TEACHER READINESS FOR AI-DRIVEN DIGITAL TRANSFORMATION IN CHINESE TVET INSTITUTIONS: A CONCEPTUAL FRAMEWORK FOR EDUCATIONAL ADMINISTRATION

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ABSTRACT
Artificial intelligence (AI) is changing the content, delivery, assessment, and governance of technical and vocational education and training (TVET). In China, revised professional teaching standards now integrate digitalization and AI, yet institutional adoption produces educational value only when teachers can exercise informed professional judgment. This conceptual review examines teacher readiness for AI-driven digital transformation in Chinese TVET institutions from an educational administration perspective, synthesizing research on organizational readiness, AI literacy, digital competence, intelligent technological pedagogical content knowledge, and whole-institution TVET development. Teacher readiness is defined as a dynamic, multilevel state in which educators are willing and collectively able to use, evaluate, adapt, and govern AI for occupationally authentic, pedagogically sound, ethical, and inclusive learning. The framework connects nine teacher-level dimensions—human-centred orientation, change commitment, AI literacy, technical and data competence, pedagogical integration, occupational relevance, assessment capability, ethical judgment, and collaborative professional learning—with six institutional conditions: strategic leadership, infrastructure and support, job-embedded professional development, workload and incentives, school-enterprise collaboration, and data and quality governance. A staged administrative process from diagnosis through capability building, protected experimentation, scaling, institutionalization, and renewal is outlined. The article argues that readiness must be demonstrated through authentic artifacts, observed practice, and learner outcomes rather than inferred from access or self-reported confidence, so administrators should govern AI transformation as a sociotechnical change process developing teacher agency, institutional capacity, and continuous evidence together.
Keywords: Teacher Readiness, AI-Driven Digital Transformation, Educational Administration

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1. INTRODUCTION

Artificial intelligence (AI) has moved rapidly into everyday educational work. Generative systems produce explanations, plans, code, and feedback; predictive systems support decisions; intelligent platforms personalize resources and automate routine processes. In technical and vocational education and training (TVET), these possibilities intersect directly with workplace technologies: teachers may use AI to design simulations, interpret equipment data, assess performance, and connect classroom tasks with changing occupational practice.

China's vocational education system faces particular pressure to respond. Industrial upgrading and intelligent manufacturing require graduates who can collaborate with automated systems while retaining practical judgment and safety awareness. In 2025, the Ministry of Education released 758 new or revised professional teaching standards that explicitly integrated digitalization and AI into professional teaching (Ministry of Education of the People's Republic of China, 2025). The standards provide direction, but the enacted curriculum still depends on teachers interpreting requirements for particular industries, programs, and learners.

The central implementation issue is therefore teacher readiness. Institutions can purchase platforms without changing learning: teachers may use powerful tools only for clerical efficiency, avoid them because rules are unclear, or adopt them without adequate verification and privacy safeguards. Readiness must encompass motivation, knowledge, pedagogy, occupational expertise, ethical judgment, collaboration, and the organizational conditions that make responsible practice feasible.

This literature-based conceptual review develops a framework for educational administrators in Chinese TVET institutions, integrating organizational readiness theory, teacher digital competence, AI literacy, and whole-institution approaches. It asks what readiness should mean in a TVET context, which dimensions constitute it, and how administrators can diagnose, develop, and sustain it. The argument is that readiness is a dynamic relationship between teachers and their work environment rather than a stable trait: effective administration must develop individual capability, collective commitment, and institutional capacity as one system.

2. AI-DRIVEN DIGITAL TRANSFORMATION IN THE CHINESE TVET CONTEXT

Digital transformation is more extensive than digitizing materials: it changes how institutions create educational value, organize work, and learn from evidence. AI intensifies this because it generates content, makes recommendations, and influences decisions. In TVET, transformation touches curriculum mapping, lesson design, simulation, assessment, quality assurance, and school-enterprise coordination. AI also adds new demands: educators must understand probabilistic output, bias, opacity, and hallucination, verify outputs against authoritative sources, protect commercially sensitive information, and redesign tasks so that AI supports inquiry rather than completing work on learners' behalf.

TVET's distinctive mission complicates adoption. Vocational competence combines conceptual understanding, procedural skill, safety, and performance under authentic conditions. Intelligent tutoring and virtual simulation can enrich some learning, but AI-generated answers cannot substitute for embodied practice, tacit knowledge, or accountability in high-risk occupations. Teachers must therefore judge which processes can be augmented and which must remain human-led. Because TVET teachers also belong to occupational communities, their competence must be discipline-specific: a nursing instructor examines clinical safety and confidentiality, a manufacturing teacher understands sensor data and human-machine coordination, and a hospitality teacher evaluates service personalization and cultural bias.

Research on Chinese TVET teachers provides a useful starting point. Xin et al. (2024) tested a digital competence model with 2,514 in-service teachers covering mindset, knowledge and skills, teaching, care and support, and collaboration. Overall competence was moderate to low, individual

and institutional factors both mattered, and regional disparities were evident—cautioning against assuming that national policy or broad access produces uniform readiness.

Chinese TVET institutions also differ in resources, regional economies, enterprise networks, and digital maturity. A national framework should establish common principles while permitting differentiated implementation: institutions in manufacturing clusters may have industry access but face rapid equipment obsolescence, while less-resourced colleges rely on shared national platforms. Administrators must assess local opportunity and risk, avoiding both uniform procurement and low-expectation approaches that reproduce inequality.

3. CONCEPTUALIZING TEACHER READINESS

Readiness is often reduced to positive attitude or intention to use. Acceptance research is valuable: Xu et al. (2024), studying 402 Chinese university educators, found that performance expectancy, effort expectancy, and motivation predicted intention, while facilitating conditions, habit, and intention predicted actual use. Yet use is not equivalent to readiness; a teacher can frequently use AI in ways that are pedagogically weak, occupationally inaccurate, or ethically unsafe.

Organizational readiness theory provides a broader foundation. Weiner (2009) defines readiness through shared change commitment and shared change efficacy: members value the change and believe they can collectively implement it, with efficacy depending on task knowledge, resources, and situational factors. This account fits TVET because AI integration is interdependent—a teacher depends on platforms, policies, technicians, curriculum teams, enterprise partners, and assessment rules—so readiness must be analyzed at both teacher and institutional levels.

AI literacy clarifies the knowledge involved. Long and Magerko (2020) describe competencies for critically evaluating, communicating, and collaborating with AI; Ng et al. (2021) organize AI literacy around knowing, using, evaluating, and ethics; and UNESCO's framework extends this into a human-centred mindset, ethics, foundations and applications, pedagogy, and professional learning across Acquire, Deepen, and Create levels (Miao & Cukurova, 2024). Pedagogical readiness additionally requires integration: Celik's (2023) Intelligent-TPACK connects AI knowledge with pedagogy and content while adding ethical knowledge of transparency, accountability, inclusion, and fairness, preventing the administrative error of treating software-training attendance as evidence of sound instructional design.

Drawing these together, teacher readiness for AI-driven TVET transformation is defined as a dynamic, context-sensitive state in which educators are willing and collectively able to select, use, evaluate, adapt, and govern AI for occupationally authentic, pedagogically sound, ethical, safe, and inclusive learning. The definition includes a capacity for refusal: a ready teacher justifies when AI adds value, when human judgment must prevail, and how risks will be controlled.

4. DIMENSIONS OF TEACHER READINESS

The proposed framework conceptualizes teacher readiness as a human-centred and adaptive capacity rather than merely the ability to use AI tools. Teachers need to view AI as an extension of human learning while maintaining professional responsibility, learner agency, meaningful interaction, and dignity. Readiness also depends on teachers' commitment to change, confidence in their ability to adapt, and psychological safety within the institution. Foundational AI literacy enables teachers to understand how AI systems work, recognize probabilistic and potentially unreliable outputs, and identify hallucinations and bias, while technical and data competence allows them to use approved systems, formulate effective prompts, evaluate outputs, manage privacy settings, and protect sensitive student, enterprise, and assessment data. Beyond technical skills, teachers need AI pedagogical competence to align AI applications with learning outcomes, learner characteristics, and formative feedback. Because AI literacy in teacher education remains underdeveloped (Sperling et al., 2024), professional learning should be embedded in authentic teaching and course-design activities rather than limited to general demonstrations. In the TVET

context, readiness should also include occupational and industry relevance, enabling teachers to evaluate whether AI applications correspond to current workplace practices, professional standards, and safety requirements.

From an educational administration perspective, teacher readiness also requires the capacity to make responsible decisions about assessment, ethics, and collaboration. As AI makes individual learning evidence more difficult to interpret, teachers need to redesign assessment through process records, oral explanation, observation, practical demonstrations, and authentic problem solving, while retaining human oversight for high-stakes decisions. Ethical, legal, and safety judgment is equally important, particularly regarding privacy, intellectual property, bias, accessibility, cybersecurity, and academic integrity. Consistent with UNESCO's (2023) emphasis on human agency, validation, inclusion, and data protection, ethical readiness should be demonstrated through everyday institutional decisions rather than treated as abstract knowledge. Finally, AI readiness should be developed collectively through professional learning communities in which teachers share prompts, lesson designs, errors, evaluation criteria, and practical experiences, while collaborating with technical specialists and industry partners. As Zhong and Juwaheer (2024) emphasize through a whole-institution approach, digital competence is not solely an individual teacher attribute; institutional structures, leadership, collaboration, and shared professional knowledge are essential for sustaining AI-driven digital transformation in TVET institutions.

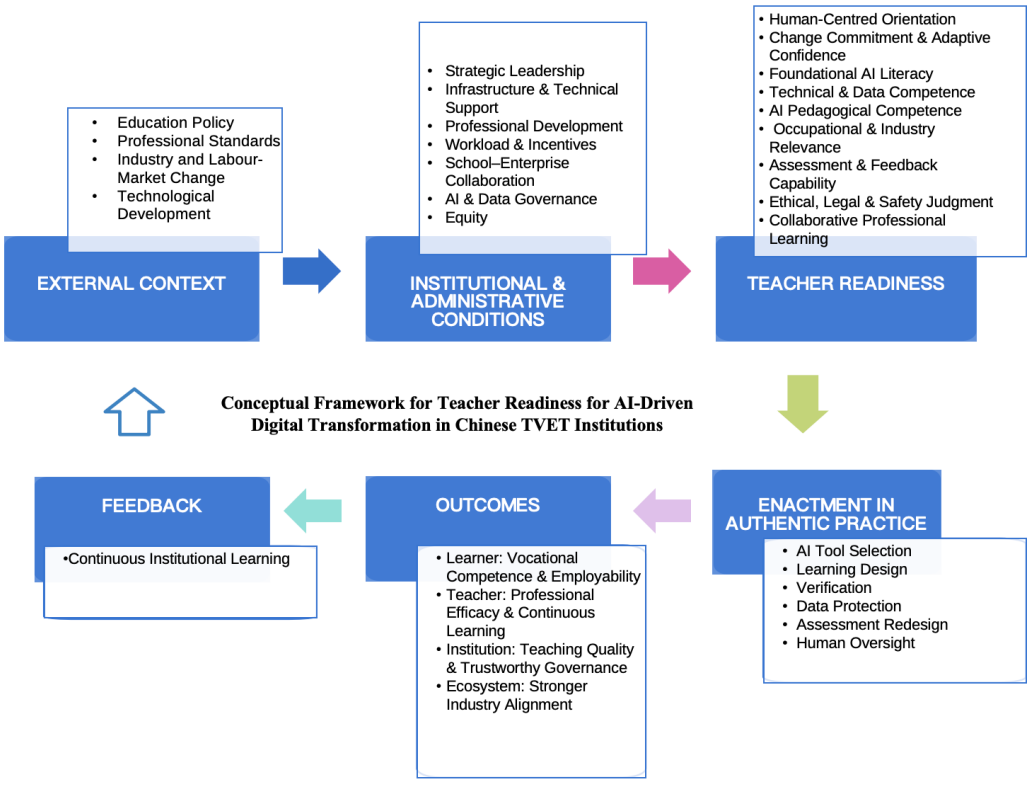
5. INSTITUTIONAL AND ADMINISTRATIVE CONDITIONS

Teacher readiness for AI-driven digital transformation depends not only on individual competence but also on supportive institutional and administrative conditions. Educational leaders should establish a clear strategic direction based on educational and occupational needs, rather than adopting technologies without defined purposes or expected outcomes. This requires reliable and equitable digital infrastructure, appropriate software, cybersecurity, technical assistance, and access to non-AI alternatives. Institutions should also provide sustained and differentiated professional development that responds to teachers' roles, career stages, disciplines, and practical teaching contexts. Although trained teachers may demonstrate higher levels of competence (Xin et al., 2024), professional development should extend beyond training frequency to include opportunities for practical application, peer learning, course redesign, and industry engagement. At the same time, administrators should recognize that AI adoption may initially increase teachers' workload through experimentation, verification, and redesign. Workload arrangements and incentive systems should therefore acknowledge teachers' development efforts and reward meaningful improvements in teaching, collaboration, and ethical practice rather than simply the use of AI tools.

These institutional conditions should function as an integrated system of leadership, collaboration, and governance. School–enterprise partnerships can provide access to current workplace applications, equipment, expertise, and mentors, while educational institutions should ensure that workplace technologies are pedagogically appropriate, safe, and transferable to learning contexts. Clear governance mechanisms are also necessary to regulate AI tools, data use, privacy, procurement, risk assessment, and incident response, with the level of control proportionate to the consequences of different applications. Importantly, equity should be embedded across all institutional arrangements. Administrators need to consider differences among learners, teachers, disciplines, and regions when allocating resources and evaluating AI systems, particularly because disparities in digital competence have already been identified among Chinese TVET teachers (Xin et al., 2024). Therefore, institutional readiness should be understood not as a collection of separate administrative measures, but as a coordinated system that enables teachers to develop, apply, and sustain AI-related capabilities within their professional practice.

6. A CONCEPTUAL FRAMEWORK FOR EDUCATIONAL ADMINISTRATION

The conceptual framework positions teacher readiness as a multilevel and developmental capacity within AI-driven digital transformation. External factors, including educational policy, professional standards, technological development, industry change, and labour-market needs, provide the strategic context for institutional action. These signals are translated through institutional and administrative conditions, including leadership, infrastructure, professional development, incentives, school–enterprise collaboration, governance, and equity. Within this environment, teacher readiness develops as an interconnected set of capabilities covering human-centred orientation, adaptive confidence, AI literacy, technical and data competence, AI pedagogical competence, occupational relevance, assessment, ethical judgment, and collaborative professional learning. These capabilities become meaningful through enactment in authentic teaching and workplace contexts, where teachers select and evaluate AI tools, redesign learning and assessment, protect data, and maintain human oversight. The resulting outcomes influence learners, teachers, institutions, and the wider vocational education ecosystem. Importantly, feedback from practice informs subsequent professional development, institutional decisions, and policy responses, making readiness a continuous cycle of institutional learning rather than a fixed state.



Conceptual Framework for Teacher Readiness for AI-Driven Digital Transformation in Chinese TVET Institutions

Note. The framework is conceptually developed from the synthesis of literature on AI literacy, teacher professional development, organizational readiness, digital leadership, and TVET digital transformation.

7. IMPLICATIONS FOR POLICY AND RESEARCH

For policy, national standards should articulate minimum AI competence and ethical expectations for TVET teachers while supporting sectoral and regional adaptation. Funding should cover professional development, technical support, and evaluation, not only equipment; shared platforms can reduce inequality, but local institutions need authority to contextualize materials, and

certification should recognize progressive readiness from foundational use to pedagogical leadership.

For institutional policy, leaders should separate experimentation from high-stakes deployment and classify uses by educational and data risk. Faculty and students need simple guidance on permitted tools, disclosure, verification, and confidentiality; procurement should require evidence of accessibility, security, and data handling; and policies should protect teacher agency by providing a route to question or refuse unsafe applications.

Future research should validate the framework across vocational schools, higher vocational colleges, and vocational undergraduate institutions in different regions, using longitudinal, multilevel designs that combine self-report with artifacts, observation, and learner evidence. Measurement requires care: existing AI literacy scales differ in purpose and population (Lintner, 2024; Sperling et al., 2024), so a TVET instrument should be occupation-sensitive, should not collapse willingness, knowledge, enacted competence, and institutional conditions into one score, and should test invariance across regions, disciplines, and career stages.

8. CONCLUSION

AI-driven transformation will influence what Chinese TVET institutions teach, how learners demonstrate competence, how teachers work, and how institutions relate to industry. Its value will not follow automatically from policy, platforms, or novelty. Teachers remain the professional agents who interpret occupational change, design learning, verify AI output, and decide when human judgment must prevail; their readiness is therefore a strategic concern for educational administration.

This article has conceptualized readiness as the interaction of nine teacher capacities with six institutional conditions, enacted through authentic practice and evaluated through multilevel outcomes, rejecting the assumptions that readiness is merely a favorable attitude or a product of brief tool training.

The practical task is to build institutions that can learn responsibly: diagnosis before procurement, co-design before mandate, protected experimentation before scale, and continuous evidence after implementation—including the courage to discontinue systems that do not improve learning. When teacher agency and institutional capacity develop together, AI can support more adaptive, inclusive, and industry-relevant vocational education while preserving the human responsibility on which trustworthy education depends.

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