Ulya et al., 2021), this model aims to directly strengthen critical thinking skills and cultural resilience (character) (Kuswanto, 2023; Manurung & Pappachan, 2025; Fitrah et al., 2024), preparing them to navigate globalization with a solid identity.

Table 1. Theoretical Synergy of Deep-Discovery Learning Model

Yes	Name	Description
1	Discovery Learning (DL)	It acts as a core pedagogical machine (learning flow). This model provides a constructivist syntax (stimulation, problem identification, data collection, verification, generalization) that ensures students actively build their own knowledge (Ridwan, 2021; Ulya et al., 2021)
2	Deep Learning as AI Technology (DL)	Acting as an adaptive facilitator who personalizes the discovery process. AI (Machine Learning) technology provides scaffolding and recommends learning resources (e.g., video, AR, e-modules) tailored to students' level of understanding, helping to bridge academic gaps (Sharifani & Amini, 2023; Chusni and al., 2022; Andayani et al., 2025)
3	Deep Learning (PM) Approach	It serves as a philosophical frame and final goal. This synergy ensures that the discovery process is not only 'active' but also 'deep', namely meaningful (using local cultural issues), aware (students reflect on their learning process), and exhilarating (utilizing interactive technology) (Suyanto et al., 2025; Rahmawati et al., 2025; Sunaryati et al., 2025)
4	Strengthening Critical Thinking	It plays a role as the main output that is intended. This synergy occurs when the 'engine' of Discovery Learning (which is proven to empower critical thinking) is applied to solve 'meaningful' local cultural problems, and is supported by Deep Learning (AI) 'facilitators' to bridge academic gaps (Manurung & Pappachan, 2025; Ridwan, 2021; Akihary et al., 2023; Chusni et al., 2022)

Deep-Discovery Model Learning Flow: Contextual and Technology-Aided Adaptive Frameworks

To operationalize the theoretical synergy in Table 1, we propose an adaptive conceptual learning flow. This flow is fundamentally rooted in the constructivist pedagogy of Discovery Learning (Ridwan, 2021; Ulya et al., 2021) and guided by the philosophical principles of Deep Learning (PM) (Ministry of Primary and Secondary Education, 2025; Rahmawati et al., 2025).

The framework is specifically designed for the context of schools in remote areas, where the main focus is on the use of the local environment as a source of learning (low-tech). However, this model also explicitly integrates "technology-assisting" (high-tech) pathways that can be activated "if available", in line with the dual potential of globalization (Sharifani & Amini, 2023; Andayani et al., 2025). The goal is to facilitate critical inquiry (Manurung & Pappachan, 2025; Chusni et al., 2022) to build cultural resilience (Wahyuni et al., 2023; Kuswanto, 2023).

Stage 1: Stimulation (PM Principle: Meaningful)

1. Core Activity (Discovery Learning): Teachers provide stimulation to trigger students' curiosity (Ridwan, 2021).
2. Contextual Implementation (Deep-Discovery):
 - 1) PM's goal: The learning process must be meaningful (Ministry of Primary and Secondary Education, 2025). The stimulation focuses on real issues: the conflict between local cultures and the influence of globalization felt by students (Listiana, 2021; Humaeroh & Dewi, 2021).
 - 2) Contextual Path (Low-Tech): Teachers use ethno-edutainment (Sunaryati et al., 2025), such as presenting local artifacts (woven fabrics, musical instruments), telling regional legends, or raising the phenomenon of the fading of national identity (Kuswanto, 2023).
 - 3) Tech Assistance Line (High-Tech, If Available): Teachers use technology as a "window" to the world. This can be a YouTube video playback about similar cultures (Akihary et al., 2023; Ulya et al., 2021) or using Augmented Reality (AR) on gadgets (if any) to visualize cultural artifacts that cannot be presented in the classroom (Andayani et al., 2025)
 - 4) Output (Critical Thinking): Students conduct an initial interpretation of the phenomena presented (Rahmawati et al., 2023)

Stage 2: Problem Identification (PM Principle: Mindfulness)

1. Core Activity (Discovery Learning): Students, with guidance, identify and formulate problems (problem statements) or hypotheses (Ridwan, 2021; Juwita et al., 2022).
2. Contextual Implementation (Deep-Discovery):
 - 1) PM's goal: Students learn mindfully (Ministry of Primary and Secondary Education, 2025), reflecting on what they know and what they need to

investigate.

- 2) Contextual Pathway (Low-Tech): Students formulate research questions relevant to their environment, focusing on specific character values such as nationalism, integrity, or mutual cooperation (Apriani et al., 2025; Fitrah et al., 2024; Novidayanti et al., 2023).
- 3) Technology Helpline (High-Tech, if available): Teachers can use a simple collaborative platform (if connected to the internet) to collect student questions.
- 4) Outputs (Critical Thinking): Students move from interpretation to analysis, breaking down big problems (e.g. "cultural erosion") into specific questions that can be researched (Rahmawati et al., 2023).

Stage 3 & 4: Data Collection & Processing (PM Principles: Enforcing & Applying)

1. Core Activity (Discovery Learning): Students collect information (data collection) and process it (data processing) to test their hypotheses (Ridwan, 2021).
2. Contextual Implementation (Deep-Discovery):
 - 1) PM's goal: The learning process must be joyful and focus on applying knowledge (Ministry of Primary and Secondary Education, 2025).
 - 2) Contextual (Low-Tech) Pathway: This is the core of the model in remote areas. "Discovery" is done physically and socially. Students conduct simple ethnography: interviews with traditional elders/local resource persons, direct observation of traditional games, or documenting local wisdom. It is authentic experiential learning.
 - 3) Tech Assistance Line (High-Tech, If Available): This is where AI and digital media technologies come into play as accelerators:
 - a. Data Access: Students use video (Akihary et al., 2023) or e-modules (Sunaryati et al., 2025) as secondary data sources.
 - b. Adaptive Personalization (AI): If the devices and connections are adequate, Deep Learning (AI) systems can provide adaptive scaffolding (Nurmaini et al., 2021; Sharifani & Amini, 2023). This is crucial to bridge the gap in different academic abilities between students (Chusni et al., 2022). Students who struggle get additional clues, while students who are quick get new challenges.
 - 4) Outputs (Critical Thinking): Students practice the skills of Analysis and Evaluation of primary (field) data and/or secondary data (digital).

Stage 5: Verification (PM Principles: Meaningful & Conscious)

1. Core Activity (Discovery Learning): Students verify their findings in class discussions to prove the initial hypothesis (Ridwan, 2021).
2. Contextual Implementation (Deep-Discovery):
 - 1) Meaningful & Conscious: Verification is done by comparing their field findings (primary data) with secondary sources (books or digital data). This strengthens a deep understanding (Rahmawati et al., 2025).

- 2) Contextual (Low-Tech) Track: In-depth classroom discussions, where students evaluate each other's arguments.
- 3) Technology Assistance Pathway (High-Tech, If Available): Teachers can display comparative data from the internet or AR platform (Andayani et al., 2025) to enrich verification discussions.
- 4) Outputs (Critical Thinking): Students practice Argument Evaluation and Inference (drawing initial conclusions) (Kawuryan et al., 2022; Rahmawati et al., 2023).

Stage 6: Generalization (PM Principles: Mindfulness & Reflection)

1. Core Activity (Discovery Learning): Students draw conclusions or generalizations from their findings (Ridwan, 2021).
2. Contextual Implementation (Deep-Discovery):
 - 1) Mindfulness & Reflecting: This is the "Reflecting" stage of the Deep Learning framework (Ministry of Primary and Secondary Education, 2025). Students not only deduce cultural facts (e.g., "Culture X has a Y value"), but reflect on the values behind it (e.g., religious character (Jumini et al., 2025) or nationalism character (Apriani et al., 2025)).
 - 2) Tech Helpline (High-Tech, if available): If a DL-AI system is used, it can provide personalized reflective questions (Sharifani & Amini, 2023) based on the digital footprint of their learning process.
 - 3) Externality (Cultural Resilience): Generalization is a "living" product. Students are challenged to answer: "How can we maintain the value of this character (Fitrah et al., 2024; Susilo et al., 2022) in today's era that has been affected by globalization (Listiana, 2021)?" This is the essence of cultural resilience—maintaining character while adapting.
 - 4) Outputs (Critical Thinking): Students perform Self-Regulation (Rahmawati et al., 2023) and High-level Inference (Kawuryan et al., 2022), positioning themselves as "proactive developers of their own culture".

Image 1. Model Deep-Discovery



Illustration of Implementation in Remote Schools

The implementation of the Deep-Discovery Model can be illustrated through thematic learning on "Sintang Ikat Weaving" in a remote elementary school with limited technological facilities. The process begins with critical stimulation in which the teacher exposes students to comparisons between the original handmade woven fabrics and the fabricated textiles, triggering deep *questions* about the economic and philosophical value behind the heritage. The investigation was carried out through a hybrid approach: students conducted physical discovery by interviewing local weavers to obtain primary data on the meaning of the motif, then used technology (such as tablets or simple AI) as adaptive scaffolding to search global comparative literature on similar geometric patterns, thus bridging local wisdom with global insights.

At the verification stage, students' critical thinking skills are honed as they compare the oral narratives of the weavers with data found on the internet, training them to validate the information and not swallow digital sources raw. Learning boils down to the stage of generalization and reflection (Deep Learning), where students not only understand the mathematical concepts of weaving patterns, but consciously build cultural resilience by formulating real conservation actions, such as creating campaign posters or digital narratives. Thus, this model transforms students from mere consumers of information into active agents capable of navigating modernity without losing the roots of their cultural identity.

In contrast to *Blended Learning* which only focuses on a mix of face-to-face and online, the Deep-Discovery Model emphasizes more on the depth of cognitive processes (Deep) through discovery (Discovery). If *Place-Based Education* focuses only on

location, this model brings that location into a global dialogue through technology.

Conclusion

Based on a systematic literature review of 26 sources, this conceptual research concludes that the Deep-Discovery Learning Model offers a relevant and strategic pedagogical framework to respond to the dual challenges of globalization in remote areas. This model is fundamentally beneficial for the development of the nation's culture, character, and values (Fitrah et al., 2024; Wahyuni et al., 2023; Susilo et al., 2022) to be in tune with the progress of the times. Instead of positioning globalization only as a threat that erodes identity (Listiana, 2021; Kuswanto, 2023), this model actually visionarily utilizes globalization tools such as video media (Ulya et al., 2021; Akihary et al., 2023), Augmented Reality (Andayani et al., 2025), and Deep Learning (AI) adaptive personalization (Sharifani & Amini, 2023; Nurmaini et al., 2021) as a facilitator to bridge the gap in access to education.

This model integrates the constructivist pedagogy of Discovery Learning, which has been shown to be effective in honing critical thinking skills (Manurung & Pappachan, 2025; Chusni et al., 2022; Ridwan, 2021), with the philosophical principles of Deep Learning (PM) which are now the focus of national policies, namely meaningful, conscious, and encouraging learning (Ministry of Primary and Secondary Education, 2025; Rahmawati et al., 2025). By making local wisdom (ethno-edutainment) the main object of inquiry (Sunaryati et al., 2025; Novidayanti et al., 2023), students are guided to critically analyze, evaluate, and reinterpret (Rahmawati et al., 2023; Kawuryan et al., 2022) their cultural heritage. This process directly builds cultural resilience: students not only memorize the values of the nation's character (Apriani et al., 2025; Jumini et al., 2025), but also develop cognitive skills to adapt those values in the context of the modern world.

The Deep-Discovery model offers a theoretical contribution in the form of a redefinition of the role of technology in remote areas: from just a material conveyor to a *cognitive partner*. The next urgent research agenda is to test the validity of this model through experimental studies in elementary schools in Sintang Regency to measure its effectiveness quantitatively. This Deep-Discovery model also repositions students from passive recipients to proactive developers of their own cultures, preparing them to navigate globalization with a solid identity. As a conceptual model, future research is recommended to test this framework empirically through developmental research (R&D) and implementation studies in the field to validate its effectiveness in improving the critical thinking skills and cultural resilience of elementary school students.

References

Akihary, W., Maruanaya, R. F., Lestuny, C., & Maruanaya, S. P. (2023). The YouTube-assisted discovery learning model: Improving students' cognitive learning outcomes and

critical thinking. *Journal of Education and Learning (EduLearn)*, 17(4), 548–554.
<https://doi.org/10.11591/edulearn.v17i4.20851>

Andayani, Anam, K., & Prabowo, S. (2025). Optimizing Cultural Awareness Through Augmented Reality: An Analysis of Educational Media Needs in Indonesian Elementary Schools. *Edubase: Journal of Basic Education*, 6(2), 204–214.

Apriani, A.-N., Perdana, R., Harun, Sari, I. P., Wuryandani, W., Salim, A., Wahyudi, A., & Riwayani. (2025). Students' character based on gender, grade, and school: religious, nationalism, integrity, independent and cooperative. *International Journal of Evaluation and Research in Education (IJERE)*, 14(3), 1916–1929.
<https://doi.org/10.11591/ijere.v14i3.29347>

Arwaty, & Lullulangi, M. (2022). Discovery Learning Model as an Effort to Increase Student Interest and Learning Outcomes. *Journal of Educational Science and Technology*, 8(1), 54–64. <https://doi.org/10.26858/est.v8i1.35217>

Chusni, M. M., Saputro, S., Suranto, & Rahardjo, S. B. (2022). Empowering critical thinking skills on different academic levels through discovery-based multiple representation learning. *Education Horizons: Scientific Journal of Education*, 41(2), 330–339. <https://doi.org/10.21831/cp.v41i2.41105>

Condorelli, F., & Berti, F. (2025). Creativity and awareness in co-creation of art using artificial intelligence-based systems in heritage education. *Heritage*, 8(5), 157.
<https://doi.org/10.3390/heritage8050157>

Fitrah, M., Marzuki, Umar, Jayanti, M. I., & Syafruddin. (2024). Strengthening character education in Indonesia: Philosophical and juridical foundations in shaping a generation of character. *el-Muhbib: Journal of Basic Education Thought and Research*, 8(2), 378–393. <https://doi.org/10.52266/el-muhbib>

Humaeroh, S., & Dewi, D. A. (2021). The Role of Civic Education in the Era of Globalization in Shaping Students' Character. *Journal on Education*, 3(3), 216–222.

Jumini, S., Rahmiati, Muntaqo, R., Majid, A., Nadrah, Y. M., & Winarto. (2025). Learning Patterns and Their Implications in the Development of Students' Religious Character. *Journal of Innovation in Educational and Cultural Research*, 6(1), 84–93.
<https://doi.org/10.46843/jiecr.v6i1.2129>

Juwita, S., Alhaq, M., Fachriyah, N. V., & Irawan. (2022). Implications of the Scientific Approach-Based Discovery Learning Model on Commendable Attitude Material. *EDUCATION: Journal of Education and Learning*, 3(3), 983–996.

Kawuryan, S. P., Sayuti, S. A., & Aman. (2022). Critical thinking among fourth grade elementary school students: A gender perspective. *Education Horizons: Scientific Journal of Education*, 41(1), 211–224. <https://doi.org/10.21831/cp.v41i1.44322>

Kuswanto, H. (2023). *National Identity in the Era of Globalization*. Inara Publisher.

Listiana, Y. R. (2021). The Impact of Globalization on the Character of Students and the Quality of Education in Indonesia. *Journal of Tambusai Education*, 5(1), 1544–1550.

Manurung, A. S., & Pappachan, P. (2025). The role of discovery learning in efforts to develop students' critical thinking abilities. *Journal of Education and Learning (EduLearn)*, 19(1), 46–53. <https://doi.org/10.11591/edulearn.v19i1.21788>

Novidayanti M, Hasibuan, K. N., & I'zaati, L. (2023). Analysis of character education values through a multicultural approach in the basic education curriculum of civic education subjects at SDN 102 Aneka Marga. *EDUCATION: Journal of Education and Learning*, 4(2), 1917–1926.

Nurmaini, S., Darmawahyuni, A., Sapitri, A. I., Rachmatullah, M. N., Firdaus, & Tutuko, B. (2021). *INTRODUCTION TO DEEP LEARNING AND ITS IMPLEMENTATION*. UNSRI PRESS.

Curriculum and Learning Center. (2025). *Academic manuscript of deep learning: Towards quality education for all*. Ministry of Primary and Secondary Education.

Rahmawati, H., Pujiastuti, P., & Cahyaningtyas, A. P. (2023). Categorization of Critical Thinking Skills of Fourth Grade Elementary School Students in Elementary School in Cluster II Kapanewon Playen, Gunung Kidul. *Journal of Education and Culture*, 8(1), 88–104. <https://doi.org/10.24832/jpnk.v8i1.3338>

Rahmawati, Y., Mu'ti, A., Suyanto, & Herianingtyas, N. L. R. (2025). Deep learning: Transforming learning towards quality education. *Journal of Education Policy Research*, 18(1), 1–16. <https://doi.org/10.24832/jpkp.v18i1.1281>

Ridwan, S. L. (2021). Improving critical thinking skills and student learning outcomes through the discovery learning model. *Journal of Didactic Primary Education*, 5(3), 637–656. <https://doi.org/10.26811/didaktika.v5i3.201>

Sharifani, K., & Amini, M. (2023). Machine Learning and Deep Learning: A Review of Methods and Applications. *World Information Technology and Engineering Journal*, 10(07), 3898–3904.

Sunaryati, T., Fatchan, M., Sudharsono, M., & Angela, P. (2025). Ethno-Edutainment Electronic Module (EMEE) to Strengthen Local Cultural Character in Elementary School Students. *Edubase: Journal of Basic Education*, 6(1), 136–149.

Susilo, M. J., Dewantoro, M. H., & Yuningsih, Y. (2022). Character education trend in Indonesia. *Journal of Education and Learning (EduLearn)*, 16(2), 180–188. <https://doi.org/10.11591/edulearn.v16i2.20411>

Ulya, F. I., Sumarno, & Wijayanti, A. (2021). Development of discovery learning-based video media for elementary school students. *Journal of Educational Technology Innovation*, 8(1), 68–83. <https://doi.org/10.21831/jitp.v8i1.42565>

Wahyuni, A. D., Sudiyana, B., & Walidi, A. (2023). *CHARACTER EDUCATION: STRATEGIES TO FACE GLOBALIZATION*. Tahta Media Group.

Wisiyanti, R. A. (2024). Strengthening Character Education Through Islamic Religious Education in the Era of Globalization. *EDUCATION: Journal of Education and Learning*, 5(1), 1965–1974.

Zainiyati, H. S., Rusydiyah, E. F., Faizah, H., Farisia, H., Purnamasari, R., & A'yun, Q. (2023). The Influence of Discovery Learning on Serotonin Hormones and Student Learning Achievements. *Journal of Innovation in Educational and Cultural Research*, 4(4), 737–744. <https://doi.org/10.46843/jiecr.v4i4.1186>