Research on the Transformation of Vocational College Teachers' Roles and Competency Framework from the Perspective of Artificial Intelligence

Siyuan Guo [1,*]

1   Hainan Vocational University of Science and Technology, Haikou, Hainan, China
*   Correspondence: Siyuan Guo, Hainan Vocational University of Science and Technology, Haikou, Hainan, China

Abstract: The rapid advancement of artificial intelligence technology is reshaping the teaching models, educational approaches, and evaluation systems in vocational education, driving its transformation from "traditional skill training" to "cultivating interdisciplinary talents for the intelligent era." As the core educators in vocational institutions, teachers face new challenges and restructuring demands in their role positioning and competency frameworks. Current vocational educators exhibit weaknesses in AI technology application, lack of teaching innovation awareness, and outdated role perceptions, making it difficult to meet the requirements of intelligent education. Based on the intrinsic logic of AI integration with vocational education, this paper analyzes the core directions of teacher role transformation, constructs a four-dimensional competency framework encompassing "technical application literacy + teaching innovation literacy + core educational literacy + lifelong learning literacy," and proposes practical pathways for role transformation. These findings provide theoretical references and practical guidance for faculty development and intelligent education reform in vocational institutions.

Keywords: artificial intelligence; vocational colleges; teacher role transformation; competency framework; intelligent education

1. Introduction

As a core technology driving the new wave of technological revolution and industrial transformation, artificial intelligence has deeply penetrated the education sector, accelerating its digital and intelligent transformation. The "Vocational Education Professional Catalog (2024)" explicitly calls for "deepening the integration of AI with vocational education," while the "New Generation Artificial Intelligence Development Plan" emphasizes the need to "build an innovative AI+Education system." As the primary platform for cultivating technical and skilled talents, vocational education's integration with AI extends beyond updating teaching equipment and technical tools, encompassing comprehensive reforms in teaching philosophies, curriculum systems, instructional models, and teacher roles [1].

Empowered by artificial intelligence, vocational education has witnessed increasingly diverse teaching scenarios [2,3]. The widespread adoption of intelligent teaching platforms, virtual simulation training systems, and AI-powered learning analytics tools has achieved educational goals such as "personalized instruction," "precision-oriented education," and "immersive training [4]." However, as the primary drivers of the teaching process, teachers 'role positioning and competency frameworks have yet to fully align with intelligent education [5]. Currently, vocational school teachers commonly face three major shortcomings: First, insufficient application capabilities in AI technology, with weak operational proficiency in integrating smart teaching tools. Second,

outdated role perceptions, remaining confined to traditional roles like "knowledge transmitters" and "skill trainers," while lacking recognition of new roles such as "learning guides" and "curriculum designers [6]." Third, inadequate teaching innovation capabilities, making it difficult to leverage AI technology for restructuring teaching processes or designing personalized instructional plans [7]. These issues prevent the full realization of AI's educational value, hindering the high-quality development of vocational education [8]. In this context, researching the role transformation and competency frameworks of vocational school teachers from an AI perspective is not only an inevitable requirement to respond to the national intelligent education development strategy, but also a core task in building teaching teams and advancing educational reforms in vocational institutions.

2. Core Directions of the Transformation of Vocational College Teachers' Roles from the Perspective of Artificial Intelligence

The application of artificial intelligence technology has broken the traditional vocational education teaching mode of "teacher-led, classroom-centered, textbook-centered", and promoted the transformation of teachers' role from "single skill transmitter" to "compound education guide", which is embodied in the following four dimensions [9].

2.1. From "Knowledge Transmitters" to "Learning Guides"

In traditional vocational education, teachers have been the sole source of knowledge and skills, primarily responsible for "cramming" instruction. In the AI era, intelligent teaching platforms, online courses, and AI-powered Q&A systems provide students with vast learning resources. Through self-directed searches and personalized recommendations, students can access materials independently, breaking the "knowledge monopoly" held by teachers [10]. This transformation shifts educators 'roles into "learning facilitators": First, they accurately identify student needs by using AI-based learning analytics tools to assess foundational knowledge, skill gaps, and learning preferences, then develop personalized study plans [11]. Second, they guide learning directions by helping students select quality resources, clarify objectives, and avoid aimless study. Third, they resolve learning challenges through targeted guidance on complex issues and practical difficulties encountered during self-directed learning, thereby stimulating students' initiative and creativity.

2.2. From "Course Implementer" to "Intelligent Course Designer"

In traditional vocational education, instructors typically follow rigid curriculum standards and textbooks, lacking autonomy in course design and innovation. In the AI era, vocational institutions face digital, modular, and personalized curriculum restructuring. Teachers must assume the role of "intelligent curriculum designers" through four key approaches: First, reconstructing course content based on industry demands and AI advancements by integrating AI-related knowledge and skills into specialized programs-such as adding "Industrial Robot Programming and Maintenance" to mechanical engineering or incorporating "Smart Financial Systems Application" into accounting. Second, utilizing AI-driven curriculum design tools to create modular, customizable systems that cater to diverse student learning needs [12]. Third, designing immersive, practice-oriented teaching environments by combining virtual simulation technology and AI training systems to develop "virtual factories" and "digital workshops," enhancing both practicality and engagement. Fourth, dynamically optimizing course content through timely updates aligned with technological innovations and AI tool upgrades, ensuring curriculum relevance and adaptability.

2.3. From "Skill Trainer" to "Innovation Practice Instructor"

The core mission of vocational education is to cultivate students 'technical skills and innovative practical abilities. While AI technology provides robust support for achieving this goal, it also demands higher instructional capabilities from educators. Teachers are transitioning from traditional "skill trainers" to "innovation facilitators" through four key approaches:

1) Utilizing AI training systems for precision skill development - employing virtual simulation technology to replicate complex operational scenarios, enabling students to practice repeatedly, mitigate risks, and enhance proficiency;

2) Guiding interdisciplinary innovation projects that integrate AI with professional skills, such as developing smart products or optimizing digital manufacturing processes, thereby fostering creative thinking and cross-domain application abilities;

3) Teaching students to apply AI tools for real-world problem-solving, including using big data analytics to streamline production workflows and AI design software to improve product efficiency, thereby developing problem-solving and technical application skills;

4) Establishing innovation platforms through participation in entrepreneurship competitions and real-world corporate R&D projects, facilitating students' evolution from "skill masters" to "innovative practitioners".

2.4. From "Achievement Evaluators" to "Comprehensive Literacy Assessors"

Traditional vocational education evaluation primarily relies on "skill assessments + written exams," featuring monotonous content and rigid methods that fail to comprehensively reflect students 'holistic competencies. In the AI era, educators' evaluation roles have transformed into "holistic competency assessors": First, utilizing AI-powered tools like intelligent learning analytics systems and skill operation sensors to collect comprehensive data on students 'learning processes-including attitudes, skill mastery, and innovative achievements-achieving an organic integration of "formative and summative evaluations." Second, establishing a holistic competency evaluation system that transcends single-skill assessments by incorporating professional ethics, teamwork, communication skills, and lifelong learning capabilities to fully reflect students' comprehensive qualities. Third, implementing personalized evaluation feedback by generating targeted reports based on student data to identify strengths and weaknesses, providing guidance for individualized development. Fourth, promoting effective application of evaluation results by using assessment data as critical references for curriculum optimization, teaching improvement, and student cultivation, thereby achieving a closed-loop management system of "evaluation-feedback-optimization [13]."

3. Construction of Four-Dimensional Literacy Framework for Vocational College Teachers from the Perspective of Artificial Intelligence

Based on the core direction of the teacher role transformation, combined with the need of the integration of artificial intelligence and vocational education, the four-dimensional literacy framework of "technology application literacy + teaching innovation literacy + core literacy of education + lifelong learning literacy" is constructed to provide clear guidance for the improvement of the literacy of teachers in vocational colleges.

3.1. Technical Application Literacy: The Foundation of Intelligent Teaching

Technical literacy is the prerequisite for teachers to implement intelligent teaching and the core foundation for role transformation. It primarily encompasses three dimensions: First, AI technology awareness, requiring teachers to understand the fundamental principles, core technologies, and development trends of artificial intelligence, as well as be familiar with intelligent teaching tools and platforms such as virtual simulation systems, AI learning analytics tools, and smart lesson preparation

platforms. Second, intelligent tool operation skills, enabling proficient use of various teaching tools including virtual simulation training equipment, AI design software, and big data analytics tools to achieve deep integration between technology and instruction. Third, technical integration application capabilities, allowing teachers to select appropriate intelligent technologies and tools based on teaching objectives and content, designing "technology + teaching" integration solutions such as optimizing instructional strategies with AI learning analytics tools or conducting practical training through virtual simulation technology. Fourth, technical ethics and security literacy, fostering awareness of AI ethics, guiding students to use AI tools correctly, mitigating risks like technological abuse and data breaches, and cultivating students' technical ethics and information security awareness.

3.2. Teaching Innovation Literacy: The Core Competence of Intelligent Education

Teaching innovation literacy is pivotal for educators to adapt to intelligent education and transform their roles, encompassing four key dimensions: 1) Conceptual innovation in pedagogy, breaking free from traditional teaching frameworks to embrace student-centered approaches, personalized education, and innovation-driven methodologies that align with smart education requirements; 2) Curriculum design innovation, demonstrating modular and digital course development capabilities to leverage AI tools for content restructuring, scenario design, and process optimization, thereby creating high-quality courses for the intelligent era; 3) Teaching model innovation, innovatively adopting project-based learning, immersive teaching, and personalized instruction by integrating smart technologies with educational content to enhance instructional effectiveness and engagement; 4) Research innovation in pedagogy, conducting studies on AI-integrated teaching to explore new methodologies, summarize teaching experiences and innovations, and drive continuous improvement in educational quality.

3.3. Core Competencies in Education: The Essential Requirements of Moral Education

Cultivating virtue and nurturing talent stands as the fundamental mission of education. In the AI era, teachers 'core competencies in education not only preserve traditional professional ethics but also integrate contemporary features of intelligent education, encompassing four key aspects: First, noble professional ethics-possessing steadfast ideals, moral integrity, caring for students, serving as role models, and guiding students to establish correct worldviews, life perspectives, and values. Second, profound humanistic literacy-possessing solid humanistic knowledge and emotional awareness, integrating cultural heritage, social responsibility, and ecological conservation into AI-based teaching to cultivate students' humanistic qualities and sense of social responsibility. Third, strong communication and collaboration skills-effectively communicating with students, colleagues, enterprises, parents, and other stakeholders to build collaborative education platforms and form synergistic educational efforts. Fourth, precise educational capabilities-utilizing AI tools to understand students 'psychological characteristics and growth needs, providing targeted ideological guidance, psychological counseling, and career planning to promote students' all-round development.

3.4. Lifelong Learning Literacy: A Long-term Guarantee for Adapting to Change

The rapid advancement of artificial intelligence technology and the ongoing transformation of vocational education require vocational school teachers to cultivate lifelong learning competencies, enabling them to synchronize their capabilities with contemporary developments. This encompasses three key dimensions: First, proactive learning awareness - recognizing the urgency of enhancing teaching skills in the AI era, embracing lifelong learning principles, and actively tracking cutting-edge trends in AI technology and vocational education. Second, self-directed learning capacity - the ability to independently acquire, integrate, and apply knowledge through diverse channels such

as online courses, academic exchanges, and industry internships, mastering AI technologies, pedagogical innovations, and industrial skills. Third, continuous reflection and iteration capability - regularly evaluating teaching practices, role positioning, and competency gaps, and continuously optimizing knowledge structures and skill systems to meet evolving demands and student needs, thereby achieving sustained growth and iterative upgrades.

4. Practical Path of the Transformation of Vocational College Teachers' Roles from the Perspective of Artificial Intelligence

4.1. Building a Diversified Training System to Enhance Teachers' Technical Application and Teaching Innovation Capabilities

Vocational institutions should address teachers 'competency gaps by establishing a diversified training system that combines "tiered categorization, online-offline integration, and theory-practice synergy." First, implement tiered training programs tailored to educators' teaching experience, disciplinary backgrounds, and technical proficiency, with three levels: foundational (AI technology basics and applications), intermediate (intelligent course design and innovative teaching models), and advanced (AI+ education research and practical innovation) to enhance targeted training. Second, diversify training content and formats, covering AI fundamentals, smart teaching tool operations, intelligent course design, pedagogical innovation, and technical ethics. The blended approach of "online courses + hands-on training + industry internships + academic exchanges" ensures practical effectiveness. Third, establish training platforms through partnerships with AI companies and universities to create teacher development centers equipped with advanced smart teaching devices and training systems. Fourth, implement evaluation and incentive mechanisms linking training outcomes to faculty promotions, performance reviews, and recognition awards, thereby motivating teachers' active participation in professional development.

4.2. Deepening Industry-Education Integration and Enhancing Teachers' Innovation-Practical Competence and Industry Adaptability

The integration of industry and education serves as the core feature of vocational education and a key pathway to enhance teachers 'innovative practical capabilities. First, it promotes teachers' in-depth engagement with enterprises through the establishment of an "Enterprise Practice System for Teachers," requiring educators to complete at least three months of on-the-job training annually. This involves participating in corporate production operations, technological R&D, and project development, enabling them to understand industrial technological innovations and AI applications while accumulating practical experience. Second, it fosters collaborative talent development platforms by partnering with AI enterprises and industry leaders to establish industry colleges and intelligent training bases. Teachers and corporate technical personnel jointly conduct teaching, research, and project development, thereby improving teachers 'industry adaptability and innovation guidance capabilities. Third, it leverages high-quality corporate resources by inviting technical experts and AI professionals to serve as part-time instructors. These faculty members collaborate with university teachers to form teaching teams, participating in curriculum design, instruction, and practical training, achieving "mutual faculty exchange and resource sharing between schools and enterprises." Fourth, it advances school-enterprise collaborative research by organizing joint research projects between teachers and corporate technicians to address technical challenges and AI application needs. The research outcomes are then transformed into teaching materials and practical projects, enhancing teachers' ability to convert research into teaching innovations and improve their teaching innovation capabilities.

4.3. Refining Evaluation and Incentive Mechanisms to Guide Teachers' Proactive Transformation and Competency Enhancement

A scientific evaluation and incentive mechanism serves as a crucial safeguard for driving teachers 'role transformation and competency enhancement. First, establish an AI-era teacher evaluation system that breaks through traditional evaluation orientations emphasizing "research over teaching" and "papers over practice". Key evaluation indicators should include AI application capabilities, innovative smart teaching achievements, student competency improvement outcomes, and industry service contributions, comprehensively reflecting teachers' overall capabilities and educational effectiveness. Second, optimize evaluation methods by adopting a multi-dimensional approach combining "self-assessment by teachers + student evaluations + peer reviews + industry assessments + expert evaluations" to ensure objectivity and comprehensiveness of results. Third, strengthen feedback and application of evaluation outcomes through regular feedback to teachers, helping them identify weaknesses and improvement directions. Use evaluation results as critical references for teacher training, professional development, title promotions, and performance evaluations, creating a virtuous cycle of "evaluation-feedback-improvement". Fourth, establish incentive mechanisms such as awards for AI-integrated teaching innovations and smart teaching achievements, recognizing teachers who excel in role transformation, AI applications, and innovative practices to stimulate their intrinsic motivation for proactive transformation.

4.4. Establishing an Exchange and Sharing Platform to Facilitate Mutual Learning and Collaborative Growth Among Teachers

Building an exchange and sharing platform serves as an effective approach to promote mutual learning and collective improvement among teachers. First, establish an on-campus exchange platform by regularly organizing intelligent teaching seminars, teaching achievement exhibitions, and AI technology application sharing sessions. These activities encourage teachers to share their experiences, achievements, and challenges in intelligent education, fostering mutual learning and collaborative progress. Second, expand inter-school exchange channels by establishing partnerships with other vocational colleges. Conduct exchanges on intelligent education reform, teacher visits, and teaching resource sharing to learn from advanced practices and broaden teachers' perspectives. Third, utilize online exchange platforms to create a national-level intelligent education exchange platform for vocational colleges. This platform integrates high-quality teaching resources, training courses, and practical cases, providing teachers with anytime, anywhere learning and communication opportunities. Fourth, encourage teachers to participate in industry exchanges by organizing attendance at artificial intelligence education forums and vocational education innovation conferences. These events allow teachers to engage with industry experts and peers, exchanging the latest trends and cutting-edge concepts to align their professional development with industry advancements.

5. Conclusion and Outlook

The advancement of artificial intelligence technology has created unprecedented opportunities for vocational education, while also raising new demands for the role positioning and competency structure of vocational school teachers. As the core educators in vocational training, teachers' role transformation is crucial for the deep integration of AI and vocational education, and serves as the cornerstone for its high-quality development. From an AI perspective, vocational school teachers must undergo a four-dimensional role transition: evolving from "knowledge transmitters" to "learning facilitators," from "curriculum implementers" to "AI-driven curriculum designers," from "skill trainers" to "innovation practice mentors," and from "performance evaluators" to "comprehensive competency assessors." Simultaneously, they must cultivate four core

competencies: technical application proficiency, teaching innovation capability, core educational competencies, and lifelong learning literacy.

The transformation of teachers 'roles and the enhancement of their competencies require coordinated efforts from multiple stakeholders including vocational colleges, government agencies, enterprises, and individual educators. Vocational institutions should establish diversified training systems, improve evaluation and incentive mechanisms, and create collaborative platforms. Governments must introduce supportive policies and provide resource guarantees. Enterprises need to actively participate in teacher development by offering practical training platforms. Educators themselves should embrace lifelong learning concepts and proactively engage in professional transformation. As artificial intelligence technology continues to advance and vocational education reforms deepen, teachers' roles and competencies will undergo continuous evolution. It is essential to stay attuned to emerging trends and demands in AI-integrated vocational education, continuously refine role transformation pathways and competency frameworks, and drive the development of vocational faculty teams and intelligent education reforms. This will cultivate more versatile, innovative technical and skilled talents to support industrial upgrading and high-quality socio-economic development.

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