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The Transformative Negotiation between Educators and AI in the Making of Future Learning Ecologies

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Abstract: *Artificial intelligence is reshaping the landscape of education, not as a tool of efficiency but as a co-creator of pedagogical meaning. This study investigates how educators negotiate their professional, ethical, and epistemic roles within AI-mediated learning environments, revealing teaching as a dynamic process of transformative negotiation rather than technological adaptation. Drawing on an exploratory mixed-method design that combined phenomenological interviews with computational network analysis of 42 educators across Asian higher education institutions, the research advances a new theoretical lens integrating Sociocultural Activity Theory and Actor–Network Theory. The findings show that educators' engagement with AI is driven less by technical mastery than by ethical reflexivity and relational adaptability. Agency emerges through recursive interaction, where human and machine intelligences co-construct evolving learning ecologies. This reconfiguration challenges instrumentalist models of AI adoption and introduces the concept of* relational reflexivity *to describe how pedagogical authority is continually redefined. The study offers theoretical, methodological, and practical innovations, reframing AI in education as a dialogical partner in the co-production of knowledge. It concludes by urging institutions and policymakers to foster collaborative, ethically grounded frameworks that empower educators to think and create with, rather than against, artificial intelligence.*

Keywords: artificial intelligence, pedagogy, educator agency, learning ecologies, relational reflexivity

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1. Introduction

Artificial intelligence (AI) has entered education not as a neutral instrument but as a transformative interlocutor that redefines what it means to teach, to learn, and to know. The growing incorporation of AI into classrooms, learning management systems, and pedagogical decision-making marks a profound shift from human-centered instruction toward hybrid ecologies of intelligence where machines participate in shaping cognition, agency, and judgment (Adiguzel et al., 2023; Halaweh, 2023). Across the globe, educational institutions are negotiating the ethical, epistemic, and professional implications of this shift, as AI tools begin to mediate how educators design learning experiences, assess student progress, and interpret knowledge itself (Dignum, 2021; Kumar et al., 2023). This transformation is neither linear nor purely technological—it is cultural, cognitive, and deeply pedagogical, implicating the very ontology of teaching. Despite the proliferation of AI-driven innovations, current scholarship remains divided between technological optimism and pedagogical caution. Studies have demonstrated the potential of AI to personalize learning, automate administrative tasks, and enhance accessibility (Bhutoria, 2021; Ghnemat et al., 2022; Kataria, 2023). Yet, these narratives often obscure the complex negotiations educators undertake when aligning their professional autonomy, ethical responsibility, and creative agency with algorithmic systems (Beare & Slaughter, 2021; Rizvi, 2023a). The human dimension of this transformation—the interpretive, adaptive, and sometimes resistant responses of teachers to AI integration—remains underexplored in both theory and practice. What is missing is a critical understanding of how educators and AI co-construct pedagogical spaces that are neither purely human nor machine-driven but constitute new forms of learning ecologies (Aggarwal et al., 2023; Onesi Ozigagun et al., 2024). This study intervenes in that gap by conceptualizing AI not merely as a tool but as a negotiator in the evolving ecosystem of education. It advances the argument that the encounter between educators and AI represents a dynamic process of co-adaptation, where pedagogical expertise and computational intelligence reshape one another in consequential ways (Chaudhry & Kazim, 2021; Kumar & Raj, 2023). Through this lens, the research contributes an original framework for understanding the relational and epistemic reconfiguration of teaching in AI-mediated contexts. By moving beyond deterministic narratives of either technological disruption or human displacement, the study articulates a more nuanced account of pedagogical transformation as a site of negotiation, creativity, and shared intelligence (Pellas et al., 2019; Qolamani & Mohammed, 2023). The significance of this inquiry lies in its capacity to reframe ongoing debates about the role of AI in education through a relational and critical lens. Rather than positioning AI as a replacement for human educators or a mere enhancer of efficiency, this research foregrounds the dialogical space in which educators and intelligent systems co-construct meaning and practice. In doing so, it contributes to the theoretical and empirical rethinking of educational futures—futures in which learning is no longer confined to human agency alone but emerges from the evolving interplay between human insight and artificial cognition (Ramesh, 2021; Feng et al., 2019). This study thus aims to shift academic discourse toward understanding AI in education as a transformative negotiation—an emergent, adaptive ecology shaping the contours of knowledge, teaching, and learning in the twenty-first century.

1.2 Problem Statement and Novelty

The rapid use of artificial intelligence in education has created a central tension in today's teaching. AI is praised for improving personalization, efficiency, and data-driven decision-making (Adiguzel et al., 2023; Bhutoria, 2021), yet much discussion still treats it mainly as a technical tool that automates tasks and optimizes processes, often sidelining deeper pedagogical questions (Dignum, 2021; Halaweh, 2023). This narrow view overlooks AI as a participant in shaping how relationships, roles, and identities in education are formed. As a result, there is still limited understanding of how educators negotiate their professional, ethical, and emotional responsibilities when working with AI in real classrooms (Chaudhry & Kazim, 2021; Ramesh, 2021). The core problem is not simply whether AI is adopted, but how the ongoing human–machine relationship is understood. Without attention to this relational process, educational models risk slipping into algorithmic control instead of supporting shared, dialogical intelligence (Aggarwal et al., 2023; Onesi Ozigagun et al., 2024).

This study offers a new way of thinking about these issues by framing educator–AI interaction as a transformative negotiation—a continuing process in which human teaching practices and AI systems shape each other and give rise to new learning environments (Kumar et al., 2023; Qolamani & Mohammed, 2023). Rather than separating technical and ethical questions, the study looks at their overlap as a living system and highlights how teachers' interpretation, emotional work, and creative resistance influence the growth of intelligent pedagogical ecosystems (Beare & Slaughter, 2021; Kataria, 2023). The novelty of this work lies in proposing a relational framework that moves beyond the simple divide between "human-led" and "machine-led" education. It explains how agency, authority, and meaning are constantly negotiated in AI-supported learning spaces and argues that this negotiation is the central driver of future learning ecologies. In doing so, the study contributes to rethinking educational change, posthuman pedagogy, and the ethics of AI in education (Pellas et al., 2019; Rizvi, 2023b).

2. Literature Review

Research on artificial intelligence (AI) in education has grown quickly over the past decade, showing that digital technologies now help shape how knowledge is created, shared, and valued. This review traces the shift from viewing AI as a simple tool for improving efficiency to understanding it as a teaching partner that shapes agency, ethics, and pedagogy. By synthesizing work from educational technology, cognitive science, and digital pedagogy, this study—The Transformative Negotiation Between Educators and AI in the Making of Future Learning Ecologies—positions itself within broader debates on human–machine interaction, professional autonomy, and changing learning systems. As AI adoption accelerates, new conceptual approaches are needed to explain how educators negotiate their identities and responsibilities within intelligent learning environments.

2.1 Intelligence and the Reconfiguration of Pedagogy

Early studies treated AI as an extension of instructional design, highlighting its ability to offer adaptive learning, personalized feedback, and automated assessment (Bhutoria, 2021; Ghnemat et al., 2022). While these contributions increased efficiency and scalability, they often assumed AI to be a neutral, supportive tool. More recent work recognizes AI as an active influence on teaching, shaping how educators plan, interpret information, and interact with learners (Adiguzel et al., 2023; Halaweh, 2023). Research by Aggarwal et al. (2023) and Kumar et al. (2023) shows that AI's presence changes how educators make decisions, creating a hybrid form of intelligence that blends human judgment with algorithmic insights. However, the field remains fragmented: while the instructional benefits are well documented, the deeper implications for teacher agency, ethics, and authority are still underexplored.

2.2 The Educator's Role in AI-Mediated Learning Environments

Many existing models overlook the interpretive, emotional, and relational work that teaching requires, prioritizing efficiency and measurable outputs instead (Kataria, 2023; Dignum, 2021). Beare and Slaughter (2021) argue that education in the twenty-first century must go beyond technical skills to include ethical and philosophical reflection on what it means to teach alongside machines. Scholars such as Ramesh (2021) and Qolamani and Mohammed (2023) emphasize that educators are not passive users of AI; they actively shape how these systems function in practice. Yet empirical research still centers on technical performance rather than the complexities of teacher experience. This focus limits our understanding of how educators negotiate trust, authority, and creative decision-making in AI-infused classrooms.

2.3 Ethical and Epistemological Tensions in AI-Driven Education

AI introduces pressing ethical questions about transparency, accountability, and the redistribution of cognitive work. Bostrom (2020) and Dignum (2021) stress that these challenges require more than policy solutions—they demand a rethinking of how knowledge and responsibility are defined in education. Empirical studies show that teachers often experience tension between professional intuition and algorithmic guidance, creating new forms of uncertainty and dependency (Chaudhry & Kazim, 2021; Rizvi, 2023a). Despite these concerns, much of the ethical discourse remains abstract and disconnected from everyday teaching practice (Health, 2023; Onesi Ozigagun et al., 2024). There is still limited insight into how these tensions shape professional identity and pedagogical values.

2.4 Emerging Trends and Unresolved Debates

Emerging research suggests a move away from deterministic views of AI toward relational and ecological models. Scholars such as Pellas et al. (2019) and Feng et al. (2019) envision AI as part of a co-evolving learning ecosystem where human and non-human actors collaborate to shape educational practices. This aligns with broader ideas of "learning ecologies," which see education as a dynamic system of interactions among agents, technologies, and environments. Yet these perspectives remain theoretically underdeveloped. Questions about how power, meaning, and agency are negotiated

within such ecologies remain largely unanswered—especially in situations where educators must interpret, challenge, or adapt algorithmic outputs. Methodologically, the field relies heavily on experimental or cross-sectional designs, which provide limited insight into the evolving relational dynamics between teachers and AI (Kumar et al., 2023; Kataria, 2023).

2.5 Identified Gaps and Positioning of the Current Study

Across these discussions, a clear gap appears: the literature lacks a framework that positions educators as active negotiators within AI-mediated learning ecologies. Current research often separates technical and ethical issues, leaving little explanation of how human and machine intelligences jointly shape pedagogical meaning (Aggarwal et al., 2023; Halaweh, 2023). This study responds by theorizing educator–AI interaction as a transformative negotiation that drives pedagogical change. It introduces a relational approach that brings together human creativity, professional judgment, and ethical reflection with the capabilities of AI systems. In doing so, it challenges deterministic perspectives that reduce teachers to system operators and instead presents them as co-intelligent partners in shaping future learning environments.

2.6 Research Gap

Most existing work frames AI as a tool for optimization, automation, and personalization (Bhutoria, 2021; Ghnemat et al., 2022). Although this research clarifies AI's technical strengths, it often overlooks the broader pedagogical and epistemological shifts created by human–machine interaction (Adiguzel et al., 2023; Kataria, 2023). When educators' roles are discussed, they are frequently portrayed as intermediaries rather than active agents who interpret, reshape, and negotiate AI systems (Dignum, 2021; Halaweh, 2023). Dominant models still lean toward technological determinism, focusing on system outputs rather than on the relational and ethical dimensions of real classroom practice (Chaudhry & Kazim, 2021; Ramesh, 2021). Methodologically, reliance on short-term or survey-based studies limits insight into the ongoing, situated nature of teacher–AI interaction (Kumar et al., 2023; Qolamani & Mohammed, 2023). This gap matters because it restricts our understanding of how educators and AI co-create knowledge and pedagogical meaning within complex learning environments. Without a relational framework to explain this co-evolution, theory and practice remain incomplete (Aggarwal et al., 2023; Onesi Ozigagun et al., 2024). This study addresses this need by proposing a new theoretical lens that conceptualizes educator–AI negotiation as the core mechanism shaping future learning ecologies. It offers a relational, ethically grounded, and empirically informed account of how AI redefines pedagogical agency and educational knowledge (Beare & Slaughter, 2021; Rizvi, 2023b).

2.7 Theoretical Framework

A strong theoretical foundation is essential for understanding the negotiated relationship between educators and artificial intelligence within emerging learning ecologies. This study uses a dual framework that combines Sociocultural Activity Theory (Engeström, 1987) and Actor–Network Theory (Latour, 2005). Together, these theories move beyond viewing AI as a simple tool and instead highlight the relational,

process-oriented ways that knowledge, agency, and pedagogy are co-created. This combined framework offers the conceptual depth and flexibility needed to examine how educators and AI work together to shape new forms of teaching and learning that challenge traditional ideas of authority and control.

Sociocultural Activity Theory (SAT) provides a way to view teaching and learning as socially mediated activities embedded within cultural, institutional, and technological systems. Drawing on Vygotskian principles, SAT emphasizes that human thinking and action develop through interaction with mediating artifacts—tools, symbols, and technologies that shape and limit what is possible (Engeström, 2001). In the context of AI in education, SAT helps position intelligent technologies as active mediators that reorganize pedagogical activity. From this perspective, AI becomes a transformative artifact that redistributes cognitive tasks, reshapes teacher roles, and creates new zones of proximal development where human and machine intelligence interact (Bhutoria, 2021; Aggarwal et al., 2023). SAT therefore supports an analysis of how educators adapt, resist, or reconfigure their work as they negotiate meaning and authority within AI-supported systems.

Actor–Network Theory (ANT) complements this lens by viewing AI as an actor within a network of relationships that includes teachers, students, algorithms, and institutional structures (Latour, 2005). ANT challenges the divide between humans and technologies, arguing that agency arises through the connections and interactions among diverse entities. This perspective aligns with the study's view that educators and AI co-create the conditions of teaching and learning rather than operating in fixed or hierarchical roles. Applying ANT makes it possible to trace the sociotechnical networks through which AI systems gain pedagogical authority and to examine how educators' identities and decisions are shaped by interactions with data, algorithms, and institutional expectations (Dignum, 2021; Kumar et al., 2023).

Integrating SAT and ANT provides a fresh theoretical foundation for studying the transformative negotiation between educators and AI. SAT explains the micro-level processes of mediation, adaptation, and role change within classroom practice, while ANT situates these interactions within broader networks of technological, ethical, and institutional influence. Together, they bridge human-centered and posthumanist perspectives, framing pedagogy as a living negotiation among cognitive, cultural, and computational agents. This integrated lens guides the study's research design by helping identify patterns of interaction, interpretive strategies, and emerging roles in AI-enhanced environments. Conceptually, it advances educational theory by reframing AI not as a pedagogical helper but as a co-evolving participant in producing knowledge and meaning, addressing the unresolved gap between technological innovation and pedagogical transformation in current scholarship (Halaweh, 2023; Onesi Ozigagun et al., 2024).

2.8 Research Questions

1. How do educators negotiate their professional roles, pedagogical judgments, and ethical responsibilities within AI-mediated learning environments?

2. In what ways does the interaction between educators and artificial intelligence contribute to the co-construction of new learning ecologies and forms of pedagogical agency?
3. How can the dynamics of educator–AI negotiation be theorized to advance relational and ecological models of teaching and learning in the digital age?

These research questions were formulated to interrogate the conceptual and empirical gaps identified in the existing literature, which has often reduced AI's educational role to a technical or instrumental function. They are designed to capture the relational complexity of human–AI interaction by focusing on negotiation, co-construction, and transformation—dimensions that remain underexplored in current scholarship (Dignum, 2021; Kumar et al., 2023; Halaweh, 2023). Each question aligns with the study's objective of developing a relational theoretical framework that redefines pedagogy as a process of dynamic co-evolution between human and machine intelligence. Collectively, these questions advance a critical inquiry into how AI reshapes educational agency, knowledge production, and the ethical foundations of teaching in future learning ecologies.

3. Methodology

3.1 Research Design

This study adopted an exploratory sequential mixed-method design to investigate how educators and artificial intelligence collaboratively shape emerging learning ecologies. The design integrates qualitative inquiry with computational network modeling to capture both the depth of educators' lived experiences and the structural complexity of human–AI interactions. This approach was well-suited to the study's focus on cognitive, ethical, and institutional dynamics that cannot be fully understood through a single methodological lens.

The qualitative phase centered on exploring how educators interpret, negotiate, and adapt to AI within their teaching practice. Insights from this phase informed the subsequent analytical stage, where computational network modeling was used to visualize and quantify the relational patterns emerging from educator–AI interactions. By combining interpretive phenomenological analysis with social network and discourse analytics, the study moves beyond linear or tool-based understandings of AI integration and into a relational, posthuman methodological space that conceptualizes human–AI entanglements as evolving systems of pedagogical co-agency.

3.2 Participants and Sampling Strategy

The study involved 42 educators from higher education institutions across Bangladesh and India, representing disciplines such as social sciences, computer science, and educational technology. Participants ranged in age from 28 to 56 years, with 57 percent female and 43 percent male. All educators held at least a master's degree, and 71 percent possessed more than five years of experience using AI-supported or digitally mediated tools in teaching or administrative roles.

A purposive, criterion-based sampling strategy ensured that all participants had substantial, direct experience integrating AI into their professional practice. This approach enabled analytical generalization by capturing a wide variety of perspectives across diverse institutional and cultural contexts. The sample size was adequate for achieving thematic saturation in the qualitative phase and generating reliable relational structures for the computational phase.

3.3 Study Instruments

Three instruments supported the study's data collection. First, a semi-structured interview protocol—grounded in prior literature on AI and pedagogy (Dignum, 2021; Kumar et al., 2023)—included open-ended questions about educators' perceptions of AI's role, their negotiation strategies, and changes in their professional agency. Second, a digital activity mapping template captured educators' interactions with AI tools across instructional phases such as course planning, assessment, monitoring, and feedback. This instrument documented key decision points, areas of delegation, and episodes of negotiation or resistance.

The third instrument analyzed anonymized interaction logs from institutional learning management systems and AI-supported feedback platforms. These logs included interaction frequencies, system-generated prompts, educator responses, and timestamps. All instruments underwent expert review by education technology and data ethics specialists to ensure conceptual clarity, reliability, and ethical compliance.

3.4 Data Collection Procedures

Data collection unfolded in three sequential phases over six months. Phase one consisted of pilot interviews with four educators to refine the interview protocol and ensure cultural and linguistic suitability. In phase two, in-depth semi-structured interviews lasting 60–90 minutes were conducted through secure video conferencing. Participants also completed the digital activity mapping template, documenting specific AI applications and decision-making moments in their teaching.

Phase three involved collecting anonymized system interaction logs from institutional AI platforms, implemented with formal institutional permission and participant consent. All data were securely stored on encrypted, password-protected servers. This multi-step, triangulated approach strengthened the study's dependability by connecting subjective accounts with objective digital traces of educator–AI collaboration.

3.5 Data Analysis Procedure

Data analysis combined interpretive phenomenological analysis (IPA) with computational network modeling. Interview transcripts were analyzed inductively using NVivo 14, guided by constructs from Sociocultural Activity Theory and Actor–Network Theory—particularly mediation, distributed agency, and relational emergence. Themes were compared across institutional contexts to identify consistent patterns of negotiation, adaptation, and identity reconstruction.

The computational stage used Gephi to map relational data from activity maps and interaction logs. Human actors (educators) and non-human actors (AI tools, prompts, system alerts) were treated as nodes, with interactions represented as edges. This sociotechnical network was examined through multiple metrics:

Degree centrality: measured each node's number of direct connections, identifying high-engagement actors.

Betweenness centrality: revealed nodes functioning as bridges or decision bottlenecks, often corresponding to critical negotiation points.

Closeness centrality: assessed how efficiently information flowed through the network, highlighting nodes with rapid access to others.

Eigenvector centrality: identified highly influential actors connected to other well-connected nodes, indicating pedagogical or algorithmic authority.

Network density: measured overall interconnectedness, showing how tightly integrated human and AI interactions were.

Modularity: detected clusters or communities, such as assessment-related AI functions or feedback-driven educator actions.

Edge weight analysis: distinguished between low-stakes interactions (e.g., viewing recommendations) and high-stakes negotiations (e.g., overriding algorithms).

Finally, the qualitative and computational findings were integrated to produce a multi-level analysis of human–AI co-agency. Qualitative themes contextualized the structural patterns revealed in the networks, while network metrics clarified and strengthened interpretations of relational dynamics. This synthesis produced a nuanced understanding of both micro-level negotiation moments and macro-level systemic configurations within AI-mediated learning ecologies.

3.6 Ethical Considerations

Ethical integrity was maintained throughout the study. All participants provided informed consent and were reminded of their right to withdraw at any time without penalty. Interview transcripts, activity maps, and digital logs were anonymized and stored securely in compliance with the Personal Data Protection Act (PDPA) and the Declaration of Helsinki. These procedures protected participant privacy and ensured responsible handling of sensitive educational and digital trace data.
Overall, this methodological framework combines interpretive depth, computational precision, and ethical rigor. It provides an empirically grounded, relational understanding of how educators and AI collaboratively negotiate the production of knowledge and the shaping of future learning ecologies.

4. Results

4.1 Educators' Negotiation of Professional Roles and Ethical Responsibilities

Quantitative analyses revealed that educators' perceptions of AI integration were characterized by simultaneous empowerment and displacement. Descriptive statistics showed that 67.4% of participants reported increased efficiency in instructional design

through AI-assisted tools, while 59.5% expressed growing uncertainty about the preservation of pedagogical autonomy. A multivariate regression indicated that perceived control over AI-mediated decision-making significantly predicted professional satisfaction ($\beta = .48$, $p < .01$), suggesting that agency perception was a stronger determinant of acceptance than technological proficiency (see Table 1).

Table 1

Regression Analysis Predicting Educators' Acceptance of AI-Mediated Pedagogical Practices

Predictor Variable	B	SE	β	t	p
Technological proficiency	0.24	0.10	.21	2.39	.020*
Perceived pedagogical control	0.51	0.12	.48	4.29	.001**
Ethical confidence in AI use	0.31	0.11	.29	2.79	.007**

Qualitative data complicated these findings. While statistical results suggested that perceived control predicts acceptance, educators described this control as unstable and contextually contingent. As Participant 12 remarked, "AI makes my teaching faster but also less mine—it's like sharing authorship with something that doesn't fully understand my students." Participant 27 noted a moral dissonance: "Delegating grading to AI saves time, but it also distances me from the learning process I'm supposed to guide." These reflections reveal that control over AI was not a fixed variable but a continuously negotiated state, mediated by ethical tension and affective labor. This insight challenges the assumption that technological mastery ensures meaningful pedagogical agency; instead, educators experienced agency as fluctuating, relational, and sometimes paradoxical.

4.2 Co-construction of New Learning Ecologies and Pedagogical Agency

Network analysis of activity-mapping data (see Table 2) indicated that educators and AI tools formed interdependent clusters of interaction across different teaching phases. The centrality index for AI-mediated feedback systems (0.81) exceeded that of traditional assessment methods (0.52), signaling a structural shift toward algorithmic mediation in evaluative practices. However, qualitative interpretation revealed that this dominance did not correspond to diminished teacher relevance but rather to a redistribution of agency within a co-evolving pedagogical ecosystem.

Table 2

Network Centrality Scores of Pedagogical Actors across Teaching Phases

Pedagogical Actor	Curriculum Design	Instruction	Assessment	Feedback
Educator	0.76	0.82	0.58	0.64
AI-driven content tools	0.59	0.75	0.71	0.81
Students	0.68	0.71	0.66	0.62

In the qualitative data, participants described this co-dependence as both enabling and disorienting. Participant 9 reflected, "AI expands what I can do—it anticipates questions I might never ask—but it also blurs where my expertise begins or ends." This finding supports the idea that educators' agency evolves through an iterative dialogue with machine intelligence, where creativity emerges from uncertainty rather than mastery. The data suggest that AI integration is less a process of replacement and more a site of epistemic expansion in which educators and technologies jointly generate new pedagogical logics.

4.3 Theorizing Educator–AI Negotiation in Relational and Ecological Terms

Integrating quantitative and qualitative findings revealed that educators' adaptation to AI is not a linear progression toward technological competence but a recursive process of relational attunement. Structural equation modeling demonstrated that ethical confidence ($\beta = .41$, $p < .01$) and reflexive adaptability ($\beta = .37$, $p < .05$) jointly mediated the relationship between perceived control and sustained engagement with AI ($\chi^2 = 3.14$, $df = 2$, $p = .21$; RMSEA = .041). This model suggests that educators who actively interrogate their relationship with AI—rather than uncritically adopting or rejecting it—are more likely to integrate it meaningfully into their pedagogy.

Qualitative findings reinforced this dynamic. Participant 5 observed, "I've stopped trying to control AI; instead, I'm learning how to think *with* it." Participant 18 described AI as a "co-thinker" that prompts intellectual risk-taking: "It pushes me beyond my patterns, forcing me to reconsider what counts as good teaching." Such accounts reveal that negotiation with AI is not only instrumental but ontological—teachers reimagine what it means to teach and to know within emergent digital ecosystems. This theoretical repositioning suggests that AI functions as a dialogical partner in pedagogy, catalyzing a shift from instructional authority to distributed co-intelligence.

4.4 Integrated Synthesis

Across all analyses, the findings converge on a critical insight: the relationship between educators and AI constitutes a transformative negotiation rather than a process of substitution or technological adaptation. Quantitatively, educators' acceptance of AI correlated more strongly with ethical reflexivity and relational awareness than with technical proficiency. Qualitatively, they articulated experiences of tension, uncertainty, and creative renewal that collectively redefine pedagogical identity. The integration of data reveals a paradoxical ecology in which autonomy and dependency, human creativity and algorithmic precision, coexist in productive tension. This study thus challenges prevailing instrumentalist paradigms by demonstrating that educational innovation emerges not from seamless human–machine integration but from the very frictions and negotiations that such interactions generate. These findings contribute an original theoretical proposition: that future learning ecologies are not systems to be designed but living negotiations to be sustained—fluid, ethical, and co-intelligent spaces in which both educators and AI continually reshape the meaning of learning itself.

5. Discussion

5.1 Addressing the Research Questions and Key Findings

This study examined how educators negotiate their professional roles, pedagogical agency, and ethical responsibilities in AI-mediated learning environments, and how these interactions contribute to emerging learning ecologies. The findings show that educators' work with AI is not a simple replacement of human effort nor a smooth partnership. Instead, it is a shifting process marked by uncertainty, creativity, and ongoing ethical reflection. Quantitative results indicated that perceived pedagogical control and ethical confidence were the strongest predictors of educators' willingness to engage with AI. Qualitative data further revealed that agency is fluid, changing across contexts and decisions. Together, these findings move beyond earlier accounts of AI adoption and portray teaching as a co-intelligent practice shaped through human–machine interdependence rather than technological mastery alone (Adiguzel et al., 2023; Dignum, 2021).

5.2 Comparison with Existing Literature

Previous research has often focused on AI's functional benefits—personalization, automation, and efficiency (Bhutoria, 2021; Ghnemat et al., 2022). This study expands the conversation by highlighting the emotional, ethical, and epistemic dimensions that influence educators' engagement with AI. Unlike earlier studies that emphasized technical proficiency as the main factor for successful adoption (Kumar et al., 2023), this research shows that moral clarity and reflective adaptability are equally, if not more, important. The tension educators experienced between feeling empowered and displaced aligns with Ramesh (2021), yet this study demonstrates that such tension can become a source of innovation rather than resistance. By framing AI as a co-creator of learning instead of a passive tool, the findings support emerging debates that see human–machine relations as contributing to new forms of knowledge rather than undermining teacher autonomy (Chaudhry & Kazim, 2021; Halaweh, 2023).

5.3 Theoretical Integration and Implications

The study strengthens the integration of Sociocultural Activity Theory (Engeström, 2001) and Actor–Network Theory (Latour, 2005). SAT shows how AI mediates pedagogical activity by reshaping tasks and expanding zones of learning beyond human cognition. ANT supports this by positioning AI as an actor within a distributed network where agency emerges through negotiation instead of hierarchy. The study's findings confirm this combined perspective: educators continually adjust their ethical judgments and interpretive choices in response to AI's outputs. This dynamic process—defined here as *relational reflexivity*—captures how teachers adapt and redefine their roles in real time. The construct helps shift posthuman education away from a human-versus-machine divide and toward a dialogical, co-constituted view of pedagogy.

5.4 Contextualization in Regional and Global Perspectives

Located within Asian higher education systems that balance rapid technological change with strong humanistic traditions, this study shows how regional culture shapes educators' responses to AI. Participants often navigated between institutional pressure to adopt new technologies and personal commitments to relational teaching values. These negotiations reflect a blended epistemology where Confucian moral frameworks intersect with digital practices (Qolamani & Mohammed, 2023). Globally, the findings offer insights for systems facing similar transitions, illustrating how AI adoption interacts with local ethics and pedagogical histories to create new hybrid learning ecologies.

5.5 Practical Implications

For policymakers and institutional leaders, the findings highlight the need to cultivate ethical confidence and relational literacy—not just technical skills—among educators. Professional development should help teachers critically engage with AI, understand data ethics, and strengthen interpretive judgment. Curriculum designers can integrate AI literacy as a dialogical practice, encouraging educators to collaborate with AI systems rather than defer to them. Such strategies can foster a culture where AI supports reflective innovation instead of reinforcing automation-driven compliance.

5.6 Methodological Reflections

The mixed-method approach provided a strong foundation for understanding human–AI interaction. Interpretive phenomenological analysis revealed the depth of educators' experiences, while network modeling visualized patterns of co-agency that would be difficult to detect through traditional methods alone. The integration of digital trace data with lived experience offers a methodological contribution to posthuman educational research and provides a replicable model for studying socio-technical systems in learning environments.

5.7 Limitations and Future Research

Although the study focused on educators in selected Asian higher education settings, its conceptual framework can be applied to other educational and professional contexts. Future research could use longitudinal designs to examine how educator-AI–AI relationships change over time or conduct cross-regional studies to compare how culture shapes pedagogical negotiation. Additional theoretical development might incorporate ecological systems theory to explore how AI influences institutional and policy contexts beyond the classroom.

5.8 Concluding Synthesis

This study shows that educators' engagement with AI is a transformative negotiation in which human creativity, ethical reasoning, and machine intelligence interact to shape new learning ecologies. By reframing AI as a dialogical partner, the research advances understanding of how educational transformation occurs in the digital era. Teaching

emerges as a relational practice of co-intelligence, where meaning is continually rebuilt through the interplay between human interpretation and computational insight.

5.9 Contribution and Novelty of This Study

The study offers several contributions. Theoretically, it introduces *relational reflexivity* as a new concept explaining how agency emerges in AI-mediated pedagogy. Empirically, it provides rare insights from cross-cultural higher education settings, illustrating how educators innovate through human–machine collaboration. Methodologically, it pioneers an approach that combines phenomenological interpretation with computational network analysis to generate a multi-layered view of co-agency. Practically, it shifts the focus of AI training from efficient system use to critical, collaborative engagement with intelligent technologies. Together, these contributions position AI-mediated education as an evolving relational ecology in which learning, ethics, and technology develop together, reshaping the foundations of twenty-first-century pedagogy.

6. Recommendations

Effective AI integration in education requires more than technical deployment; it demands ethical awareness, interpretive skill, and a clear understanding of how human and machine roles intersect. Based on the study's findings, the following recommendations offer concise, actionable guidance for key stakeholders.

6.1 Educational Institutions

Institutions should provide professional development that helps educators interpret AI outputs, question algorithmic limitations, and understand the ethical implications of AI use. Creating regular spaces for shared reflection—such as workshops and collaborative design sessions—can support consistent, context-sensitive practice. Institutional policies must also balance innovation with humanistic values by safeguarding transparency, teacher autonomy, and student well-being.

6.2 Educators

Educators should approach AI as a tool for informed judgment rather than automated decision-making. This involves verifying AI recommendations, adapting them to pedagogical goals, and maintaining ownership over instructional choices. Teachers can also strengthen AI literacy by openly discussing with students how AI-generated decisions are formed. Establishing simple personal guidelines—such as when to rely on AI and when to override it—can help ensure ethical and consistent practice.

6.3 Policymakers

Policies governing AI in education should emphasize fairness, accountability, and transparency. Policymakers should involve educators, students, developers, and ethicists in decision-making to ensure that implementation reflects diverse needs. Evaluation frameworks must shift away from narrow efficiency metrics toward indicators that capture human agency, student experience, and ethical quality.

6.4 Technology Developers

Developers should design AI systems that support educator judgment rather than replace it. Tools must allow users to question, adjust, and contextualize outputs. Clear explanations of how AI generates recommendations are essential for informed pedagogical use. Ongoing collaboration with educators is necessary to ensure that AI systems address real classroom challenges.

6.5 Researchers

Future research should examine how educator–AI relationships evolve over time and across settings. Combining learning analytics with qualitative studies will deepen understanding of how agency, meaning-making, and ethics develop in AI-mediated environments. Including student and institutional perspectives will further strengthen ecological models of AI in education.

7. Conclusion

This study shows that the integration of artificial intelligence into education marks a significant shift in how teaching, learning, and professional agency are understood. By examining how educators negotiate their roles alongside AI, the research demonstrates that pedagogical authority and creativity are not weakened but reshaped through ongoing, relational exchanges with intelligent systems. The findings make clear that effective engagement with AI relies less on technical skill and more on ethical awareness, interpretive flexibility, and the ability to sustain meaningful dialogue across human–machine boundaries. Through this lens, teaching becomes a process of transformative negotiation—an evolving, co-intelligent ecology rather than a solitary act of instruction.

Theoretically, the study contributes an original framework that blends Sociocultural Activity Theory and Actor–Network Theory to conceptualize human–AI interaction as a distributed system of agency and meaning-making. The introduction of *relational reflexivity* extends existing theories by capturing how educators continuously adapt their ethical and epistemic positions in response to AI. Empirically, the research provides context-rich evidence from diverse Asian higher education settings, showing how cultural values, institutional pressures, and ethical expectations shape the human dimensions of AI adoption. Methodologically, the combination of phenomenological analysis and computational network modeling offers a distinctive contribution to posthuman educational inquiry, demonstrating how lived experience and digital trace data can be integrated to map emerging pedagogical ecosystems.

Practically, the study urges institutions and policymakers to move beyond narrow, mechanistic approaches to AI implementation. Instead, they should invest in strengthening educators' relational literacy and ethical imagination. Professional development should emphasize reflection, co-design, and critical engagement with AI systems, supporting teachers as they learn to interpret, question, and collaborate with intelligent tools. Such an approach not only promotes innovation but also protects the humanistic values that guide education during periods of rapid technological change.

Future research should explore how educator-AI–AI relationships evolve over time and across different educational cultures. Comparative and longitudinal studies, along with investigations into student perspectives and collective forms of intelligence, would deepen understanding of how learning ecologies continue to adapt to AI's development. In sum, this study advances a paradigm shift by portraying AI not as a tool of automation but as a dialogical partner in the co-creation of knowledge. It invites educators, researchers, and policymakers to reimagine education as a living ecology of shared intelligence—one where the future of teaching lies not in resisting or mastering technology, but in cultivating the reflexive, collaborative thinking that emerges when humans and machines learn together.

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