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Constructing a Human-Centric Creativity Framework for Teacher Role Transformation under AI

Yujia Yang[1*]

[1]College of Music, Luoyang Normal University, Luoyang, China

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***Corresponding Author:**

Yujia Yang

E-mail:

yangyujia1987@126.com

Abstract: This study focuses on the crisis and reconstruction mechanism of teacher creativity in AI deepened educational context, and constructs human centric creativity (HCC) theoretical framework. Using grounded theory, the study collected an individual interviews, a focus-group interviews, and classroom observation from 18 primary and secondary school teachers with experiences in AI supported instruction and went through open coding, axial coding, and selective coding to obtain four fundamental attributes: real time judgment, a human centered connection, interdisciplinary integration, and technological ethical reflection. The results indicate that teacher creativity in AI empowered contexts manifest as simultaneously practical, personalized, reflective, and systemically implanted, which not only focuses on acute classroom responsiveness, immediate agency and responsiveness, merges emotional connection between teachers and students and interdisciplinary creativity with deep reflection on technology and societal values. The resultant HCC structure presents practicable paths for teacher professional growth and offers immediate implications for teacher training programs, school system reform on curriculum, and AI education policymaking. Future research may want to confirm this model in different

cultural contexts, verify the model with quantitative data through scale development for dimensions of each type of competencies and structural effectiveness in prediction, and include students' perspective to improve these educational ecosystem analysis frameworks.

Keywords: human centric creativity; AI enhanced education; teacher creativity; interdisciplinary integration; technological ethical reflection

1. INTRODUCTION

AI applications are increasingly infiltrating the education domain, leading to an intelligent change of teaching and resource distribution. But this algorithm-induced change is also inexorably veering educational activities toward standardized and proceduralized form, making it impossible for education to play its role of wakening life and giving breath to creativity (Lin & Chen, 2024).

This trend has given rise to an increasing phenomenon of 'creativity domestication.' AI tends to convert the blurred, accidental, and unpredictable elements of human experience into probabilistically optimal solutions, subtly guiding learning activities toward homogenization and patterning (Imran & Almusharraf, 2024). Superficially, teachers may appear to gain powerful content-generation capabilities, yet algorithmically driven content convergence is persistently eroding originality and diversity (Yan et al., 2023). More concerningly, AI systems define creativity in highly mechanical and singular terms, overlooking the humanistic dimensions of the creative process. This technological logic exerts deep-seated technological-colonial pressure on educational agency and poses a threat to the human-centered essence of education (Nazaretsky et al., 2022).

Within this new educational ecosystem, teachers' roles are undergoing an unprecedented transformation. On one hand, as AI users, teachers need to master technology to enhance instructional efficiency and align with the trend of educational intelligence; on the other hand, they must assume the role of 'guardians of creativity,' staying vigilant against algorithms that may erode cognitive diversity and the creative

life force (Chan & Tsi, 2023). This dual identity places teachers in a continual tension between efficiency and depth, between tool dependence and creative agency, engendering a novel form of professional dilemma (Xia et al., 2022).

However, current educational theory lacks an effective framework to guide teachers in preserving the essence of creativity and fostering meaningful educational innovation in contexts where AI is involved (Gaggioli et al., 2025). Thus, this study posits a Human-Centric Creativity (HCC) theoretical outline, and highlights two stages for teachers in the AI era. Intended to offer new mindsets and praxeological paths for educators willing to reclaim their educational agency in AI-based settings, and thus to foster students' divergent thinking, and their ability to be inventive.

Research Questions: (1) What specific challenges do teachers face in safeguarding creativity and constructing agency within AI-enhanced educational environments? (2) How should the concept of Human-Centric Creativity (HCC) be defined, and what are its theoretical framework and core components? (3) Based on the HCC framework, how can we design practical pathways that empower teachers to achieve educational innovation while preserving diversity?

2. LITERATURE REVIEW

2.1 The Efficiency Paradox of Educational Digitalization and the Crisis in Creativity

The AI-led educational models have created a systemic crisis for educational creativity. More directly, it's evident in three principle forms, under the aegis of cognitive homogenization, intellectual passivity, and the estrangement of innovation mechanisms (Ottenbreit-Leftwich et al., 2023).

First, AI activates the dangers of teachers' cognitive homogenization (Kim, 2024). The AI-generated educational resources and instructional designs are largely based on big data and algorithmic reasoning, thereby standardizing educational resources and curricula (Doshi & Hauser, 2024). In several of the education tools, AI is fed previous teaching data and it does its best to find patterns and optimize, culminating in one-size fits all, clipart resources that tend to look rather generic (Chiu etal.,2024). For instance, GPT-like language models can generate fluent teaching texts and lesson plans, but those outputs can be based on existing templates and routines, failing to provide unique

innovation and novelty (Creely & Blannin, 2025). The AI-assisted "creation" does not just impact teachers' pedagogical design but negatively affects classroom diversity and personalization hindering teachers' creativity (Celik etal.,2022). ' As educators continue to turn to AI tools, they may begin to lose this kind of room for independent thought and independent creation, moving instead into patterned and predictable modes of thought.

Second, AI technology might even create cognitive inertia in teachers. With the rise of AI in Education, educators gradually become more reliant on technology tools for course design and classroom management, and dependence slowly turns into a habit. Such a trend may cause urban teachers to prefer AI-provided standard solutions in the face of pedagogical problems, rather than initiating autonomous innovation and thinking on their own (Celik et al., 2022). It has been found that users overly relying on intelligent tools are inclined to show limited engagement in active interactions and initiative innovative thinking in complex tasks (Liu & Zhang, 2019). This inertia of intelligence, on the one hand affects the teaching methods and reduces the teachers' capability to respond to educational reform and challenging. Such overdependence on AI may hinder educators' flexibility and creativity to manoeuvre in the complex educational landscape, which could stifle educational innovation (Whalen and Mouza, 2023).

In addition, the influence of AI on the forces for reformation in education must not be underestimated. Whilst AI can use data scientists to offer effective solutions, often though established data sets and algorithms – it's not the disruptive thinking that we now need to effectively break the mould (Rizvi et al, 2023) (to innovate with) that goes beyond paradigms (to think and change "outside the box"). For example, AI-based aids for learning such as intelligent assessment systems are capable of providing fast evaluation of progress of the students, but their evaluation optics and feedback standards are often limited directly by historical pedagogical models and structures of knowledge, rather than fostering a fresh vision for innovation in teaching content and methods which is pedagogical (Saputra et al., 2024). Research has indicated that innovation based on AI usually builds on the existing knowledge in that it does not base itself on the creative and hypothesis forming of new theories or practices (Bulut et al., 2024). This innovation through technology approach may result in teachers taking on

a more passive role in their pedagogical innovation through technology, which could negatively affect the variety and creativity of educational models.

2.2 The Rupture and Reconstruction of Teacher Roles

The widespread use of AI has changed the traditional role for teachers in a big way. In traditional schools, the role of the teacher has been that of knowledge dispenser and classroom manager, with the creative talent of teachers coming out in the creation of curriculum and novel teaching techniques (van Dusen & Otero, 2012). But AI is changing the situation and many routine tasks associated with teaching, such as planning, grading, and the development of personalized learning pathways, are being replaced with AI tools (Mulaudzi & Hamilton, 2025). AI is capable of automating these activities by the use of big data analytics and machine learning algorithms so as to minimize teacher's intervention in instruction designing and providing feedback. While such an influence enhances the effectiveness of education, it imposes a limitation on the creative freedom of teachers. This constraint is especially conspicuous during the creation and evaluation of content, where the ability of teachers to independently innovate is stifled and steadily exchanged with the automated features of tools (Owoc et al., 2021).

Moreover, the transformation of teachers into "learning designers" requires a fundamental redefinition of their educational mission. In this new role, teachers are no longer mere transmitters of knowledge; they must act as designers and supervisors of AI-supported learning activities. Teachers are expected to ensure that AI tools support students' personalized needs effectively while maintaining creativity in the learning process (Nabhani, Bahous, & Jawhar, 2025). However, whether teachers can sustain their creativity and independent thinking while using AI tools remains an open question (Kizilcec, Martínez, & Maldonado, 2024). Current teacher training systems have not sufficiently supported this transition, which may lead educators to rely more heavily on the efficiency of AI technology while neglecting its pedagogical innovation potential.

More importantly, teachers in AI-powered instruction face issues of curricular standardization and proceduralization. Excessive reliance on AI-driven teaching models may lead to mechanized educational content, lacking in interdisciplinary innovation and deep critical thought (Williamson & Piattoeva, 2019). Although the

predictive learning pathways provided by AI are efficient, they often fail to account for students' unique creative thinking and emotional needs—underscoring the necessity for teachers to maintain a central role in instruction to ensure personalization and depth.

2.3 Theoretical Framework for Reconstructing Teacher Creativity

This research has been grounded on three theoretical underpinnings to justify the reconstruction of teacher creativity: humanistic educational theory (Khatib, Sarem & Hamidi,2013); critical pedagogy (McLaren,2023) and creativity generation theory (Plucker & Makel,2024). This means that educators need not only the general capabilities of transmitting knowledge and managing a class, but a human-centered creativity that is both sophisticated and rooted. These theories provide a reframed view of teacher creativity with the human at the core of creativity, and they inform the urgency for teachers to re-envision their creative roles in the era of AI (Plucker & Makel,2024).

Humanistic educational theory emphasizes teachers' intrinsic motivation and self-actualization. By providing unconditional positive regard, teachers can stimulate their own creative potential within a freer and more supportive environment (Khatib, Sarem & Hamidi, 2013). Antifragility, the capacity to grow stronger in the face of stress and challenge, is one of the core competencies that teachers should possess (Godfrey & Julien, 2025). In the AI era, the rapid transformation of the educational landscape requires teachers not only to adapt to technological shifts, but also to find opportunities for growth and innovation within them.

Critical pedagogy further emphasizes that teachers must possess reflective and critical capacities to identify and resist educational frameworks that suppress creativity. It offers a lens for critical reflection and technological ethics in educational practice (Bradshaw, 2017). Therefore, when engaging with AI and technological tools, teachers must scrutinize potential negative impacts. This necessitates psychological resilience , the ability to find innovative spaces amid rapid change and uncertainty , to continually reshape educational content and methods (König et al., 2024). Education should not become mechanized or standardized; teachers must preserve independent thought and autonomy over instructional content (Parcerisa et al., 2022). Thus, situational awareness and instantaneous responsiveness become key components of teacher

creativity. Educators must respond rapidly to student needs and adapt teaching strategies creatively based on evolving contexts, thereby promoting deep and personalized learning. Embodied cognition theory suggests that teaching isn't merely symbolic processing in the brain but a dynamic, co-constructive process with students and the environment (Wang & Petrina, 2025). Consequently, teacher creativity is also reflected in the capacity to make effective, innovative in-the-moment responses in the classroom to address diverse student needs.

Creativity generation theory emphasizes that creativity is not only activated through individual capabilities but is also a product of social interaction and collaboration. In the AI context, although technological tools can provide highly personalized learning pathways, the teacher's role remains irreplaceable (Chan & Tsi, 2023). Within this environment, teacher creativity manifests in their ability to effectively organize and guide student learning. Faced with AI-generated educational content, teachers must possess the skill to impose structure and direction amid chaos, integrating diverse educational resources and information to prevent students from falling into information cocoons and to create a learning environment that is diverse, challenging, and motivating (Davies et al., 2014). Through cross-disciplinary teaching methods, collaborative learning, and project-based approaches, teachers transcend subject boundaries and enable students to develop creative solutions within authentic, complex learning contexts (Anderson et al., 2024).

Humanistic educational theory emphasizes a caring approach to education, requiring teachers to attend to students' uniqueness and diverse needs. Simultaneously, critical pedagogy further expects teachers in a globalized context to possess cultural reflexivity, to recognize and confront biases and inequalities within educational systems. Accordingly, teacher creativity also manifests in the cultivation of cultural intelligence (Bradshaw, 2017). Teachers need to be able to comprehend cultural differences and alternate perspective, to be able to respect and value students' different backgrounds in order to foster various creative thinking (König et al., 2024). Teachers who keep improving their acculturation ability can better relate to their students of different cultures, and lead them to achieving imaginative resolutions by mixing and dialoguing different cultures (Parcerisa et al., 2022).

The creativity generation theory suggests that innovation runs counter to

breakthroughs in a discipline, in the sense that, innovation comes from integrating ideas and solutions outside of a specific discipline and gain time. The creativity of teachers needs to break free of subject constraints that are historically grounded as well as to draw on and apply knowledge in an interdisciplinary manner if education is to be changed (Pike etal., 2024). This means that educators should not only update content of education, but also adjust teaching methods and evaluation system to adapt to AI era education requirements which is different from the traditional one (Wu et al., 2024). In the procedure, teachers should employ AI to enrich the resources of teaching, the modes of interaction, and advocate for multidiscipline knowledge system that can enhance the students' integration capacity and creative thinking (Griffith, 2023).

Synthesized through the humanistic theory of education, critical pedagogy, and a theory of creativity generation, teachers' HCC is primarily expressed in four interlocking core capacities: a heightened awareness of the teaching environment, adoptive responsiveness to students, critical reflection on the technological and social within the classroom, and interdisciplinary creativity. It is essential that these fundamental capabilities are reconstructed in order for educators to maintain the unique worth that education offers, and to ensure humanistic care in the age of AI.

3. METHOD

Considering that the traditional theoretical frameworks do not fully interpret how teachers' cognitive change and practical reconstruction in the AI era (Nazaretsky et al., 2022), this research aims to investigate the crisis and reconstruction mechanism of teacher creativity in the AI-empowered educational ecological environment. So, the use of Grounded Theory as method is very appropriate (Liu & Yang, 2023). Through the perspective of Grounded Theory, the experiences of teachers in AI-based teaching practice can be presented more objectively to help enrich the theory of Chinese educational practice, and meet the theoretical requirements of HCC framework.

3.1 Participant Selection

This study employed a combination of theoretical sampling, purposive sampling, and chain-referral (snowball) sampling strategies to select participants. First, initial selection criteria were determined through a review of relevant literature, followed by

preliminary sampling based on observations and interviews to identify participants capable of providing maximal data richness. Next, the raw data obtained from the initial sampling phase were coded and analyzed; emerging preliminary theories informed the development of subsequent sampling criteria. Finally, during the ongoing process of sampling and analysis, data and theory were continually compared until theoretical saturation was achieved—i.e., no new categories or subcategories emerged from the data (see Table 1).

Table 1. Participant selection criteria

Stage	Criteria
Initial Sampling	Primary and secondary school teachers with experience in AI-enhanced instruction; selected to represent diverse regions, subjects, and grade levels; teachers should possess a basic level of technical proficiency, such as having used AI-based tools, intelligent lesson-preparation systems, or personalized learning platforms.
Secondary Sampling	Teachers with relatively rich practical experience in AI-enhanced teaching, able to reflect concrete impacts of AI on pedagogical creativity, and possessing a certain degree of teaching autonomy; teachers should demonstrate critical thinking about AI technology and ability to envision their future roles, thus providing in-depth data support.
Tertiary Sampling	Teachers with strong self-awareness and adaptability, capable of adjusting their teaching strategies in an AI-integrated classroom environment; possessing good reflective ability and professional qualities, and able to provide valuable feedback for further research.

This study ultimately selected a total of 18 primary and secondary school teachers with AI instructional experience, representing diverse regions (eastern coastal and central-western areas), subject specializations (including Chinese language, mathematics, music, and information technology), and teaching tenures (under 3 years; 4–10 years; over 10 years). Research data were collected via individual interviews, focus-group discussions, and classroom observations. The researcher participated in the study as a guiding teacher, employing purposive sampling in Stage 1 to select interview participants, followed by theoretical and chain-referral sampling in Stages 2 and 3 to further refine the participant pool.

3.2 Interview Topics

The interviews were structured around the following themes to explore teachers' cognition, emotions, behaviors, and their evolving processes in AI-integrated teaching:

In your experience designing lessons or teaching with AI technology, are there any scenarios or moments that left a strong impression on you? Please describe these in detail with specific examples.

Have your attitudes, emotions, goals, or behaviors in teaching changed in the course of AI-assisted instruction? Have you consciously adjusted your teaching strategies during practice? If so, please explain the adjustments in chronological order.

Do you find AI technologies (such as intelligent lesson-planning systems or AI language models) helpful for your teaching? Please share your experiences with respect to curriculum design, instructional effectiveness, and classroom interaction.

Has AI technology affected your relationships with students, colleagues, or other educational stakeholders? What role has this influence played in your professional development?

During AI-assisted teaching, what personal reflections or perspectives have emerged? For example, how do you perceive AI's impact on teacher autonomy, creativity, and pedagogical diversity?

What specific challenges have you encountered using AI technology in teaching? How did you address these difficulties? Do you have any strategies for coping with them?

In facing the challenges brought by AI technology, how do you engage in reflective practice? For instance, when unexpected situations arise in class, how do you typically adjust your mindset and instructional behaviors?

What gains have you made through AI-supported teaching? Do you feel that you need to develop additional knowledge or skills to adapt to the widespread use of AI in education?

4. RESULT

The coding analysis for this study was conducted in three stages. The research objectives and number of participants for each stage are presented in Table 2.

Table 2. Grounded theory analysis stages in exploring teacher creativity in AI-empowered education context

Stage	Number of Participants	Objective
Stage 1: Open Coding		Systematically analyze teachers' real experiences and perceptions of the HCC core capacities in an AI context (embodied perception & real-time judgment; educational care & human connection; interdisciplinary integration & project design; cultural critique & technological-ethical reflection).
Initial Conceptualization	12	Identify initial concepts related to the four HCC capacities.
Conceptualization	7	Refine and articulate the shared characteristics and concrete expressions of the four HCC capacities.
Category Identification	5	Formulate systematic concepts and prototypes for the four HCC capacities.
Stage2: Axial Coding	15	Discover the logical relationships and complementary mechanisms among the HCC elements through exemplar-based analysis.
Stage3: Selective Coding	8	Focus on core HCC categories to construct a cohesive theoretical framework reflecting teachers' embodied perception, educational care, interdisciplinary integration, and critical reflection in AI-supported environments.

Stage 1 Open Coding involved the conceptualization of raw experiential data. The researcher approached the data with an open mind, suspending personal biases and preexisting theoretical assumptions. All materials were logged according to their presented form, gradually deconstructed, assigned conceptual labels, and then recombined in new ways to form a systematic conceptual and categorical structure. Data were collected through individual interviews and focus group discussions, with a total of 12 participants—7 in individual interviews and 5 in focus group sessions. Each interview was coded immediately afterward by analyzing and defining the interview transcript line by line. Open coding focused not only on teachers' experiences and feelings in the AI-enabled educational environment but also deeply explored their

authentic responses and reflections regarding creativity, instructional strategies, technological adaptation, and professional identity.

Through inductive analysis and refinement of raw experiential data, concepts and categories were delineated, and their attributes and dimensions were further explored to ensure the coding process was both systematic and rigorous. To illustrate the open coding procedure, the following sections present sample coding records (see Table 3) and selected category attributes and dimensions (see Table 4).

Table 3. Examples of open coding in the study of teacher creativity in the AI-empowered educational context

Original Data	**Conceptualization**	**Categorization**
AI-delivered teaching content fails to adapt immediately to student questions, so I flexibly adjust according to classroom conditions.	Immediate adjustment of teaching strategy	Real-time judgment ability
Observing student attention drifting in class, I immediately change teaching methods to regain interest.	Responsive teaching alertness	Real-time judgment ability
AI-designed procedural lessons lack a sense of presence; I incorporate self-observation and adjustment to enhance classroom vitality.	Embodied perception and adjustment	Real-time judgment ability
I increased time for sharing and interaction between students and teachers, reducing one-way AI input.	Increased teacher-student interaction	Human-centered connection ability
I included discussion segments in AI lesson plans to allow students to express their feelings.	Emotion-facilitated exchange	Human-centered connection ability
When students appear lacking confidence, I provide care and encouragement to boost their willingness to express themselves.	Emotional support and educational care	Human-centered connection ability
I introduced a combination of music and coding in class by designing interdisciplinary inquiry tasks.	Interdisciplinary project integration	Interdisciplinary integration ability

I designed courses that combined AI with real-world social issues, such as green energy and environmental topics.	Real-world problem–driven learning	Interdisciplinary integration ability
I created interdisciplinary collaborative tasks requiring students to solve complex problems with AI assistance.	Cross-domain problem-solving	Interdisciplinary integration ability
I analyzed AI-generated content to help students identify its biases and limitations.	Critical evaluation of tech-generated content	Technological-ethical reflection ability
I included discussions on how to judge the accuracy and credibility of AI-recommended content.	Reflection on technological authenticity and ethics	Technological-ethical reflection ability
I guided students in exploring AI's influence on educational equity.	Educational equity and AI ethics	Technological-ethical reflection ability
I used AI to identify student learning difficulties and adjust tasks in real time.	Timely adaptation of instructional content	Real-time judgment ability
After noticing a shift in students' interests, I quickly shifted to related topics.	Flexible adaptability	Real-time judgment ability
The teacher and students empathize, focusing on learning-related stress.	Learning care	Human-centered connection ability
The teacher encourages diverse viewpoints to foster pluralistic dialogue.	Expression of multiple perspectives	Human-centered connection ability
I combined AI with an art-design course for interdisciplinary innovation.	Cross-boundary integrative innovation	Interdisciplinary integration ability
Students integrated AI with historical knowledge during group discussions.	Cross-domain knowledge application	Interdisciplinary integration ability
Teachers reflect on AI's classroom dominance and its implications for educator roles.	Reflection on technological dominance	Technological-ethical reflection ability
Exploring alignment and conflict between AI content and curriculum objectives.	Critical assessment of content suitability	Technological-ethical reflection ability
When students become engrossed in AI-generated outcomes, I guide them to	Process-oriented reflection	Technological-ethical reflection

focus on underlying principles and processes.		ability
If AI-designed content is unsuitable for some students, I promptly change the task design.	Immediate response to individual differences	Real-time judgment ability
The teacher selects the most suitable AI task formats by observing students' performance.	Optimization of instructional tasks	Real-time judgment ability
The teacher uses open-ended questions to prompt student opinions and independent knowledge generation.	Open questioning	Human-centered connection ability
Establishing learning groups to promote student cooperation and support.	Construction of learning communities	Human-centered connection ability
Designing multimodal expressive tasks that combine AI-generated text with imagery.	Multimodal integrative expression	Interdisciplinary integration ability
Carrying out AI-based scenario simulation tasks to address real-life problems.	Scenario-based task design	Interdisciplinary integration ability
Analyzing the algorithm logic and societal biases behind AI outputs.	Critique of algorithms and social structures	Technological-ethical reflection ability
Exploring whether AI technology promotes dependency on standard answers in education.	Diversity vs AI limitations critique	Technological-ethical reflection ability
Excessive AI use in class reduces interpersonal interaction, so I increase interactive activities.	Repair of teaching interpersonal interaction	Human-centered connection ability
To meet diverse student needs, the teacher redesigns AI-recommended content.	Differentiated adjustment of instructional content	Real-time judgment ability
Guiding students to critically examine AI-generated learning plans.	Encouraging critical thinking	Technological-ethical reflection ability
Combining AI tools to cultivate students' diverse modes of expression.	Innovation in expressive methods	Interdisciplinary integration ability
Discussing and deciding classroom	Student involvement in	Human-centered

pace and task priorities with students.	lesson pacing decisions	connection ability
Introducing AI data connected to social issues to lead students in exploring real-world problems.	Exploration of social issues	Interdisciplinary integration ability
Teacher reflects on the role and limitations of AI in education.	Critical reflection by the teacher	Technological-ethical reflection ability

Table 4. Examples of category attributes and their dimensions in the study of teacher creativity in the AI-empowered educational context

Category	Attribute	Dimensions
Real-time Judgment Ability	Perception of classroom dynamics	Observing student behaviors; sensing changes in classroom atmosphere; quickly noticing attention drifts
	Immediate adjustment strategies	Switching teaching methods; modifying classroom pace; introducing new questions for stimulation
	Responses to individual differences	Adjusting content for different student needs; designing personalized tasks; responding promptly to student feedback
Human-centered Connection Ability	Quality of teacher–student emotional interaction	Monitoring student emotions; increasing communication and interaction; creating a warm classroom environment
	Supportive and guiding capability	Building student confidence through encouragement, peer support, and opportunities for expression
	Building learning communities	Establishing collaborative learning groups; fostering student cooperation; guiding pluralistic dialogue
Interdisciplinary Integration Ability	Interdisciplinary design	Creating tasks that integrate multiple discipline elements; introducing real-life contexts and problems
	Multimodal integrative expression	Using text, images, audio, etc., to promote expression; designing engaging and creative tasks
	Real-world problem-	Incorporating social issues, environmental

	driven learning	topics, and real-life contexts; designing practice-based inquiry tasks
Technological-ethical Reflection Ability	Critical analysis of AI-generated content	Evaluating accuracy of AI outputs; revealing algorithmic biases and limitations
	Awareness of educational equity and ethics	Exploring how AI technology impacts different groups; focusing on tech ethics and social responsibility
	Self-role awareness and educational responsibility	Reflecting on changes in the teacher's role; emphasizing human-centered values and educational significance; safeguarding student diversity and creativity

Table 5. Exemplary Paradigm Model in the study of teacher creativity in the AI-empowered educational context

Paradigm Model	**Real-Time Judgment Category**	**Human-Centered Connection Category**	**Interdisciplinary Integration Category**	**Technological-Ethical Reflection Category**
Causal Conditions	Real-time classroom awareness	Educational care and emotional support	Design of interdisciplinary integrated tasks	Discussions on AI and educational ethics conflicts
Phenomenon	Flexible pedagogical adjustments	Increased teacher–student interaction	Multidisciplinary integrated inquiry	Critique of technology and content
Context	Responsiveness in the teaching setting	Support and guidance of students	Interaction through practical tasks and projects	Reflection on educational equity in the AI context
Intervening Conditions	Perception and judgment capabilities	Teaching empathy capacity	Knowledge integration capability	Critical thinking and reflective ability

Action Strategies	Flexible adaptive adjustments	Encouragement, support, and caring	Innovative task design and multimodal application	Facilitation of critical discussion and reflection
Results	Enhanced sensitivity and pedagogical adaptability	Strengthened emotional bonding between teacher and students	Improved interdisciplinary innovation and design capabilities	Elevated technical and cultural critique competence

Stage 2, axial coding, utilizes the paradigm model "Causal Conditions → Phenomenon → Context → Intervening Conditions → Action/Interaction Strategies → Consequences" to organically link the categories extracted during open coding. Axial coding draws on the concepts and categories refined during open coding to systematically analyze their interrelationships, ultimately integrating them into core categories. The paradigm model serves as the key analytical tool at this stage, used to organize causal chains, contextual relationships, and logical pathways between concepts and categories and summarize them into categories. In this stage, four core categories were derived in this study: embodied perception and real-time judgment; educational care and human-centered connection; interdisciplinary integration and project design; and cultural critique and technological-ethical reflection. Examples are presented in Table 5.

Real Time Judgment Ability is composed through the paradigm model by three concepts—real time classroom awareness, immediate adjustment strategies, and responses to individual differences—and two categories: observation and perception, and adaptive action. The paradigm model explains how monitoring student behaviors and classroom climate changes in AI-equipped educational setting help teachers rapidly notice modifications, and adjust teaching tactics, such as their flexible use of instructional strategies, pacing and question framing. This skill not only evidences teachers' sophisticated understanding of complex, fluid teaching contexts but it also is indicative of personalized responsiveness to students' needs. School's embodied perception and concurrent judgement stressed teachers' immediate classroom responsiveness and autonomic decision making under complex situation. Within the HCC framework, that means teachers in-action - observation, responsiveness, strategy at the moment, and differentiation all in in play. This dimension emphasizes the role of

the teacher as the class agent who, assisted by AI, develops a perception and actions that are human-centered and in-the-moment — involving immediacy, dynamism, and a high level of individualization.

Human-Centered Connection Ability is constituted, via the paradigm model, by three concepts—student–teacher emotional interaction, support and guidance, and the development of learning communities—and two categories: emotional care and empathic communication. The paradigm model describes how, in AI-assisted teaching, teachers enhance emotional bonds and interpersonal interaction with students—and mitigate the coldness of AI—by integrating additional discussion segments, offering emotional support, and organizing learning groups. Teachers' educational care is demonstrated not only in curricular design but also in attending to students' emotions and psychology, and in creating a warm learning environment. Educational care and human-centered connection emphasize teachers' understanding and compassion for students in digital environments, reflecting educators' humanistic spirit and sense of responsibility. This ability is characterized by its human-centered orientation, emotional attachment, and relational connectivity, serving within the HCC framework as a compassionate foundation for both teacher creativity and instructional effectiveness.

Interdisciplinary Integration Ability is formed through the paradigm model by three concepts—interdisciplinary integrative task design, multimodal expression, and real-world problem-driven learning—and two categories: integrative innovation and task-driven focus. The paradigm model illustrates how, in AI-assisted teaching, teachers proactively design tasks that integrate elements from different disciplines—such as combining technology with art or science with social issues—incorporating multimodal expression (text, images, audio) and inquiry-based tasks to stimulate students' innovation and collaboration. Interdisciplinary integration and project design ability plays a central role in teacher creativity of HCC, with its high level of requirements for the teachers to combine complex knowledge structure and design project-based learning activities, as well as to innovate via a multimodal way. This class demonstrates the complexity and innovation of cross-boundary integration in practice and it provides an important incentive for teachers' response to AI-driven educational movement, namely systematically innovative and problem-related nature.

Technological-Ethical Reflection Ability is composed by the paradigm model of

three concepts of critical analysis of technology, education equity and ethics, self-reflection on role and responsibility, two categories of critical analysis, education ethics. In the paradigm model, teachers increasingly appreciate possible content biases and algorithmic disempowerment of AI in the classroom/curriculum and have taken action to help students identify these themselves, disempowering AI as a classroom tool; they explore the impact of the technology on educational equity and diversity. At the same time, teachers also reflect on self-positioning and educational responsibility under the development of AI in the VR class, paying more attention to combining AI with humanistic concepts in a balanced and deep way. The ability of cultural critique and technological ethics reflection represents teachers' reflection on the moral responsibility of AI education in the era of digital education, focuses on the value of social responsibility and fairness, and shows teachers' critical and ethical action in the process of digital education. This category reflects, judges, ethicists, and educates in responsibility and may contain the deepest support for teacher creativity in education in HCC.

Stage 3 selective coding refers to the process of, after systematic analysis of all identified conceptual categories, selecting a "core category" and conducting analysis centered around it. The primary tasks include: first, clarifying the theoretical storyline constructed from the data, illustrating the developmental trajectory of teachers' four HCC capacities in the AI-enabled educational context; second, systematically describing the selected core category along with its categories, attributes, and dimensions, highlighting its close relationship with the core characteristics of teacher creativity; third, testing the preliminary hypotheses established during earlier coding and supplementing and refining any categories that require expansion; fourth, selecting from among the categories a core category capable of encompassing the others to serve as the theoretical linchpin of the study; and fifth, constructing clear logical relationships between the core category and other categories to form a systematic explanatory framework.

Through in-depth analysis of the above-identified categories and the four core categories—embodied perception and real-time judgment, educational care and human-centered connection, interdisciplinary integration and project design, and cultural critique and technological-ethical reflection—combined with iterative validation,

comparison, and questioning against the original experiential data, this study finds that these four core categories effectively encompass all other related categories. The research reveals that, in an AI-empowered educational environment, teachers' creativity is influenced not only by technology but also by the interaction of the four HCC capacities, which give rise to distinct connotations and characteristics. First, in their teaching practice teachers already display a crucial attentiveness to classroom action and a nimbleness of response through embodied perception and spontaneous decision-making. When educational care and humanistic connection are more intense, teacher–student interaction and emotional bonding are more intense as well, adding classroom climate and teaching effectiveness warmness. Meanwhile, teachers continuously enhance their overall innovative capabilities through transdisciplinary integration and project design, thus achieving a diversified and nuanced instructional content. More importantly, in the context of digital education, the teachers show a higher level of cultural criticism and technological ethical reflection ability, and they gradually adjust their professional identity and educational goal through critically reflecting on the relationship between AI technology and education over and again.

In conclusion, teachers' creativity is gradually enhanced by the joint function of these four foundational abilities, reaching a dynamic balance with the help of AI. Teacher creativity in the context of HCC, on the one hand, highlights the capacity of perception and response in real-time, reflects the humanistic concern for warmth and care in education, promotes the integration and innovation between disciplines, and emphasizes the in-depth reflection on the relationship between ethics, technology and education. By doing so, teachers are able to develop their instructional creativity to a greater extent than before, and it is during this depth layer of dynamic construction process that they are capable of working to improve their educational creativity contexted by AI (see Figure 1) and hence attain systematized professional growth.

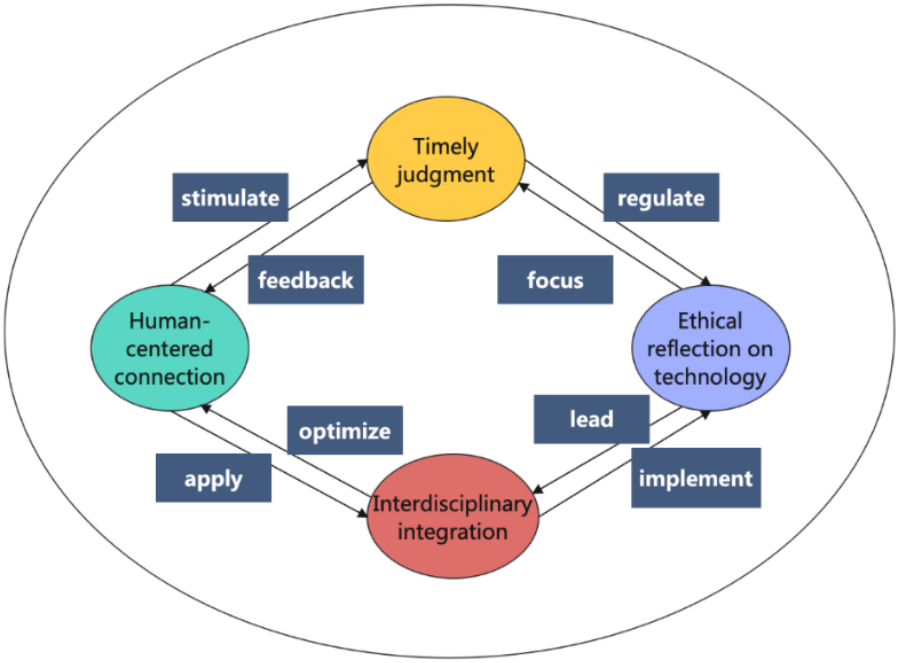

Figure 1. HCC framework for teachers in AI context

5. DISCUSSION

As a primary outcome, we provide the HCC (Human-Centered Creativity) theoretical model in this article. Grounded in data-oriented voice from teachers as AI practitioners, drawing on a grounded theory analysis of the teacher experience in AI-mediated educational practice, it systematically demonstrates how teachers counteract technological tensions in learning and technology integration and stand to produce creative practices invoking agency and educational warmth.

5.1 Constituent Components of HCC

The teacher creativity in AI-Augmented education has not only universal identical properties, but also common features, and differences in the convict cell and features (Szmidt & MajewskaOwczarek,2020). Such similarities are mainly realized in relation to the assumption that teacher creativity draws on accumulated practical knowledge and successfully directs teaching practice, which further evidences attributes such as practicality, personalization, and dynamic adjustment of creative teaching—corresponding to central categories in educational creativity (Karwowski &

Beghetto,2018).

A few of the aspects upon which it is obvious the differences. On the one hand, teachers' creativity in a context facilitated by AI is characterized by the pragmatic attribute of "judging ability on the spot." Teachers are required to adapt their teaching methods in light of immediate classroom feedback and in spite of the complexity of AI tools (Kasnecket al.,2024). In contrast with creativity paths based on unique experiences in traditional education, teacher creativity in AI situations gives more value to the interrelationship with, and observation of, technological space, which implies dynamic response and self-regulation skills (Jaramillo & Chiappe, 2024).

Second, in the AI-Augmented setting, "human-centered connection ability" is a critical part of teacher creativity. Contrast to the conventional perspectives of creativity which concentrate on the classroom outcomes, teachers have to put the stress on the emotional attachment and interpersonal relationships with students, creating a warm learning environment and strengthening the interaction to offset the coldness and tedium brought by the AI (Lin & Chen,2024). But such a humanistic connection is not simply an add-on teaching tool, but rather an essential internalized aspect of creativity itself.

Third, in AI-based context, teacher creativity is characterized as "interdisciplinary integration ability." By cross-disciplining learning and by designing authentic tasks and multimodal expressive activities teachers deepen and broaden their field of study. This capacity helps to promote varied thinking and creativity among learners, lending credence to the multi-facetedness and flexibility of educational content generation in AI-rich environments (Roschelle etal.,2024).

Finally, with regarding its constitutive traits, teacher creativity becomes dynamically constructed as "critical culture and techno-ethical reflection capacity." While it is the case that teachers in AI-supported environments engage in reflection on not only the teaching outcomes, but the harmony between technology and education quality, equality, and ethical values, this is in contrast to the one-sided reflection practiced in traditional learning experiences (Kamali, Alpat, & Bozkurt, 2024). By continuously criticizing and reflexively adjusting it, they turn the creativity of learning to the future not just into an adaptive capacity for technological progress, but into a productive process of building-up the rationality and value of learning.

5.2 Characteristics of HCC

By examining the research results, the component elements of teacher creativity in AI-based educational scenarios are of multidimensional nature and interactive features. In sum, such has creativity as juxtaposition; practicality as reflexivity and personalization as systematization (Plucker & Beghetto, 2020).

First, the elements of the creativity of teachers interrelate and are supplemented by one another. Teachers have accurate perception and adaptive response, by means of which the teaching activities can be conducted fluently. Human-oriented connection ability keeps creativity with emotional impetus and human warmth and, via teacher-student interaction and peer communication, serves as a good environment for creative teaching in classroom management (Lin & Swanson, 2014). The interdisciplinary integration capabilities break through the separation of disciplines and construction of multimodal tasks, providing multidimensional space and knowledge support for educational innovation. Cultural criticism and technological-ethical reflection competence within an AI-generalized education set the value direction and ethical assurance to the sustainable development of creativity by means of profound consideration of AI's functions, restrictions and social impacts.

Secondly, the features the components can not only vary in contents, but also can interact dynamically in their formation mechanisms. The process of forming an ability to judge in real-time is not isolated, but evolves over time, as practical wisdom, through engagement with pedagogical care, interdisciplinary design, and critical reflection (Henriksen & Mishra, in press). Similarly, human-centred connection power is also enhanced in various types of teaching tasks and is regenerated once more in the process of interdisciplinary fusion (Limetal.,2023). In general, the teacher creativity in AI supported settings is configured as a dynamic generative pattern: generated by practice; animated by multi-dimensional interaction; and reflected to the next level.

Finally, the nature of these building blocks is mirrored by the process through which they are formed, which is open, adaptable. Over against the linear path of action and reflective experience and problem solving in traditional contexts, teacher creativity in the AI-driven context is characterized by high degrees of openness and dynamic adjustability. In addition to multiple difficulties of AI technology encountered by the teachers, the latter ones proactively exert themselves for both integrating cross-

curricular knowledge and constructing creative learning tasks in complex settings as well as critically thinking of educational value and ethical issues of using technology (Kasneci etal.,2024). This multi-level flexibility and pondering guarantee that teacher creativity, in the running process, has continuity and contextuality but also thoughtful-layers and system-like building up, revealing the unique benefits of human-based creativity in the HCC model.

6. CONCLUSION

6.1 Research Summary

This study used grounded theory to analyze in-depth interviews and code analysis with several dozens of frontline teachers who have engaged in AI-assisted instruction, and proposed a Human-Centric Creativity (HCC) model. Structurally, this model illustrates teachers' creativity generation mechanism, including situational thinking, humanistic disposition, and creativity act, and refines four competence dimensions, including situational judgment, human-based connection, interdisciplinary integration, and technological-ethical reflection. The research shows that, when facing tensions such as cognitive inertia, homogeneity of thought and competency anxiety arising from artificial intelligence, teachers do not react in passive ways and/or in complete technologization. They're not pure and they don't fit a mold; rather, they repurify and make the mold their own in new educational practices that are humanistic, reflective and generative all at once.

6.2 Theoretical Contributions

First, within grounded theory and based on practical experiences of teachers, we developed a theoretical “independent human-centered educational creativity model”, which expands existing (mostly too mechanistic on technology side) research in ed-tech. This model disrupts a linear “technology adoption–instructional effectiveness” cause-and-effect mechanism and foregrounds the teacher as a political actor shaping values as well as cultural commentator, thereby providing a new theoretical framework for investigating the generative mechanisms of edupolitical creativity.

Second, the HCC model redefines the traditional construct of “teacher creativity.” While existing research frequently simplifies creativity to uni-dimensional operational

concepts like curriculum innovation or pedagogical ingenuity, this study reconstructs the notion of "educational creativity" across value, cognitive, and action dimensions—highlighting its humanistic orientation and contextual adaptability.

Third, this study reconceptualizes artificial intelligence as a "constructive force in the educational field," revealing that AI technologies not only influence the selection of instructional tools but also reconstruct teachers' identities, pedagogical structures, and educational value judgments. This deepens theoretical development at the intersection of educational sociology and educational technology.

6.3 Practical Significance

The study offers concrete development pathways for teacher professional growth. First, it clearly identifies the four key competencies teachers need in the AI era, providing a structured framework and measurable dimensions for teacher training programs, and facilitating the transition from mere technology users to human-centered adaptive educators. Second, it supplies strategic references at the school level for curriculum design and teaching support. Findings indicate that enabling teachers to exercise autonomy in lesson design, establishing interdisciplinary collaboration platforms, and creating structures for ethical and humanistic discourse are important mechanisms to support creativity. School leaders should thus shift organizational culture from technology-efficiency – oriented to educational-value – oriented. Third, the study furnishes a theoretical basis for education policy-making. It highlights that the AI-induced tensions in education call on policymakers, when promoting AI technologies, to pay close attention to the processes of teacher agency development and cultural adaptation—rather than reducing AI to a mere tool for efficiency.

6.4 Study Limitations

First, the representativeness of the sample is limited. Although the study's interviewees come from various regions and disciplines, the sample size is relatively small and may not comprehensively reflect teachers' AI practice experiences across all educational stages and contexts. Future research could expand the sample to include teachers from vocational schools, rural schools, and other marginalized settings.

Second, this research focuses on a static depiction of teachers' experiences and does not fully capture the dynamic processes and evolutionary mechanisms underlying the development of teacher creativity. Future studies could employ longitudinal methodologies (such as follow-up surveys or teaching logs) to further explore how teachers develop stable creative cognition and behavioral patterns over the course of prolonged technological integration.

Third, the rapid evolution of AI technologies in education may make the study's findings susceptible to temporal validity risks. As generative AI, multimodal learning systems, and other technologies continue to advance, the types of technological tensions teachers face may evolve further. Therefore, the HCC model will require ongoing validation and refinement in practice.

6.5 Recommendations for Future Research

Future studies should expand the research to include teacher groups under different cultural contexts and educational policy systems to explore the cross-cultural applicability and limitations of the HCC model. Building on this qualitative research, the development of measurement instruments to quantitatively assess the four HCC competency dimensions—along with methods such as structural equation modeling—would help verify the model's structural validity and predictive power.

Exploring how teachers transition from "tool dependence" to "value creation" in AI environments, identifying key turning points and influencing factors, would provide more targeted theoretical support for the design of teacher support systems. Future research could also incorporate the student perspective to investigate how teachers' HCC competencies affect students' learning experiences, cognitive engagement, and creativity development, thereby forming a more comprehensive framework for educational ecosystem analysis.

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

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