
Academic Article

REIMAGINING HUMAN-AI CO-TEACHING IN SOUTHEAST ASIAN TEACHER EDUCATION: THE CARE FRAMEWORK FOR HYBRID PEDAGOGICAL INTELLIGENCE

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Abstract: The worldwide teacher education system is currently experiencing transformation because of the fast growth of generative artificial intelligence technology which generates new challenges for teachers regarding their professional decision-making and their ability to create effective teaching methods in AI-based educational settings. Existing research mainly investigates how people use AI technology as a teaching resource while researchers have not studied Human–AI Co-Teaching models that meet academic standards in Southeast Asian educational systems. The article presents a CARE Framework which establishes a conceptual framework for understanding hybrid pedagogical intelligence in teacher education through its components of Contextualization, Augmentation, Reflection, and Empowerment. The article conducts an integrative conceptual review which combines various academic fields by examining teacher education materials and educational technology resources and teacher agency information and learning design resources and hybrid intelligence studies and Global South educational research published between 2016 and 2026. The review uses policy reports and theoretical scholarship together with new research on generative AI in education which exists in international databases and institutional sources that include UNESCO and OECD publications. The synthesis identifies four interrelated dimensions necessary for sustainable Human–AI Co-Teaching and argues that AI integration should be understood as a recursive pedagogical ecology rather than a technological substitution process. The proposed framework establishes a new contribution to international literature through its development of a context-specific model that highlights multilingualism, cultural responsiveness, teacher professionalism, and ethical pedagogical judgment as essential elements of Southeast Asian teacher education. The study presents implications that affect three areas: curriculum redesign, teacher professional development, and future empirical research on human–AI collaboration in diverse educational settings.

Keywords: generative artificial intelligence, teacher education, teacher agency, human-AI co-teaching, Southeast Asia

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1. INTRODUCTION

The quick development of generative artificial intelligence (GenAI) technology has transformed teacher education programs and instructional design practices and professional development initiatives that operate in educational institutions throughout the world. GenAI provides technical capabilities, but it also creates essential teaching challenges that deal with teacher autonomy and their ability to make

professional decisions in educational setups that use AI technology. Recent research has started to investigate how AI technology supports lesson creation and assessment activities and student learning assistance, but researchers have not yet studied how educators and AI systems work together as teaching partners. The need for specific theoretical frameworks becomes crucial in Southeast Asia because its multilingual population combined with its different infrastructural development levels and its distinct cultural approaches to teaching both present complex challenges that demand specialized theoretical frameworks (UNESCO, 2026; OECD, 2023). The article introduces the CARE Framework, which stands for Contextualization and Augmentation and Reflection and Empowerment, as a Human-AI Co-Teaching model to establish hybrid pedagogical intelligence systems for Southeast Asian teacher education.

The worldwide speed of AI implementation throughout educational systems has caused researchers to stop studying how people access technology and instead focus their research on teaching methods and ethical issues and the transformation of teaching professions. Earlier educational technology discourse often framed AI primarily as an efficiency-enhancing tool, emphasizing automation, personalization, and predictive analytics (Luckin et al., 2016; Holmes et al., 2019). The development of large language models together with generative systems has created new opportunities. AI today enables three functions which include creating educational content and designing feedback systems and simulating educational dialogues and planning instructional activities (Dwivedi et al., 2023; Kasneci et al., 2023). The new system requires educators to stop seeing artificial intelligence as a tool and start using it as their teaching partner.

The shift creates significant effects which affect teacher education programs. Teaching has traditionally been understood as a profession which requires professionals to make judgments about specific situations while following ethical standards. Teacher expertise extends far beyond the transmission of content knowledge; it encompasses the ability to interpret learner needs, design meaningful learning experiences, and respond adaptively to diverse classroom contexts (Priestley et al., 2015; Schön, 1992). The growing use of GenAI creates challenges for educators who must handle its implementation because it provides automated teaching recommendations that seem trustworthy and logical and appropriate for various situations. The system produces outputs which depend on three factors: data bias and contextual abstraction and the system's absence of actual classroom knowledge. The current situation exists because educational institutions must determine how educators should use AI tools while maintaining their professional authority and teaching standards.

The Southeast Asian region considers this matter to be of great importance. The existing research about AI applications in education originates from Western educational systems and from regions with advanced digital infrastructure because those areas have different institutional support systems and teaching methods compared to Global South regions. Southeast Asian education systems face challenges in implementing new technologies because multilingualism and digital access disparities and teacher identities that exist in their cultures create obstacles (UNESCO, 2025; OECD, 2023). Teachers serve multiple roles in the educational system because they function as instructional designers and simultaneously act as moral leaders and community managers and emotional support systems. The frameworks that exist in other regions do not provide sufficient understanding about how AI technologies are implemented in this area because they lack essential information on relationships and local environments.

The present article demonstrates that AI integration into teacher education programs should be perceived as a process that develops hybrid pedagogical intelligence through contextualization and augmentation and reflection and empowerment. The article establishes the CARE Framework as a Human-AI Co-Teaching model through a synthesis of teacher agency research and learning design theory and hybrid intelligence studies and educational perspectives from the Global South. The framework establishes three teacher roles as epistemic curators and reflective practitioners and

pedagogical leaders while treating AI as a partner that assists in learning design and educational development.

The article makes three key contributions to the international literature. The first achievement of the study presents an integrated theoretical framework which describes AI integration through pedagogical ecology rather than through technological adoption. The second achievement of the study analyzes Southeast Asian teacher education to demonstrate that Western educational AI models require localized application. The third achievement of the study establishes a conceptual framework which helps educators redesign curricula and develop their professional skills while conducting research about human-AI collaboration in different educational settings.

Although researchers increasingly study artificial intelligence applications in education, the existing academic literature still has significant knowledge gaps. The existing studies on AI tool deployment and automated assessment and learner analytics primarily examine technical aspects without showing how teachers and AI systems work together for teaching purposes (Kasneci et al., 2023; Dwivedi et al., 2023). The present understanding of AI integration developed through research in Western countries and advanced educational systems, which failed to consider the actual language and cultural and infrastructural conditions that exist in Southeast Asian teacher education institutions (UNESCO, 2025; OECD, 2023). The existing research on teacher agency and digital skills and responsible AI usage needs an unifying framework that connects these three areas into a unified system for Human–AI Co-Teaching.

The existing research gaps require the present article to investigate three main conceptual questions which include (1) the theoretical framework for Human–AI Co-Teaching in Southeast Asian teacher education and (2) the essential components needed to build hybrid pedagogical intelligence through AI-powered educational systems and (3) the methods which will enable teachers to maintain their professional autonomy while responding to specific situations and making ethical teaching decisions in Human–AI collaborative work environments. The article has three main objectives which include (1) a synthesis of AI-related research from various academic fields that connects with teacher education and teacher agency and hybrid intelligence and (2) the creation of the CARE Framework which serves as a conceptual model for Human–AI Co-Teaching and (3) an investigation of how the framework affects teacher education policies and teacher training programs and upcoming research initiatives in educational systems throughout Southeast Asia.

The remainder of the article proceeds as follows. Section 3 reviews the theoretical foundations which support human-AI co-teaching through teacher agency and professional identity and learning design theory and regional perspectives from Southeast Asia. Section 4 introduces the CARE Framework as the central conceptual contribution of the article. Section 5 presents implications which affect teacher education practice and educational policy while Section 6 contains a comprehensive theoretical examination together with a plan for upcoming research studies. The article concludes by examining how hybrid pedagogical intelligence will shape upcoming developments in teacher education programs.

2. METHODOLOGICAL APPROACH

The article uses integrative conceptual review methods to create the CARE Framework which serves as a theoretical model for Human-AI Co-Teaching in Southeast Asian teacher education. The study uses integrative reviews to process multiple theoretical perspectives and conceptual scholarship and policy discourse and empirical trends into a single analytical framework which applies to emerging interdisciplinary fields (Torraco, 2005; Snyder, 2019). The goal of integrative conceptual reviews is to create new theoretical knowledge through their analysis of multiple literature sources which exist across different academic fields.

The review process evaluated research from multiple fields which examined how generative artificial intelligence affected educational systems and teacher empowerment and professional development and course creation and mixed intelligence systems and educational approaches from the Global South. Researchers discovered literature by conducting searches through main academic databases which included Scopus and Web of Science and ERIC and Google Scholar. The researchers acquired extra institutional and policy documents from UNESCO and OECD repositories because these documents shape worldwide discussions about artificial intelligence in education.

The search process employed combinations of keywords such as “generative artificial intelligence,” “teacher education,” “human–AI collaboration,” “teacher agency,” “hybrid intelligence,” “AI pedagogy,” “learning design,” “professional identity,” and “Southeast Asia.” The review primarily focused on publications produced between 2016 and 2026 in order to capture the emergence of large language models and recent developments in AI-mediated educational environments. The study included essential primary texts about teacher agency and reflective practice and learning design theory because these texts still hold value for research purposes.

Selection criteria required peer-reviewed journal articles and scholarly books and policy frameworks and influential conceptual works which directly related to AI integration in education and teacher professional practice. The study excluded publications which discussed technical algorithm development because they lacked educational value or they dealt with AI implementation in fields outside of education. The review selected research studies which investigated ethical dimensions and sociocultural aspects and contextual factors of educational AI systems instead of research which focused only on practical uses and technological aspects.

The synthesis process involved multiple rounds of thematic analysis through all chosen research materials. The researchers discovered common conceptual themes which connected to contextual responsiveness and pedagogical augmentation and reflective professional judgment and teacher empowerment across distinct academic traditions. The process produced four connected elements which formed the basis of the CARE Framework through its development of three distinct areas: Contextualization and Augmentation and Reflection and Empowerment. The researchers created a recursive conceptual model which demonstrates Human–AI Co-Teaching as a hybrid educational system that combines pedagogical intelligence with machine learning systems instead of replacing educational processes.

The article uses conceptual content as its basis but the review process followed transparent principles while maintaining theoretical consistency and combining multiple academic fields to enhance the scholarly quality and practical application of the proposed framework.

3. LITERATURE REVIEW AND THEORETICAL FOUNDATIONS

3.1 From Generative AI as Instrument to Human–AI Pedagogical Partnership

The field of artificial intelligence in education (AIED) has shifted its main focus during the last ten years from machine-based learning methods to teaching methods that emphasize student connections and collaborative learning. The early research work in AIED focused on computational and cognitive science theories which treated AI as a technology that enabled better learning results. The main abilities of AI systems in this system functioned through adaptive tutoring and automatic feedback and smart assessment and learning prediction through analytics (Luckin et al., 2016; Holmes et al., 2019). The researchers who created this early body of work believed that learning outcomes would improve through better efficiency and personalized learning experiences and data-based decision methods.

The systems used this method because it matched intelligent tutoring systems (ITS) which used AI to create teaching systems that operated like teachers through their cognitive abilities. The essential research work showed three aspects which included learner modeling together with personalized

learning support and algorithmic system development (Gidiotis & Hrastinski, 2026; Laksanasut, 2026). These systems advanced personalized learning research yet they treated teachers as secondary elements who operated inside the main theoretical framework while their teaching expertise existed as variables which computers could simulate.

The new field of generative artificial intelligence which includes large language models has completely transformed the existing instrumentalist framework. Unlike previous AI systems which operated according to fixed educational sequences, generative AI enables users to create language content while understanding contexts and developing ideas and participating in simulated conversations. The educational functions of artificial intelligence have evolved from their original purpose of improving efficiency to their current role as partners in creating educational content and developing teaching methods (Dwivedi et al., 2023; Kasneci et al., 2023).

Recent scholarly research describes this shift as a transition that starts with automated processes and ends with cooperative work between humans and machines. The theoretical field requires this distinction because it holds crucial importance. The process of automation enables AI systems to take over specific teaching responsibilities which include activities like grading and quiz generation and summarization tasks. AI systems develop human capabilities through their augmentation which lets users maintain control over their professional decision-making processes. The latest development of AI systems enables them to function as educational partners who work with teachers through shared design and reasoning activities (Rokkones & Giannakos, 2025; Gidiotis & Hrastinski, 2026).

The current partnership concept establishes a direct connection with collaborative intelligence which demonstrates human cognitive skills and machine capabilities working together to produce combined benefits (Dellermann et al., 2019). Educational settings demonstrate that collaborative intelligence creates effective teaching through the combination of teacher knowledge and AI-based system support. The educational worth of AI systems depends more on how teachers assess and modify system outputs for their specific needs than on the system's ability to create results independently.

The current academic research shows the theoretical framework transition which scientists have been studying in their recent investigations. The research team conducted a teacher-AI co-design study which demonstrated that educators use generative AI technology for both lesson development and teaching method development and classroom testing. Yusuf et al. (2025) describe AI as a "third pedagogical agent" which functions in schools by supporting educational activities and helping students develop their learning paths.

The current educational system needs a complete transformation of its existing teaching authority system because of this new shift. All authority in traditional teaching methods relies on the expertise of human instructors. The introduction of generative AI technology creates a challenge for this basic assumption because it produces new knowledge claims that appear authoritative and fluent and suitable for educational use. Le et al. (2026) identifies the current challenge as needing teachers to select between trusting or adapting or rejecting or evaluating AI output because technology integration no longer serves as the main obstacle.

Teacher education programs need to focus on this particular epistemological aspect. AI-based learning environments require teacher preparation programs to teach future educators beyond technical skills by providing them with training on AI-based teaching methods. The assessment process requires evaluators to check AI results against four criteria which include contextual appropriateness and subject matter accuracy and ethical assessment and matching with student requirements.

The transformation from instrument to partnership represents more than a semantic change because it fundamentally alters all elements of educational practice after ChatGPT technology. The current literature base establishes the theoretical basis which the study will use to present Human-AI Co-Teaching as a collaborative teaching model instead of a method that uses technology to support instruction.

Table 1
Evolution of AI Roles in Education

Period	Dominant AI Role	Pedagogical Orientation	Key Scholarly Focus
Pre-2022	Intelligent tutoring and analytics tool	Learner support and personalization	Adaptive learning, ITS, learning analytics
2022–2024	Generative assistant	Instructional efficiency	Lesson drafting, automated feedback, assessment support
2025–present	Collaborative co-teacher / co-designer	Human–AI partnership	Co-design, teacher agency, collaborative intelligence

3.2 Teacher Agency, Professional Identity, and Reflective Judgment in AI-Mediated Teaching

The quick adoption of generative artificial intelligence (GenAI) in educational settings has created new opportunities for instructional design and pedagogical support but it has also generated deep theoretical challenges which affect teacher agency and professional identity and reflective judgment. The current discussion requires these constructs because they serve as fundamental elements which determine the teaching validity of human-AI co-teaching. Recent research shows that educational AI systems achieve successful implementation when educational institutions use advanced technical systems to enhance teachers' ability to make decisions and interpret information in difficult school situations (Rokkones & Giannakos, 2025; Frøsig & Romero, 2024; Roe & Perkins, 2024).

Teachers possess agency which enables them to develop teaching methods that suit specific educational environments while maintaining ethical standards to address various classroom situations. Educational theory from ancient times considers agency to be a characteristic that develops through various social circumstances and professional expertise which becomes available during human learning. The research works of Priestley et al. (2015) and Biesta & Tedder (2007) and Le-Khanh et al. (2024) establish agency as an ecological concept which develops through the combination of previous experiences with current situations and future professional objectives. The OECD Digital Education Outlook 2026 defines teacher agency as educators' power to choose their actions while their main professional responsibilities cover teaching creative development and building trusted relationships with students.

The current understanding of human agency becomes more complicated because of contemporary GenAI technology. The automated process of creating lessons and generating assessments and producing feedback and conducting instructional dialogue establishes new systems of decision-making which allow educational leaders to control their teaching methods through algorithmic systems. The research investigates how AI technology affects teacher decision-making power because it examines two distinct aspects of teacher authority which result from AI system implementation.

The latest research demonstrates an active conflict between these two options. GenAI enables teachers to focus more on advanced teaching methods because it helps them handle their mental load and administrative tasks. Teacher development studies show that educators use GenAI to create resources faster and adapt materials for various student needs and design different teaching paths which results in improved classroom flexibility (Mahmoudi-Dehaki & Nasr-Esfahani, 2025; Barnes & Tour, 2026). AI-generated content creates a danger for teachers according to critical scholarship because it can lead them to trust automated suggestions instead of using their professional judgment (Roe & Perkins, 2024; Rokkones & Giannakos, 2025).

The concept of epistemic agency demonstrates a high level of tension between its opposing elements. In traditional educational settings, teachers use their expertise to establish their authority through their ability to judge which knowledge students should learn and which knowledge should be regarded as valid and meaningful for their specific educational needs and learning environment.

Generative AI produces outputs which seem to exhibit fluent and coherent and pedagogically acceptable characteristics, which makes it difficult to evaluate this process. The educational value of a system should not be assessed based on its apparent educational suitability. Current research shows that linguistic complexity creates an appearance of teaching effectiveness which actually conceals three problems: educational content errors, cultural understanding mistakes, and ethical violations. The challenge exists because contemporary educational assessment standards for artificial intelligence systems require both technical evaluation results and actual human identity and specific learning situations and expert evaluation to be used together (Ding & Magerko, 2025).

The identity of a teacher encompasses their professional duties and their teaching expertise and their core values and their educational responsibilities. The existence of social forces drives the continuous development of this phenomenon which people experience through their practical work and their reflective learning. The identity of a person in an AI-mediated environment experiences major changes through different processes of identity verification.

Recent empirical research studies show strong evidence which proves this transformation. The research conducted by Alvarez and his team in their study which appeared in *Teaching and Teacher Education* showed that AI technologies created major changes in how EFL teachers perceived their professional identities across six different areas these teachers achieved their work through expertise and authority and instructional creativity and ethical duty (Alvarez et al., 2025). Recent case studies in language education show that teachers increasingly progress from their role as knowledge transmitters to become pedagogical curators and evaluators who serve as ethical guides while they create instructional materials with GenAI technology (Yusuf et al., 2025; Chiu et al., 2026).

The shift carries theoretical importance because it establishes a new standard for what constitutes professional legitimacy. The ability of AI to produce lesson plans and reading materials and formative questions within seconds makes it impossible to evaluate teacher expertise through their ability to create instructional materials. The professional identity of teachers develops through their ability to interpret situations and build relationships and make ethical decisions, which creates a unique teaching approach that only human educators can provide. Current evidence supports the idea that AI implementation will transform educational practices from traditional teaching methods toward new approaches that require teachers to assess and interpret automated system outputs (Frøsig & Romero, 2024; Rokkones & Giannakos, 2025).

The third theoretical concept which this section requires has its basis in reflective judgment which serves as the system through which people show their agency and identity according to their actual behavior. The concept of a reflective practitioner which Schön developed in 1992 maintains its significance for educational environments which use artificial intelligence technology. Teaching in this perspective involves instructors who engage in immediate reflection while they assess their teaching practices. Educators do not merely apply predesigned procedures; they continuously interpret emergent classroom realities, revise assumptions, and make situated decisions.

The emergence of GenAI technology increases the need for people to practice reflective judgment skills. Teachers need to evaluate AI-created materials according to their developmental suitability and cultural appropriateness and their ability to provide valid knowledge and their capacity to maintain ethical standards. Recent studies in initial teacher education show significant differences between pre-service teachers and teacher educators according to their confidence levels and ethical understanding and their ability to teach with GenAI technology which demonstrates the need for reflective training programs (Gamlem et al., 2026; Lund et al., 2025).

The research demonstrates that teacher agency and professional identity together with reflective judgment undergo complete transformation through AI integration into educational systems. The article shows how human-AI co-teaching functions as hybrid pedagogical intelligence because it combines

technological elements with educational practices that depend on human expertise for their understanding and ethical foundations.

The ongoing discussion leads to the subsequent section, which examines how learning design theory and co-creation serve as the fundamental framework for implementing hybrid intelligence technologies in teacher education programs.

Recent scholarship increasingly finds support for this switch from agency to design-based enactment, especially in the hybrid intelligence and co-design frameworks

Table 2

Theoretical Dimensions of Teacher Agency, Professional Identity, and Reflective Judgment in AI-Mediated Teaching

Theoretical Construct	Definition in Educational Theory	AI-Mediated Tension	Implications for Teacher Education
Teacher Agency	Capacity to make intentional, context-sensitive, and ethically informed pedagogical decisions (Priestley et al., 2015; Biesta & Tedder, 2007)	Risk of over-reliance on algorithmic suggestions and reduced instructional autonomy	Develop AI-informed pedagogical reasoning and decision-making competence
Professional Identity	Dynamic understanding of one's role, expertise, values, and professional legitimacy as a teacher	Role displacement anxiety; shift from knowledge transmitter to pedagogical curator	Reconstruct teacher identity around judgment, curation, and ethical guidance
Epistemic Agency	Authority to determine what counts as valid, appropriate, and meaningful knowledge in context	AI-generated plausibility may mask conceptual inaccuracies or cultural misalignment	Strengthen critical evaluation of AI outputs for disciplinary and contextual accuracy
Reflective Judgment	Ongoing reflection-in-action and reflection-on-action in professional practice (Schön, 1992)	Passive acceptance of fluent AI outputs without pedagogical interrogation	Embed structured reflective practice and AI critique in teacher preparation
Ethical Agency	Responsibility for fairness, inclusion, privacy, and student wellbeing	Bias, hallucination, privacy risks, and opaque decision-making	Integrate AI ethics, accountability, and responsible use frameworks

3.3 Teacher Agency, Professional Identity, and Reflective Judgment in AI-Mediated Teaching

The theoretical discussion of teacher agency and reflective judgment naturally leads to the question of how these capacities are operationalized in pedagogical practice, particularly within AI-mediated educational environments. The central aspect of this situation requires learning design theory to be examined. Teachers use their authority to decide what their students will learn while they use their reflective judgment to evaluate their decisions; learning design theory provides the system through which teachers create purposeful educational activities.

Learning design has developed from its traditional instructional design models to implement current learning design approaches which focus on learner needs and specific learning contexts. The ADDIE model and backward design method which Wiggins & McTighe (2005) developed in 2005 established systematic planning processes that aligned learning outcomes with instructional activities and assessment methods. Contemporary scholarship uses dynamic co-creative processes to describe learning design while these models continue to serve as foundational elements of the field (Conole, 2013; Goodyear, 2005).

The current transformation stands as the major accomplishment within the field of generative artificial intelligence research. GenAI systems present a different capability than traditional educational

technologies which only assist specific parts of course creation because they can work throughout the entire educational design process from initial concept development to final assessment stage. Recent scholarship describes this development as a move toward co-creative learning design ecosystems, in which human educators and AI systems collaboratively generate, adapt, and refine instructional artifacts (Romero, 2025; Chiu et al., 2026).

Theoretical research shows that educational design-based thinking approaches teach students through problem-solving cycles which include problem framing and prototyping and testing and redesigning (Brown, 2008; Design-Based Research Collective, 2003). The generative systems in AI-mediated environments create multiple teaching options which they produce within seconds to accelerate these instructional design processes. The teachers use AI to create different lesson scenarios and new discussion questions and culturally appropriate reading materials and unique assessment methods, which they will assess and improve through their teaching expertise.

The design literature demonstrates that successful learning experiences depend on their ability to meet learner requirements and their cultural background and their academic objectives (Goodyear & Dimitriadis, 2013). AI should function as a design partner because it lacks the authority to make design decisions.

The current research evidence from empirical studies provides strong support for this viewpoint. Chiu et al. (2026) found that teachers use GenAI for three related design functions which they identified as idea generation, structural organization and iterative refinement in their synthesis of teacher-AI co-design research. The research demonstrates that AI-supported co-design in higher education learning design enables teachers to maintain control over teaching methods while creating more innovative instructional materials (Frøsig & Romero, 2024; Kadenhe et al., 2025).

The co-design approach for teacher education programs demonstrates its most effective application. The post-ChatGPT era requires teacher training programs to teach AI tool usage while building design literacy skills for human-AI interactions. Educators need design literacy skills which enable them to create effective teaching prompts, assess AI-generated educational pathways, and develop adaptable instructional materials for various classroom situations.

The educational value of hybrid intelligence literacy develops through the interaction between human teaching methods and machine design capabilities (Dellermann et al., 2019; Rokkones & Giannakos, 2025). Hybrid intelligence recognizes artificial intelligence as an educational tool that enables teachers to create instructional materials while maintaining their authority to make final teaching decisions.

The co-creation element of learning design brings important benefits to teaching methods that respect different cultural backgrounds. AI-generated results must be specifically adjusted to match the local language requirements and regional examples and culturally suitable communication methods and institutional standards present in Southeast Asian multilingual educational environments. The design process with AI requires specific contextual information to prevent the design method from creating Western-based models which use standard training data.

The study of learning design theory serves as a fundamental framework through which people can comprehend human-AI co-teaching since it functions as an educational approach that evolves through deliberate planning and adaptation to specific environments and ongoing evaluation.

The forthcoming section of this document develops the CARE Framework through its connection to this theoretical framework which provides academic support for the creation of Contextualization and Augmentation dimensions that depend on learning design principles.

Table 3
Learning Design Phases in Human–AI Co-Creation

Learning Design Phase	Teacher Role	AI Role	Pedagogical Purpose	Key Risk	Teacher Education Implication
Problem Framing	Define learning goals, learner profile, contextual constraints	Suggest objectives, identify content alternatives	Establish instructional intent	Overly generic goals	Develop contextual design reasoning
Ideation & Prototyping	Select pedagogical strategies and activities	Generate lesson ideas, scenarios, prompts, materials	Design divergence and creativity	Excessive dependence on AI-generated options	Strengthen design literacy and prompt formulation
Alignment & Structuring	Align activities with outcomes and assessment	Organize lesson sequence and assessment suggestions	Ensure coherence and scaffolding	Misalignment between tasks and outcomes	Train teachers in constructive alignment
Contextual Adaptation	Localize language, examples, and interaction style	Offer variations and adaptations	Cultural responsiveness and learner relevance	Cultural mismatch or Western bias	Develop culturally responsive AI mediation
Reflective Redesign	Evaluate effectiveness and revise design	Summarize feedback and propose revisions	Iterative improvement	Passive acceptance of AI revision suggestions	Embed reflective design cycles

3.4 Global South and Southeast Asian Teacher Education Perspectives

The existing scholarship on generative artificial intelligence (GenAI) in educational research has developed rapidly but maintains a geographical and knowledge base restriction that limits its progress to Western and high-income regions. The current evidence base has been built through research that studied North American and European countries along with advanced educational systems in East Asia which do not reflect the actual conditions of other regions. The theoretical framework suffers from a major imbalance because it uses teacher-AI collaboration models which do not effectively represent the actual conditions that exist in the Global South.

Recent international reports on higher education transformation have explicitly identified this imbalance. A 2025 regional report on digital transformation in higher education across Southeast Asia notes that while AI integration is accelerating its implementation remains dependent on differences in infrastructure and policies and institutional capacities (Hermawan et al., 2025). UNESCO's regional studies show that digital transformation in Southeast Asian education requires more than providing technological resources because it needs teacher development and localized teaching methods and educational system management (UNESCO, 2025; UNESCO, 2026).

The contextual lens serves as an essential aspect which teacher education programs need to implement. Teachers in multiple Southeast Asian contexts maintain their role as educators who deliver content yet still maintain strong ties to their students and local traditions. The teacher functions as a moral instructor who serves as a community member and provides students with emotional support in educational systems which follow collectivist teaching traditions. The professional identities of educators determine their understanding of artificial intelligence which they use in their daily work. Southeast Asia needs significant changes to Western-developed human–AI co-teaching models which were created for individualistic societies and digitalized environments.

The region has its second defining characteristic because people speak many different languages. The educational systems of Southeast Asian countries function in environments which use multiple languages and scripts together with local languages and national languages and English-language instruction. The use of AI for teaching purposes creates major consequences. Indonesian teachers have demonstrated through their evidence from classrooms that AI usage for lesson planning and teaching media and assessment support has increased yet teachers face difficulties with AI outputs which lack specific content and produce results in incorrect languages (Hosna et al., 2026). The study establishes its main relevance through research which shows that human–AI collaboration needs to be understood through localization and pedagogical mediation needs to be understood as a requirement for the present study.

The problem of infrastructural inequality makes it more difficult for regions to implement their plans. The people of Southeast Asia face unequal access to devices and stable internet connections and institutional digital ecosystems which particularly affects their ability to access these resources in urban areas and rural areas. UNESCO's recent work in Thailand demonstrates that educational technology needs to be combined with two essential components which include teacher skill development and student learning resources. The Ministry of Education's AI literacy and teacher development programs in Thailand show that recent national initiatives now connect policy development with professional learning systems instead of focusing on equipment distribution (UNESCO, 2025; UNESCO, 2026).

The regional difference exists as both a logistical issue and an epistemological matter. In educational settings with limited resources or multiple languages teachers function as the main translators who convert standard AI results into learning materials that match local cultural and linguistic needs. The research findings from extensive studies of teacher-AI partnerships in multilingual low-resource educational environments demonstrate that educators use AI technologies to begin their teaching process before they conduct detailed human evaluation and contextual modifications of their work (Dennison et al., 2025). The Global South educational systems require teacher expertise because it becomes fundamental for their operation.

The digital transformation which shapes Southeast Asia operates through its active digital transformation processes which create an ever-shifting environment. All four countries of Thailand, Indonesia, Cambodia, and Malaysia have established recent digital literacy and artificial intelligence educational reforms which they implement through different organizational methods. The developments now underway create a regional movement which views teachers as active leaders who drive inclusive artificial intelligence transformation instead of seeing them as users who follow existing technology solutions. The policy discussion closely matches the article's theoretical framework which focuses on empowerment and contextualization through the CARE Framework.

The Global South perspective provides a theoretical challenge against main stream technological determinism through its examination of technological developments. The literature now supports a context responsive approach which recognizes how teacher identity and community norms and institutional culture and policy ecosystems together determine educational results according to various contexts instead of following a standard adoption method for AI integration (Rokkones & Giannakos, 2025; Hosna et al., 2026).

The Southeast Asian viewpoint brings new regional information to existing research but changes how researchers understand human-AI collaboration through its focus on three elements: multilingualism, infrastructure difference, and teacher-led control of educational material and native professional expertise. The present study uses these findings to support its main research approach which uses contextualization as the first principle of the CARE Framework.

Table 4*Comparative Regional Dimensions of AI-Mediated Teacher Education in Southeast Asia*

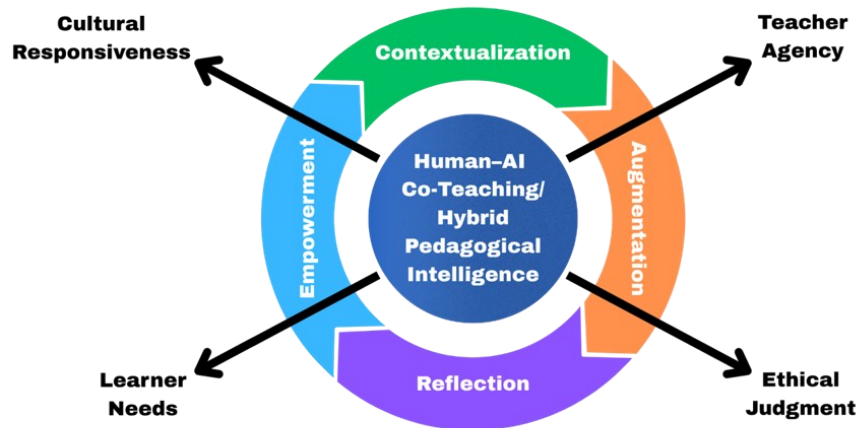
Regional Dimension	Characteristic in Southeast Asia	Key Challenge for Human–AI Co-Teaching	Implication for CARE Framework
Linguistic diversity	Multilingual classrooms; local + national + English use	AI outputs may lack local language nuance and pedagogical appropriateness	Strengthens Contextualization
Infrastructure disparity	Uneven connectivity and device access across urban–rural contexts	Inconsistent access to AI tools and digital ecosystems	Requires Augmentation with flexible human-led alternatives
Teacher role culture	Highly relational, authority- and community-based professional identity	AI may disrupt traditional perceptions of teacher expertise	Reinforces Empowerment
Policy heterogeneity	Varied national AI literacy and education strategies	Inconsistent institutional readiness and training standards	Supports Reflection and policy-informed adaptation
Curriculum localization	Strong need for local examples and culturally responsive pedagogy	Generic AI outputs may reflect Western assumptions	Requires iterative Contextualization + Reflection

4. THE CARE FRAMEWORK: A HUMAN-AI CO-TEACHING MODEL FOR SOUTHEAST ASIAN TEACHER EDUCATION

The article develops its main argument through the establishment of the CARE Framework which unites three theoretical fields. The framework exists to solve a primary research gap which current literature observes. Recent studies acknowledge AI as a teaching assistant. The existing research still lacks proper explanations which describe the required human and machine interactions that should take place in different teacher training environments.

The CARE Framework (Figure 1) contains four interconnected dimensions which include Contextualization, Augmentation, Reflection, and Empowerment. The dimensions function as an iterative educational system which enables teachers to move between contextual understanding and AI-based design development and their evaluation of both systems and their own professional development.

The framework establishes its fundamental principle that AI must serve as a co-teacher and co-designer instead of operating as an independent teaching authority. This position aligns with recent scholarship on hybrid intelligence and teacher–AI teaming, which emphasizes the co-constitution of pedagogical value through the interaction between human judgment and machine affordances (Rokkones & Giannakos, 2025; Dellermann et al., 2019; Chiu et al., 2026). The educational framework establishes human teachers as the primary sources of knowledge, ethical guidelines, and contextual understanding that shape their teaching methods.

Figure 1*The CARE Framework for Human–AI Co-Teaching in Southeast Asian Teacher Education*

The first dimension, Contextualization, reflects the argument developed in Section 3.4 that educational technologies cannot be divorced from their sociocultural environments. Teacher education in Southeast Asia includes three main components: linguistic plurality, culturally embedded teacher identities, and institutional diversity. Contextualization therefore refers to the teacher's capacity to interpret AI-generated outputs through local pedagogical realities, adapting content, examples, interactional styles, and assessment tasks to meet learner needs and cultural expectations. This dimension receives its main influence from two educational approaches: culturally responsive pedagogy and ecological teacher agency frameworks (Gay, 2018; Priestley et al., 2015).

The second dimension Augmentation uses AI technology to enhance teaching capabilities. The process involves creating lessons and building instructional materials and providing special support and producing feedback and developing assessment systems. The process of augmentation does not equate to the process of delegation. Teachers use artificial intelligence tools to expand their lesson development and teaching abilities which they choose to control throughout their teaching practices. This dimension uses learning design theory and hybrid intelligence research to demonstrate how artificial intelligence creates new teaching design options for educators (Goodyear, 2005; Frøsig & Romero, 2024).

The third dimension, Reflection, serves as the essential evaluative component which enables the framework to evaluate its effectiveness. The growing ability of artificial intelligence systems to produce credible results according to Section 3.2 requires teachers to develop better skills for evaluating these AI systems. Reflection entails the organized examination of artificial intelligence recommendations through the lenses of developmental suitability, academic disciplines, cultural significance, ethical standards, and educational results. This dimension is theoretically rooted in Schön's (1992) conception of the reflective practitioner and more recent scholarship on AI-informed pedagogical reasoning (Lund et al., 2025; Gamlem et al., 2026).

The fourth dimension of Empowerment extends to professional identity and leadership abilities while requiring individuals to develop their technical skills. The framework defines empowerment as the degree to which teachers maintain their power and self-assurance and their ability to control AI-powered educational environments. Teacher education programs need to teach future educators about AI tools while enabling them to guide discussions on responsible technology usage and equitable teaching practices and classroom improvements. The study on teacher identity reconstruction in AI-rich environments provides evidence that this dimension needs to be included because it affects teachers' ability to perform their roles and their professional self-efficacy (Alvarez et al., 2025; Yusuf et al., 2025).

The four dimensions create a system which functions through their relationships with each other. The process of contextualization establishes local value for AI design which supports design elements through its application to real-world situations. The process of augmentation produces educational materials which need to be examined through reflective practices. The process of reflection helps people become more empowered because it develops two essential traits which are professional confidence and ethical decision-making abilities. The teacher uses empowerment to lead AI-based teaching methods through the process of renewing educational context.

The CARE Framework functions as a dynamic system which combines human experience with artificial intelligence to create educational solutions for teacher training programs that respect cultural differences.

Table 5

The CARE Framework for Human–AI Co-Teaching in Southeast Asian Teacher Education

CARE Dimension	Conceptual Definition	Theoretical Foundation	Teacher Education Application	Expected Pedagogical Outcome
Contextualization	Interpreting and adapting AI outputs to local sociocultural, linguistic, and institutional realities	Culturally responsive pedagogy; ecological teacher agency	Localized lesson design; multilingual scaffolding; curriculum adaptation	Contextual relevance and learner inclusivity
Augmentation	Strategic use of AI to expand instructional and design capabilities	Learning design theory; hybrid intelligence	Lesson planning; differentiated materials; assessment prototyping	Enhanced design capacity and instructional flexibility
Reflection	Critical evaluation of AI outputs and teaching decisions	Reflective practitioner theory; pedagogical reasoning	Critique of prompts, outputs, feedback, and learner impact	Improved pedagogical judgment and ethical decision-making
Empowerment	Preservation and strengthening of teacher agency, identity, and leadership	Teacher identity theory; professional agency	AI leadership training; ethical policy literacy; professional development	Stronger teacher confidence and sustainable AI integration

5. IMPLICATIONS FOR TEACHER EDUCATION PRACTICE AND POLICY

The CARE Framework offers its implications to several areas which include teacher education curriculum design and professional development systems and institutional policy and regional educational reform. The educational system must now determine how to incorporate generative artificial intelligence (GenAI) into teacher preparation programs because educational institutions have begun using this technology.

The main implication of this research requires teacher education programs to develop new curricula which need to be redesigned. The current teacher preparation programs in various educational settings continue to teach digital literacy through basic educational technology skills and their application to learning management systems and presentation software. The development of GenAI technology needs educational programs which teach two essential skills for AI-based teaching methods and two additional skills for assessing AI-generated content and making teaching choices (Lund et al., 2025; Gamlem et

al., 2026). The CARE Framework requires educational institutions to create organized instructional programs which teach students to develop competencies in each of the four essential competency areas.

The process of contextualization becomes operational through the implementation of a course that teaches pre-service teachers to design AI-based lessons which accommodate multiple languages and local educational needs. The educational design modules will include augmentation as a requirement for students to develop lesson prototypes and formative assessments through AI tools and create customized learning support materials. Teacher candidates must use critical appraisal tasks to assess AI-generated content for three specific criteria which include developmental suitability and disciplinary truthfulness and ethical considerations. Professional identity development requires Empowerment which requires teachers to operate as leaders who make decisions in AI-based educational systems.

The second implication of this study shows its effect on professional development programs for teachers who currently work in schools. Current evidence suggests that many teachers encounter AI tools informally and often without institutional guidance, which leads to inconsistent teaching methods and different levels of pedagogical effectiveness (Barnes & Tour, 2026; Mahmoudi-Dehaki & Nasr-Esfahani, 2025). The CARE Framework offers a professional learning system that organizes its development process from initial awareness to advanced integration and leadership competencies. The educational ministries together with teacher development institutes and school networks can implement CARE as their professional development framework that assists teachers in developing their basic AI knowledge into full classroom application and leadership skills.

The framework establishes important effects on teacher education policies and accreditation standards at the institutional level. Teacher preparation programs must now show their compliance with future-ready competencies and digital literacy requirements and inclusive pedagogical standards according to accreditation bodies. The present framework suggests that AI competence should not be treated as an isolated technical standard but as an integrated component of teacher professionalism. The requirements include specific benchmarks that assess teachers' ability to use AI for teaching purposes and their capacity to make ethical choices and handle data and develop instructional methods based on their teaching environment.

Southeast Asia faces critical policy challenges because countries in the region are developing national AI educational integration plans that show different levels of progress. The current policy efforts in Thailand and Singapore and Indonesia place greater importance on digital transformation yet tend to concentrate mainly on establishing infrastructure and providing internet access. The CARE Framework requires educational authorities to treat teacher capacity development as the essential foundation for their policy frameworks instead of using it as an implementation component. The sustainable implementation of AI systems according to UNESCO's recent regional guidelines relies on three essential elements which include teacher skills and contextual support and existing system resources (UNESCO, 2025; UNESCO, 2026).

The policy development process needs to address both equity and inclusion requirements. The educational system needs protective measures because AI technology will worsen existing educational gaps in multilingual and rural and low-resource environments. The Contextualization and Empowerment dimensions of CARE directly address this concern by foregrounding teacher mediation, local adaptation, and professional agency as mechanisms for equitable implementation. The policy requires that AI programs should provide multiple support methods to disadvantaged schools while implementing local language models and creating ongoing professional development systems which extend beyond single technology training sessions.

From a leadership perspective, the framework positions teachers as active agents who drive educational change through their work instead of demonstrating their learning through technology. The research results show how school leaders and teacher educators and educational ministries will need to adapt their functions to implement educational reform. The educational system will use CARE as a

unified framework to transform professional development programs and teaching methods and teacher leadership programs into new structures for collaborative artificial intelligence implementation.

The framework provides researchers with two different paths for their research efforts and their work on policy research. The present article exists as a conceptual document but future research will create measurable elements from CARE that assess teacher readiness and pedagogical choices and institutional AI maturity. The framework can help develop evidence-based policies which will support researchers in their international studies.

The CARE Framework presents a complete implementation framework which connects classroom instruction, teacher training, professional development and regional policy creation through a single human–AI co-teaching system (Table 6).

Table 6
Implementation Pathways and Policy Implications of the CARE Framework

CARE Dimension	Teacher Education Practice	Professional Development Pathway	Policy / Institutional Implication
Contextualization	Culturally responsive AI-supported lesson design; multilingual adaptation tasks	Workshops on localizing AI outputs for diverse learners	Regional guidelines for culturally and linguistically appropriate AI use
Augmentation	AI-assisted lesson planning, assessment design, and differentiated scaffolding	Hands-on AI design labs and microteaching simulations	Integration of AI pedagogy standards into teacher education accreditation
Reflection	Structured critique of AI-generated outputs; ethics case analyses	Reflective communities of practice and coaching cycles	Institutional frameworks for responsible AI use and quality assurance
Empowerment	Professional identity, AI leadership, and agency-building modules	Leadership training for teacher mentors and teacher educators	Teacher-centered AI transformation strategies at ministry and school levels

6. DISCUSSION

The present article set out to address a critical gap in the rapidly expanding literature on generative artificial intelligence (GenAI) in education. The existing research needs a theoretical framework which can describe human-AI co-teaching in Southeast Asian teacher education programs because the current literature lacks such a framework. Researchers have begun to explore AI uses beyond technical functions but most research remains divided because it fails to connect teaching methods with teacher empowerment and educational design and Global South educational systems. The CARE Framework was proposed as a response to this fragmentation, offering an integrative model that repositions AI as a collaborative pedagogical partner while preserving the centrality of teacher expertise.

The main theoretical contribution of this article shows that artificial intelligence integration should be studied through pedagogical ecology instead of studying it through technological adoption. Educational technology discourses currently dominant in the field approach innovation through three main factors which include access and usability and technical efficiency. The present conceptual synthesis shows that GenAI needs more than adoption models to understand its pedagogical value. AI needs to be understood as one component within a system that includes professional judgment and contextual mediation and ethical responsibility and instructional design. The ecological perspective established in this study expands on previous research about teacher agency (Priestley et al., 2015) and hybrid intelligence (Dellermann et al., 2019) because it establishes the repetitive relationship between context and augmentation and reflection and empowerment as its primary focus.

This discussion also contributes to the emerging literature on hybrid pedagogical intelligence. Current research shows that AI educational value exists beyond its system performance because it

depends on how humans and machines interact with each other according to Rokkones & Giannakos (2025) and Chiu et al. (2026). The CARE Framework advances this conversation by proposing that pedagogical intelligence is not an attribute of either the teacher or the AI system in isolation but rather an emergent property of their dynamic collaboration. The framework establishes a new research direction by shifting its emphasis from AI capabilities to the relational capabilities that enable teachers to evaluate and manage AI-assisted learning methods in an ethical way.

The second important achievement transforms the understanding of teacher professional standards which exist in environments that utilize artificial intelligence technology. One of the persistent anxieties in the international literature relates to the potential deprofessionalization of teaching through automation. The article presents an argument which shows that the emergence of GenAI technology will increase requirements for professional skills instead of decreasing those requirements. Educational systems now develop AI systems which can produce fluent educational materials that appear credible thus changing the teachers duty from developing content to functioning as knowledge steward who assesses information and manages ethical issues. The professional value which exists in this transition changes according to the requirements of advanced decision-making abilities and the capacity to assess particular situations and the need for leadership skills. Recent studies about teacher identity development in artificial intelligence enriched learning environments study results match this new understanding (Alvarez et al., 2025; Yusuf et al., 2025).

The article's regional concentration extends to international academic research through its examination of Southeast Asia. The study uses Southeast Asia as its primary focus to combat Western-model supremacy in AI integration while advancing decolonization efforts within educational technology discussions. The literature review demonstrated that issues such as multilingualism, infrastructural disparity, culturally embedded teacher roles, and policy heterogeneity significantly shape how AI-mediated pedagogy is enacted. The future development of educational AI theories requires researchers to establish regionally grounded models that avoid using universalistic assumptions.

The situation currently includes multiple significant conflicts which remain unresolved. First, the CARE Framework provides a theoretical framework which exists as a complete model yet needs practical testing for validation. The framework has a limitation which requires future research to create systematic solutions. The research requires empirical studies to investigate how teachers from various educational levels and regional areas implement the four CARE dimensions in their actual work. The research can include mixed-methods studies which investigate how teachers make decisions and studies which test classroom design and studies which track professional development programs over time.

Current AI systems require testing because their present testing methods fail to meet existing operational needs. The current educational systems need updates because AI systems have created a need for new teaching approaches which the existing frameworks fail to support. The current understanding of CARE needs to evolve because the framework functions as a dynamic structure which needs regular updates to adapt to ongoing technological and educational advancements.

The ethical aspect requires more thorough examination. The empowerment and reflection methods which empower people to make decisions and think critically. The research needs to study bias issues together with data privacy matters and algorithmic transparency requirements and equitable access needs which affect Global South populations.

The existing tensions between established research fields of study and emerging scientific fields of study will create a research agenda for future studies which appears in Table 7.

Table 7
Future Research Agenda for Human–AI Co-Teaching

Research Domain	Key Research Questions	Suggested Methodological Approaches	Potential Scholarly Contribution
Framework validation	How do teachers enact the CARE dimensions in real classrooms?	Classroom observations; mixed-methods case studies	Empirical validation of conceptual framework
Teacher education	How does CARE influence pre-service teacher readiness and identity formation?	Design-based research; longitudinal cohort studies	Evidence for curriculum redesign
Regional comparison	How does human–AI co-teaching vary across Southeast Asian contexts?	Comparative cross-national studies	Global South theorization and policy insight
Ethics and equity	How do bias, privacy, and access affect CARE implementation?	Critical policy analysis; qualitative interviews	Responsible AI integration frameworks
Multimodal AI	How do image-, voice-, and video-based AI systems reshape co-teaching?	Experimental learning design studies	Next-generation AI pedagogy models

The discussion shows that the CARE Framework functions as a research platform which combines existing academic work into a unified conceptual framework. The framework provides immediate educational support for teacher training programs while it creates new research opportunities in human-AI collaboration and teaching empowerment and educational change that respects local cultural backgrounds.

7. CONCLUSION

The educational systems around the world are experiencing major changes because of the fast growth of generative artificial intelligence (GenAI) technologies which create new methods for teaching and instructional design and teacher professional development. Educational discourse requires theoretically grounded frameworks which support responsible Human-AI collaboration in educational settings because current educational discussions have moved beyond technological adoption to examine pedagogical methods and ethical considerations and professional autonomy. The present article introduces the CARE Framework through its four components Contextualization and Augmentation and Reflection and Empowerment as a conceptual model designed for Human-AI Co-Teaching and hybrid pedagogical intelligence implementation in Southeast Asian teacher education.

The primary value of this article emerges from its new definition of artificial intelligence which shows that AI should function as a teaching device that works together with educators rather than replacing their professional knowledge. The article develops a comprehensive theoretical framework through its integration of research about teacher agency, learning design, hybrid intelligence, and educational perspectives from the Global South, which defines teachers as educational experts who practice reflection and ethical mediation while leading changes to classroom methods in environments using artificial intelligence technology.

The article provides a locally based perspective through its emphasis on the social and cultural and educational system infrastructure that exists in Southeast Asia. The CARE Framework for educational AI implementation in the region requires educational institutions to consider multilingualism and digital access disparities and the teacher functions that exist within their cultural context and the specific needs of their community. Educational institutions in ASEAN countries continue to face difficulties because

their technological resources differ from one another and their academic policies differ from one another.

The proposed framework produces multiple practical outcomes and policy outcomes. Teacher education programs at institutions need to teach AI literacy and ethical pedagogical judgment and Human-AI collaborative design to their students. Educational ministries and teacher accreditation organizations need to establish AI competency standards which take into account the particular needs of their regions and encompass both technical abilities and cultural understanding and reflective skills and professional development capacity. The framework will assist Thailand in its national initiatives which aim to improve digital education and develop competency-based curricula and create educational innovations during the country's digital transformation process. ASEAN educational networks can advance their educational systems through cooperative regional frameworks which establish AI governance and enhance teacher skills and create fair digital infrastructure systems.

The current article contains multiple limitations which need to be recognized. The CARE Framework exists as a conceptual framework which researchers have not yet tested through research in educational environments or teacher training programs. Future studies should therefore examine the applicability and effectiveness of the framework through qualitative research and quantitative research and mixed-methods research which various educational contexts. The article presents an interdisciplinary synthesis of research from different fields but the fast development of generative AI technologies will result in ongoing changes to both conceptual frameworks and teaching methods. The article studies Southeast Asian teacher education but ASEAN educational systems show extensive differences which require national and local educational systems to modify the framework.

The article demonstrates that sustainable hybrid teaching methods which depend on human decision-making abilities and contextual understanding and ethical responsibilities provide a better framework to assess the future role of AI in educational environments than technological efficiency. The ongoing issue requires educational institutions and their staff and governmental leaders to establish Human-AI partnerships which will maintain academic value and cultural relevance and social fairness in future educational systems that use artificial intelligence.

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