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Positioning Teacher Roles in the Era of Generative Artificial Intelligence: A TPACK-Based Perspective

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Abstract: *The rapid development of generative artificial intelligence (GenAI) is profoundly reshaping the educational ecosystem, posing triple challenges to traditional teaching in terms of tool use, teacher-student relationships, and knowledge instruction. Drawing on the TPACK theoretical framework, this study examines the "teacher–technology", "teacher–student", and "teacher–knowledge" relationships, and proposes the normative role positioning of teachers in the GenAI era: acting as value guides in technological collaboration by critically evaluating GenAI outputs to guard against algorithmic bias and ethical risks; serving as emotional supporters in student development by maintaining the humanistic warmth of education through embodied interaction; and functioning as professional gatekeepers in knowledge instruction by balancing foundational knowledge with higher-order abilities. To facilitate the systematic transformation of teacher roles, the study constructs a multi-dimensional collaborative pathway encompassing policy, school, and teacher levels: at the policy level, refining action guidelines and improving institutional safeguards; at the school level, building intelligent training platforms and fostering collaborative cultures; and at the teacher level, strengthening agency to achieve a dialectical unity of technological empowerment and educational essence. This study provides theoretical insights and practical implications for the systematic reconstruction of teacher roles in the age of artificial intelligence.*

Keywords: *Generative Artificial Intelligence, Teacher Roles, TPACK Framework*

1. Introduction

The "Education Power Development Plan (2024–2035)", jointly issued by the Central Committee of the Communist Party of China and the State Council, explicitly calls for leveraging education digitalization to open new development pathways and shape emerging advantages, while promoting artificial intelligence (AI) as a driver of educational transformation [1]. On November 30, 2022, the launch of ChatGPT by OpenAI marked a milestone in the evolution of AI technologies, heralding the transition into a new phase characterized by general-purpose, large-scale generative AI models. This shift—from discriminative to generative models, from unimodal to multimodal architectures, and from narrow to general applications—signals a critical stage in the advancement of intelligent technologies.

Distinct from traditional discriminative AI, Generative Artificial Intelligence (GenAI) refers to AI technologies that autonomously generate content based on algorithmic rules and pretrained databases. Powered by massive datasets, computational resources, and advanced algorithms, GenAI is capable of providing human-like, interactive responses [2], profoundly altering the ways in which knowledge is produced, disseminated, and applied. Consequently, it is reshaping the traditional educational framework. Within this context, teachers—as central agents in educational activities—are facing unprecedented and multifaceted challenges. Rethinking and precisely redefining the role of teachers in the GenAI era has thus become a pressing issue.

2. Challenges Facing Teachers in the GenAI Era

2.1 The Dual Pitfalls of Tool Use

Teachers' understanding and application of technological tools are directly linked to the effectiveness of their teaching practices. As an extension of human intelligence, intelligent machines serve as a projection of the teacher's essential power, ultimately reflecting the teacher's subjectivity [3]. However,

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current teacher engagement with GenAI reveals two main pitfalls: tool alienation and tool dependence.

On one hand, due to GenAI's anthropomorphic features and powerful computational capabilities, it is often perceived as mysterious and overly potent [4]. This leads some teachers to resist or distrust its content accuracy, ethical boundaries, and potential impact on their professional status. Such a state of tool alienation not only limits the potential of technology but also hampers classroom efficiency. On the other hand, the convenience and efficiency of GenAI have led some teachers to over-rely on it, outsourcing a large portion of teaching tasks mechanically, without adequate content filtering or pedagogical reconstruction. As a result, the use of GenAI in some teaching contexts becomes superficial or performative. For instance, in open demonstration classes, teachers may overly prioritize technological presentation over actual pedagogical needs, resulting in limited meaningful integration of GenAI into instructional practice.

2.2 The Dual Challenges of Teacher–Student Relationships

While the internet has already diversified students' access to knowledge, the transformative power of GenAI goes far beyond this trend. With its human-like interactivity, GenAI can deeply engage both student learning and teacher instruction, thereby disrupting the traditional dyadic teacher–student relationship.

On one hand, excessive reliance on GenAI risks marginalizing the role of the teacher. Unlike earlier internet technologies that merely served as information conduits, GenAI offers interactivity, generativity, and real-time feedback, allowing students to acquire structured and explanatory knowledge—and even complete creative and reasoning tasks—without teacher involvement. From goal setting and content selection to learning assessment, the entire process can bypass the teacher, undermining their role as a "knowledge authority" [5]. This devaluation also diminishes the teacher's function as a moral guide and emotional supporter, weakening the warmth of interpersonal interaction and leading to depersonalized teacher–student relationships. On the other hand, GenAI may enable excessive control over students. Through real-time analysis of language, images, and behavior, it allows teachers to closely monitor students' learning states and provide tailored guidance. However, such surveillance blurs the boundaries of teacher–student interaction, potentially resulting in the suppression of student agency and violations of privacy. These shifts risk instrumentalizing the educational relationship, causing student anxiety, resistance, or even identity crises.

2.3 The Dual Deviations in Knowledge Instruction

In the GenAI era, the definition and boundaries of knowledge are being restructured. William Poundstone has argued that outsourcing knowledge to digital platforms constitutes one of the dominant narratives of the 21st century—whatever expertise one possesses, the cloud either already contains it or will soon acquire it [6]. The unprecedented accessibility of knowledge challenges the teacher's traditional role as sole knowledge holder and raises new issues in pedagogical philosophy and practice.

On one side, some teachers remain entrenched in a "knowledge-centric" paradigm, clinging to mechanistic and didactic teaching approaches that aim to transmit standard answers. This narrow view of knowledge separates it from capabilities and values, neglecting students' need to construct knowledge actively and develop higher-order thinking and evaluative reasoning. Such methods fall short of the talent demands of the AI era. On the other side, some argue that instruction in areas where AI excels—such as memory and computation—can be offloaded, allowing teachers to focus on cultivating uniquely human abilities [7]. Yet, reducing this argument to the abandonment of foundational knowledge risks depriving students of essential knowledge reserves and disciplinary understanding, which are critical for lifelong learning and problem-solving in complex environments.

3. Reconstructing Teachers' Roles in the GenAI Era: A TPACK-Based Perspective

Faced with the profound transformations brought about by Generative Artificial Intelligence (GenAI), it is imperative to reexamine and redefine the professional role of teachers in education. The Technological Pedagogical Content Knowledge (TPACK) framework provides a vital analytical lens for this purpose. In 1986, Shulman [PCK] introduced the concept of Pedagogical Content Knowledge (PCK), emphasizing that effective teachers must integrate both disciplinary knowledge and pedagogical expertise. Building on this, Koehler and Mishra (2005) expanded the model by adding a technological dimension, proposing the TPACK framework, which includes Technology Knowledge (TK),

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Pedagogical Knowledge (PK), and Content Knowledge (CK) [8].

Each of these knowledge domains corresponds to a distinct relational aspect of teachers' work in the GenAI context: TK supports teachers in understanding and managing GenAI technologies; PK guides them in improving interaction and instruction with students; and CK underpins their professionalism in delivering and constructing knowledge. Thus, the TPACK model offers a structured framework for interpreting and analyzing the evolving teacher role amid GenAI integration, and provides a pathway for role transformation across three core relationships: teacher–technology, teacher–student, and teacher–knowledge.

3.1 Value-Oriented Guide in Human–AI Collaboration

As a new instructional agent, GenAI not only functions as a support tool to enhance teaching and learning activities but can also assume certain instructional responsibilities, becoming a collaborator with teachers. While humans and technologies each have their strengths—technologies excel at repetitive, procedural, and well-defined tasks [9]—teachers can strategically deploy GenAI's functionalities based on pedagogical needs. For instance, GenAI can generate structured instructional recommendations aligned with learning objectives, content knowledge, and pedagogical logic, helping teachers optimize lesson design, differentiate instruction, and even reflect on their teaching. By offloading procedural tasks, GenAI enables teachers to reallocate cognitive resources toward emotional labor, instructional innovation, and value cultivation. Leveraging algorithmic capabilities, teachers may even transcend their individual pedagogical limits [3].

Yet GenAI is not a neutral tool; its outputs are inevitably constrained by the training data and algorithmic architecture. Research has identified major barriers to GenAI's trustworthy application, including *model hallucination*—the generation of false or unfounded content [10]—and *algorithmic bias*, where embedded social or cultural prejudices in training data may lead to structural discrimination [11]. If such flawed content enters classrooms without scrutiny, it may distort students' understanding and exacerbate educational inequities. Moreover, studies show that teachers' trust in AI systems tends to stabilize when systems perform well but declines sharply when errors occur, with potential long-term effects on trust [12]. This emotion-driven trust mechanism may weaken professional judgment and adversely impact pedagogical decision-making.

In response, teachers must move beyond mere functional or remedial use of GenAI and return to the educational essence—fostering holistic human development. Instead of passive reliance, they should adopt a collaborative approach, guided by educational aims and ethical awareness, critically evaluating GenAI outputs to ensure alignment with curricular goals, student needs, and value orientations. Teachers must maintain their professional subjectivity, harnessing GenAI's potential while exercising critical reflection and rational judgment to prevent overreliance and value distortion, ensuring technology truly serves student growth.

3.2 Emotional Supporter in Student Development

A sound teacher–student relationship should be grounded in respect for the intrinsic value of both parties, as well as broader social and relational contexts [13]. GenAI's capacity for real-time feedback, personalized recommendations, and 24/7 availability allows it to meet student needs in ways beyond human capability. As students increasingly interact with technology, their dependence on GenAI may surpass their engagement with teachers. This trend risks replacing human relationships with human–machine interactions and reducing education to a mere learning process [14]. But can data-driven language models truly constitute intersubjective participants [15]?

The idea of AI replacing teachers stems from a reductionist understanding of education as equivalent to learning. In fact, education is more than knowledge transmission; it involves emotional communication and moral guidance. John Dewey's *philosophy of communicative action* emphasizes communication as central to education—not just through speech or writing, but through embodied, non-verbal exchanges. Concepts like thought, agency, reason, language, and truth emerge through communication. Dewey maintained that educational communication must involve genuine participation, not one-way transmission or rote instruction [16].

Teaching is a living experience marked by subtle, unconscious emotional expressions—care, respect, trust—that GenAI cannot compute [4]. Overreliance on technology erodes human interaction and turns learning into mechanical processes. Individuals may become isolated, lacking meaningful emotional and

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social connections. Building strong educational relationships therefore requires attention to emotional exchange and warmth in teacher–student interactions [4]. Given that both cognitive and physical aspects of teaching are increasingly automated, teachers must revalue their emotional intelligence and emotional labor.

By prioritizing affect alongside cognition, education can retain its humanistic core in the digital era, integrating knowledge with emotions, attitudes, and values [17]. Though GenAI can analyze emotional cues, it lacks the *presence* and empathy of a human teacher. As Jaspers argued, education must aim to "liberate human nature" through both knowledge and lived experience, fostering moral insight and purposeful action [18]. Only through deep, human-to-human engagement can learners achieve socialization and develop into culturally enriched beings.

3.3 Professional Gatekeeper in Knowledge Instruction

GenAI dramatically improves the accessibility and immediacy of knowledge, allowing students to obtain answers and explanations on demand. However, this convenience risks reducing opportunities for deep thinking and independent knowledge construction. The traditional education model—centered on knowledge transmission—is under pressure, as teachers are no longer the sole knowledge holders or conveyors, and their instructional roles are increasingly supplanted by digital tools.

This weakening of knowledge's perceived value stems from a misunderstanding of the relationship between knowledge and competence. While high-order skills such as critical thinking, social–emotional learning, and creativity are essential for future talent development [19], they cannot be cultivated without foundational knowledge. Bloom's taxonomy highlights that advanced cognitive processes like analysis and creation rest on basic skills like remembering and understanding. Similarly, in traditional Chinese philosophy, Wang Yangming's doctrine of "unity of knowledge and action" i\nsists that knowledge and action are inseparable.

If students lack a robust knowledge base, they may struggle to evaluate or reflect on GenAI-generated content and become dependent on it for intellectual guidance. Learners must possess internalized knowledge to develop critical thinking, innovation, and moral reasoning in a complex world. The binary logic of "knowledge to AI, wisdom to humans" thus overlooks the foundational role of knowledge in cognitive development.

Teachers must therefore uphold rigorous standards for knowledge instruction, protecting the integrity of foundational content and avoiding hollowing out curricula. They should delineate which knowledge must be mastered, which skills may be AI-supported, and which values require direct teacher guidance. Beyond delivering key concepts and core skills, teachers must help students critically evaluate GenAI's limitations and foster their capacity for independent learning and collaborative problem-solving. Striking a balance between instructional professionalism and educational innovation will enable the coordinated development of students' cognitive, creative, and moral capacities.

4. A Multi-Level Collaborative Pathway for Reconstructing the Teacher's Role

To integrate knowledge and technology in the teaching process, and to clarify teachers' normative roles as *value-oriented guides*, *emotional supporters*, and *professional gatekeepers*, the transformation of the teacher's role must be supported by coordinated efforts across *policy-making*, *school-based support*, and *teacher agency*. This study proposes a multi-dimensional collaborative pathway across these three levels to ensure teachers can effectively adapt to the deep integration of GenAI into educational environments.

4.1 Policy Leadership: Refining Action Guidelines and Strengthening Institutional Support

China has placed strong emphasis on the educational impact of AI. In May 2025, the Ministry of Education's Basic Education Committee released the *General AI Education Guidelines for Primary and Secondary Schools (2025 Edition)* and the *Guidelines for the Use of Generative AI by K-12 Students (2025 Edition)*, which together provide a foundational framework for integrating AI into education. To further promote the implementation of these policies, several strategies are still needed:

First, policy documents should be refined to enhance operational guidance. Future policies should offer scenario-specific guidance tailored to the realities of teachers' work. For example, implementation frameworks can be developed around teachers' daily professional tasks—curriculum planning,

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instructional strategies, classroom management, assessment, grading, home–school communication, professional development, and research duties [20]—to create actionable blueprints across grade levels and subject areas. The boundaries of GenAI's educational applications must also be clearly defined, offering teachers practical protocols for tool usage.

Second, policy execution must be streamlined and localized. While aligning with national strategies, local education departments should tailor implementation strategies to fit local contexts. This requires refining policy content and optimizing implementation pathways to overcome the "last-mile" challenge of turning policy into action, ensuring feasibility and effectiveness at the school level.

Third, resource systems should be developed and successful models disseminated. To support implementation, a national GenAI teaching resource bank covering diverse grade levels and subjects should be established. Meanwhile, pilot schools should be encouraged to document replicable and scalable GenAI teaching cases. By extracting best practices and pedagogical patterns [21], a national case repository can be built to support school-based adaptation and innovation, fostering a positive ecosystem for GenAI integration.

4.2 School-Based Support: Building Professional Development Platforms and Collaborative Culture

Teacher professional growth relies not only on high-quality digital resources but also on coordinated school-level efforts that bring together universities, research institutes, and tech enterprises. Schools should construct integrated teacher development support networks that combine resource consolidation, competency development, and pedagogical innovation.

First, schools should establish dedicated training platforms to enhance teacher capacity. These GenAI professional development platforms should integrate expert mentorship, case-based resources, and hands-on simulations. Through workshops, model lessons, and peer observations, teachers can deepen their understanding of GenAI's technical principles, educational applications, and associated risks, thereby enhancing both technical and ethical literacy. Training must be grounded in authentic classroom tasks—lesson design, assessment criteria, interaction strategies—to ensure relevance. Embedding these trainings into ongoing professional learning systems, with regular updates and follow-ups, will facilitate knowledge transfer into practice. Virtual simulations can further support the transition from theory to instructional application.

Second, schools must foster a culture of collaboration and mutual support. Beyond material support, an open and inclusive professional culture should be cultivated. Establishing GenAI teaching communities can facilitate collaborative lesson planning, reflective inquiry, and innovation. Institutions should protect time and energy for such work, while offering hybrid platforms (online/offline) for resource sharing, peer feedback, and joint problem-solving. Activities like model lesson competitions and collaborative research projects can enhance intrinsic motivation, fostering a virtuous cycle from individual exploration to collective innovation.

Third, incentive systems must be improved to encourage pedagogical experimentation. To inspire teachers to actively explore GenAI-integrated instruction, schools should establish robust incentive mechanisms. For instance, "AI+Education" innovation grants can provide funding, time, and technical support for classroom experimentation. Teachers' GenAI-related innovations should also be incorporated into performance evaluations, with preferential consideration in promotion and awards. Exemplary cases should be publicized to create role models. Additionally, schools should systematically document and curate teaching outcomes to develop internal case repositories and knowledge bases, facilitating sustained innovation and knowledge dissemination.

4.3 Teacher Agency: Strengthening Subjectivity and Upholding Educational Purpose

While GenAI expands instructional possibilities with its efficiency and power, it also risks weakening teacher agency and undermining professional judgment. Therefore, teachers must not only adapt to the new technological environment but also reaffirm their core educational purpose and professional autonomy.

First, teachers should take proactive steps to enhance their professional literacy. This includes cultivating a *conscious awareness* of GenAI's potential to empower practice. Teachers should adopt an open attitude, actively engage in foundational GenAI and AI ethics training, and apply tools like DeepSeek to optimize lesson design, improve efficiency, and promote reflective practice. For example, a teacher may draft an initial lesson plan, generate an alternative using DeepSeek, and then compare the

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two to identify new structures or creative ideas. This comparative process can inspire revisions and elevate instructional quality.

Second, teachers must use GenAI dialectically, asserting their pedagogical subjectivity. They must avoid equating GenAI output with verified knowledge and instead approach it with critical and ethical discernment. Teachers should actively collaborate with GenAI to reconstruct existing knowledge systems and generate new ones. They must verify whether GenAI-generated cases align with curricular objectives and tailor content to student readiness, thereby enhancing adaptability and pedagogical creativity. For instance, in a history lesson, teachers can use DeepSeek to generate background and debate perspectives on an event, then filter and reframe those into provocative discussion prompts to foster student argumentation and reflection.

Third, teachers must remain grounded in *education for the whole person* and provide moral leadership. GenAI tools should serve as scaffolds for student learning—not definitive answer providers [16]. Teachers must also remain emotionally invested and value-driven, especially in areas such as personal development and moral reasoning. For example, in writing instruction, teachers might adopt a "AI–teacher co-assessment" model: DeepSeek provides initial grammatical and structural feedback, followed by the teacher offering personalized commentary on emotional depth and thematic insight. Students can then share their writing intentions and reflections, facilitating deeper teacher–student connection and emotional resonance.

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