

AI-Enabled Vocational Education: Teacher Role Reshaping and Competency Enhancement Paths

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Abstract: With the rapid development of Artificial Intelligence (AI) technology, the traditional role of teachers in vocational colleges and universities is undergoing profound changes. Combining the theory of educational technology integration and the theory of personalized learning, this study systematically explores the transformation of teachers' roles, including from knowledge transmitters to learning facilitators, from teaching evaluators to data analysts, from curriculum designers to technology integrators, and from classroom managers to learning community builders. Through literature analysis and case study methodology, the key competency requirements of teachers in these new roles are analyzed in depth and specific competency enhancement strategies are identified. These strategies include systematic theoretical learning, technology application practice, reflective improvement, and peer communication and sharing, aiming to help teachers effectively improve their teaching quality and professional competence while coping with the challenges of AI technology. The results of the study show that through the implementation of rational strategies, teachers are not only better able to adapt to the new technological environment, but also play a greater role in the sustainable development of vocational education.

Keywords: Vocational Education; AI Technology; Teachers; Roles; Competencies

1. Introductory

With the rapid development of AI technology, the global education field, especially the field of vocational education, is experiencing profound changes. AI technology not only shows great potential in improving the quality and efficiency of education, but also becomes an important driving force to promote changes

in the supply of education, the teaching form and the education ecology. In modern society, vocational education is becoming more and more important as a key way to cultivate skilled personnel and promote economic development. However, the introduction of generative AI technology is revolutionizing the traditional teaching methods and educational scenarios, and the role of teachers is facing unprecedented challenges and opportunities.

The application of AI technology not only significantly improves the quality of teaching, but also profoundly affects teachers' teaching methods and responsibilities. Although studies have been conducted to explore the application of generative AI in higher education and the risks it poses, most of them have focused on the higher education sector, while the exploration of the reshaping of teachers' roles and enhancement of their competencies in the vocational education environment has been more limited. There is a particular dearth of path analysis and empirical data from existing studies on the transformation of teachers from knowledge transmitters to learning facilitators, data analysts, technology integrators, and learning community builders, which makes research on the transformation of teachers' roles in vocational education all the more important.

While the existing literature has extensively explored the role of AI technology in enhancing educational quality and teaching efficiency, there is still a lack of in-depth research on the transformation of teachers' roles and their competence enhancement paths in the field of vocational education. Li Yunfu and Wang Fei (2024) point out that the key to reforming higher education in the age of AI lies in improving teachers' digital literacy and technology application ability, and this viewpoint also applies to vocational education[1]. Xunyu (2024), on the other hand, emphasized the potential of generative

AI in narrowing the gap between urban and rural educational resources and promoting educational equity[2]. However, most of these studies remain at the theoretical level and have yet to provide clear implementation paths and empirical support for how to achieve these goals in a vocational education setting, especially in terms of teacher role reshaping and competency enhancement.

In order to fill this research gap, this study aims to systematically analyze how AI technology empowers the professional development of teachers in vocational colleges and universities, focusing on the process of the transformation of teachers' roles and the challenges they face, and proposing corresponding paths of competence enhancement and strategic recommendations. By focusing on the unique teaching context of vocational education, this study will provide empirical data support for the in-depth application of AI technology in vocational education and contribute to the theoretical and practical basis for promoting the sustainable development of vocational education.

2. Traditional Roles of Teachers in Vocational Institutions

In traditional vocational education, teachers play diverse and critical roles. They are not only knowledge transmitters, but also curriculum designers, instructional evaluators, classroom managers, and mentors. The responsibilities of these roles are critical to student growth and career development.

2.1 Knowledge Transmitters

Traditionally, the core task of teachers focuses on delivering specialized knowledge and skills, using classroom instruction, hands-on exercises and case studies to help students acquire key knowledge and skills. However, with the integration of AI technologies, teachers are faced with the challenge of learning novel teaching means and tools, covering virtual reality technologies and AI systems, aiming at personalized customization of teaching. As an example, Shenzhen Institute of Vocational Technology (SZIVT) has successfully introduced AI technology to build a virtual laboratory environment, which enables students to complete experimental operations in simulated situations and effectively enhances their practical skills[3]. In

addition, studies have shown that the application of virtual reality technology in education significantly improves student learning and engagement[4].

2.2 Course Designers

As curriculum designers, teachers must conceptualize teaching content with practical significance based on educational goals and industry trends. However, the traditional approach to curriculum development is relatively rigid and homogenous, making it difficult to respond quickly to the emergence of new technologies and the constant changes in market demand. AI technologies can provide students with personalized learning paths and intelligent Q&A, but this requires teachers not only to understand and apply these technologies, but also to be able to effectively integrate them into their curriculum design. Tianjin Vocational and Technical Teachers' University has begun to use AI systems to customize personalized learning plans for students, improving the flexibility and relevance of curriculum design. Related studies also point out that the application of AI technology in curriculum design can significantly improve the flexibility and relevance of the curriculum[5].

2.3 Teaching Evaluators

Traditional teaching assessment methods rely on subjective judgment and manual grading, which are time-consuming and susceptible to subjective factors. The application of AI technology allows teachers to conduct accurate assessment through big data analysis. For example, Beijing Electronic Science and Technology Vocational College uses an AI system to automatically collect and analyze students' learning data and provide real-time feedback to help teachers adjust their teaching strategies in a timely manner. This not only improves the objectivity and fairness of assessment, but also provides new opportunities for teachers' professional development. Literature shows that the application of big data analytics in teaching assessment can significantly improve the accuracy and efficiency of assessment[6].

2.4 Classroom Managers

Teachers need to effectively manage students' learning and life while performing their

teaching duties. However, with the popularization of online education, teachers need to communicate with and instruct students through online platforms to overcome time and space constraints. Zhejiang Finance Vocational College has built a personalized learning platform using AI technology, through which teachers can track students' learning progress in real time and provide timely help and support to students. The study points out that the application of online platforms in classroom management can effectively improve the management efficiency of teachers and the learning effect of students[7].

2.5 Mentors

As instructors, teachers need to provide students with personalized learning counseling and career planning guidance. AI technology can provide personalized learning advice through learning analytics, but this also requires teachers to be able to interpret this data and provide personalized guidance based on students' different needs. For example, Guangzhou City Vocational College uses AI technology to analyze students' learning data to help teachers develop personalized tutoring plans, which improves the relevance and effectiveness of guidance. The literature suggests that personalized learning advice systems can significantly improve student learning outcomes and satisfaction[8]. However, these traditional roles are facing new challenges with the rapid development of AI technology. AI technology not only changes the way teachers work, but also requires teachers to redefine and reshape their roles with the support of new technologies. This shift presents unprecedented opportunities and challenges for teachers, requiring them to be more than just knowledge transmitters; they need to be learning facilitators, data analysts, technology integrators, and learning community builders.

3. The Changing Role of Teachers in Vocational Colleges Empowered by AI and the Challenges They Face

As AI technology continues to evolve in education, the traditional role of teachers in vocational institutions is facing significant challenges. The use of AI technology in classroom instruction, such as intelligent

lectures, automated grading, and personalized learning guides, has shaken the teacher's central role in knowledge transfer[9]. The following section explores the specific impact of AI technologies on the role of the teacher, real-world examples, and the challenges faced in the transformation process.

3.1 Transformation of Knowledge Transmitters to Learning Facilitators

Within the traditional education system, teachers often play the role of knowledge transmitters. However, with the integration of AI technology and the revolution of educational concepts, the role of teachers is gradually changing from a single knowledge transmitter to a facilitator of the learning process. The evolution of this role not only requires teachers to continue to take on the task of imparting knowledge, but also emphasizes the importance of personalized learning needs of students, designing personalized learning programs, and planning personalized learning paths and resources based on the needs of each student. For example, Shenzhen Vocational and Technical College utilizes smart classroom and virtual lab technologies to not only engage students more actively in learning, but also enhance their learning experience. By analyzing students' process-based learning data, the AI system is able to recommend the most suitable learning resources and methods to help students achieve personalized learning[10]. This role change requires teachers to master and flexibly use various AI tools to analyze and interpret student data, and personalize teaching design according to students' needs. However, not all teachers are sufficiently technologically literate, which poses a huge challenge to their ability to apply and adapt technology.

3.2 Shift from Instructional Evaluators to Data Analysts

In traditional education, teachers usually assess students' learning effectiveness through personal judgment and manual marking, which is time-consuming, labor-intensive and susceptible to subjective bias, making it difficult to ensure impartiality. With the introduction of AI technology, teachers' roles are transforming from assessors to data analyzers, a change that improves the quality

of teaching and promotes teachers' professional development. For example, Beijing Electronic Science and Technology Vocational College uses AI systems to automatically collect and analyze students' grades, classroom performance and online activities to comprehensively assess learning outcomes and develop personalized teaching strategies. This requires teachers to not only master AI tools for data collection and analysis, but also have the ability to interpret data to make sound teaching decisions, thus enhancing cognitive and technical skills.

3.3 Shift from Curriculum Designer to Technology Integrator

In traditional teaching, teachers are responsible for designing and executing lessons, including setting goals, developing programs, selecting content, and planning activities. With the widespread use of AI technology, teachers' roles are transforming from curriculum designers to technology integrators. For example, Tianjin Vocational and Technical Teachers' University uses AI systems to customize personalized learning plans for students, and teachers analyze student data to develop more accurate teaching plans. In this transition, teachers face the challenge of effectively integrating multiple technologies into the curriculum, such as technology compatibility, application effectiveness, and student acceptance. This requires teachers to be technologically adaptable and motivated for continuous learning in order to function effectively in the new environment[11].

3.4 Moving from Classroom Managers to Learning Community Builders

In traditional teaching and learning environments, the role of the teacher is often focused on managing the classroom and maintaining discipline. However, with the continued advancement and popularization of AI technology, the role of teachers in vocational institutions is undergoing a profound transformation. Teachers are gradually changing from classroom managers to learning community builders. For example, Zhejiang Finance Vocational College has built a personalized learning platform through AI technology, where teachers can share diverse learning resources, conduct online seminars and tutorial activities, and promote

collaborative interactions among groups of students. This shift requires teachers to master the skills of using online platforms, and to be able to effectively organize and manage an online learning community that promotes interactions between teachers and students and the sharing of resources. This places new demands on teachers' organizational and management skills and their ability to apply technology.

4. Paths for Improving the Competence of Teachers in vocational Colleges and Universities

With the deeper application of AI technology in education, the roles and competency needs of vocational education teachers are undergoing significant changes. In AI-enabled educational scenarios, teachers are challenged to transition to new roles that span learning facilitators, data analysts, technology integrators, and learning community builders. These emerging roles place a higher level of demand on teachers' professionalism. This study aims to explore the key competencies of these roles in detail and design competency enhancement strategies accordingly, with the aim of helping teachers to be more effective in these emerging roles.

4.1 Capacity Analysis

4.1.1 Competency requirements for learning facilitators

As learning facilitators, teachers should use AI technology to thoroughly understand each student's individual learning needs and barriers to learning. This role involves collecting and parsing student performance data to design precise, individualized lesson plans. Teachers must be familiar with the operation of the AI system and utilize its instant feedback mechanism to flexibly adjust their teaching strategies to assist students in overcoming learning barriers. For example, the smart classrooms and virtual labs deployed by the Shenzhen Vocational College of Technology are able to analyze students' classroom interaction data and plan personalized learning paths for students based on these data analyses, which effectively enhances the effectiveness of teaching and learning.

4.1.2 Data analyst competency requirements

As data analysts, teachers need to master the acquisition and in-depth analysis techniques of

educational data, which is the most basic requirement. In addition, teachers need to apply advanced analytical tools to thoroughly analyze student learning data. This covers the entire process from data collection to analyzing student learning paths to discover hidden problems and adjusting teaching methods based on these insights. For example, Beijing Electronic Science and Technology Vocational College uses AI systems to automatically collect and analyze students' homework grades and classroom behaviors, helping teachers more accurately assess learning outcomes and design personalized teaching plans. Therefore, proficiency in data analytics tools, in-depth understanding of data analytics principles, and the ability to flexibly apply data in practice constitute the key qualities required for this role.

4.1.3 Competency requirements for technology integrators

As technology integrators, they are faced with the challenge of organically integrating multiple educational technology tools into their teaching and learning activities, aiming to enhance the effectiveness of teaching and learning through such integration strategies. Teachers need to master a variety of AI-driven teaching platforms and tools, such as virtual labs and learning management systems, and be able to flexibly apply these tools to meet the needs of different students. For example, Tianjin Vocational and Technical Teachers' University analyzes students' learning data and develops personalized teaching plans through smart technologies, thus significantly enhancing students' learning outcomes. This requires teachers to be skilled not only in technological tools, but also in integrating resources to support continuous innovation and improvement in teaching.

4.1.4 Competency requirements for learning community builders

As learning community builders, teachers need to utilize AI technology to build and manage online learning systems and virtual learning communities. These platforms not only expand the space for learning, but also ensure the continuity and interactivity of learning activities. Teachers must understand the theory of social constructivism and promote cooperation and knowledge sharing among students through effective organizational management and technology application. For

example, through the creation of a virtual learning community in Zhejiang Finance Vocational College, teachers are able to engage in reflective dialogue and professional guidance, continuously optimize teaching methods, and promote the overall development of students.

In summary, vocational college teachers need to possess four key competencies, namely, personalized instructional design, data analysis, technology integration, and learning community building, in the process of transitioning from traditional to new roles. Enhancing these competencies requires synthesizing multiple strategies and focusing on the interconnections and holistic frameworks among the strategies.

4.2 Enhancement Strategies

With the rapid development of AI technology in education, the roles and competency needs of teachers in vocational institutions are changing significantly. In order to better adapt to the AI-enabled educational environment, teachers need to shift from their traditional roles to become learning facilitators, data analysts, technology integrators, and learning community builders. To this end, developing and implementing comprehensive strategies to help teachers function better in these new roles is a key task in the current development of vocational education.

4.2.1 Enhancing the capacity of learning facilitators for personalized instructional design

Improving personalized instructional design capabilities is an important part of AI-enabled vocational education. Personalized instructional design refers to the development of optimized learning programs based on students' needs, interests, learning styles and abilities. For this reason, teachers need to deeply understand the theory of personalized learning, master its core concepts, and apply them to instructional design.

Teachers can learn relevant courses through online platforms (e.g., Mucon.com, Scholastic Online) to get theoretical support. The use of AI tools (e.g., intelligent recommendation system, virtual experiment scenarios, data analysis software) to analyze the data of students' learning behaviors helps to design more personalized teaching programs. This not only improves the ability to apply theories, but

also enhances the technical level of teachers. In addition, teachers should actively participate in academic exchanges to share and learn from the experiences of their peers, understand the latest research results, and establish a feedback mechanism to optimize the teaching design on a regular basis. Through practice and reflection, teachers can continuously improve the quality of teaching and better meet the individual needs of students.

4.2.2 Enhancing the data analyst's data analysis skills

The ability to analyze data is key for teachers to improve the quality of teaching in AI-enabled vocational education. It includes the comprehensive ability to collect, process, interpret and utilize data. In order to improve this ability, teachers need to systematically learn data analysis theories, master related tools, and make practical applications in teaching. First of all, teachers should understand the application of educational data mining (EDM) and utilize data to reveal problems in students' learning and intervene effectively so as to enhance teaching effectiveness. To this end, teachers can learn data analysis courses through online platforms (e.g., Catechism.com, NetEase Cloud Classroom, etc.), which cover basic theories, methods and practical cases. Secondly, mastering data analysis tools such as SPSS, R language, Python, etc. is the key to improving competence. These tools can help teachers deal with big data, perform statistical analysis and data visualization, and deeply analyze students' learning behaviors so as to optimize teaching strategies. For example, using SPSS to analyze test data, using R to chart learning progress, or Python to predict student performance and personalize interventions in advance. Finally, reflection and communication are also important ways to improve data analysis skills. Teachers can participate in teacher communities or academic conferences to share and learn from data analysis experiences to further optimize their teaching methods.

4.2.3 Enhancing the technology integration capacity of technology integrators

Technology integration competence is key for teachers to optimize the teaching and learning process in AI-enabled vocational education, referring to the effective integration of AI

technologies with existing teaching methods and resources. Enhancing this competency requires drawing on educational technology integration theories (e.g., TPACK) and continuous improvement through real-world projects, self-directed learning, and reflective communication. First, TPACK theory helps teachers understand the integration of technology, pedagogy and subject content, which is the basis for improving technology integration competence. Teachers can learn relevant courses through platforms such as Mootool.com and Scholastic Online to master the theory and implementation strategies of technology integration. Secondly, it is crucial to verify and improve skills through actual teaching projects. Teachers can use AI tools such as Wisdom Tree and Superstar Learning Access to design personalized learning paths, or adjust teaching strategies in real time through technologies such as AliCloud DataWorks. Such projects provide hands-on opportunities that help accumulate experience and optimize the application of technology. In addition, independent learning and practice should not be neglected. Teachers can continuously try new technologies in their daily teaching, use platforms such as Nail and Tencent Classroom to enhance classroom interaction, or enhance students' practical skills through virtual labs to gradually improve their technology integration and problem-solving abilities. Finally, regular reflection and participation in peer-to-peer exchanges help teachers continuously optimize technology integration solutions. By recording problems and experiences in teaching and participating in teacher communities or academic conferences, teachers can gain new ideas and continuously improve their teaching practices.

4.2.4 Enhancing the community building capacity of learning community builders

Learning community building skills are key competencies for teachers to create and manage online learning communities through AI technology and digital platforms. These platforms expand the boundaries of the traditional classroom, promote continuous learning, and enhance learning through social interaction. Enhancing this competency requires incorporating social constructivist theory, which emphasizes learning as a process of constructing knowledge through interaction

and collaboration. Using AI technology, teachers can better organize learning communities and promote collaboration among students. To enhance this capability, teachers need to understand social constructivist theory and learn the skills to build online learning communities through professional training. In practice, teachers can translate theory into action by following these steps:

① Organize online groups of students to collaborate and discuss projects and practice teamwork and social constructivist theory.

② Regularly facilitates reflective communication and uses AI tools to analyze student feedback, identify issues and optimize instruction.

③ Adjust learning community management based on reflection and student needs to optimize task difficulty and collaboration patterns to enhance student engagement.

In conclusion, through theoretical learning, technical practice, reflection and improvement, and peer exchange, teachers can effectively enhance their learning community building capacity, adapt to future educational needs, and support the development of vocational education.

5. Conclusions

This study examines the impact of AI technology on the role transformation and competence enhancement of teachers in vocational colleges and universities. With the development of AI technology, teachers have gradually transformed from traditional roles such as knowledge transmitters and curriculum designers to learning facilitators, data analysts, technology integrators and learning community builders. This transformation improves the personalization and efficiency of teaching and learning, and at the same time puts higher demands on teachers' digital literacy.

The study clarifies the key competencies of teachers in their new roles and proposes specific enhancement strategies. The application of AI technology brings opportunities for teachers' professional development as well as accompanying challenges. In the future, teachers' role reshaping in the context of AI empowerment will become an important direction in the

development of vocational education, and continuous research and practice are crucial to improving the quality of education.

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