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Rebuilding the Competence of Professional Course Teachers in Vocational Undergraduate Schools Based on Agents

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Abstract

With the in-depth application of intelligent agents in vocational undergraduate education, professional course teaching is facing new challenges such as technological alienation and skill barriers, while existing research lacks targeted discussions on teachers' competence. This study, based on the attributes of vocational undergraduate education and the application laws of embodied intelligence, adopts a method combining dimensional deconstruction and logical reconstruction to construct a framework for reshaping teachers' competence. The research has clearly defined four core dimensions: the integration power of teaching technology, the supply power of teaching content, the innovation power of teaching methods, and the realization power of teaching effectiveness, as well as practical paths. The conclusion indicates that teachers need to proactively balance technology and value, break through the skill cocoon, build virtual-real integrated scenarios, and transcend the limitations of human-computer interaction in order to achieve a deep integration of technology and the essence of education and assist vocational undergraduate education in cultivating compound high-end skilled talents.

Keywords

Agent; Vocational undergraduate professional course teacher; Competence reshaping

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1. Introduction

With the accelerated penetration of new-generation information technologies such as large models and embodied intelligence into the field of education, intelligent agents, as the core carrier of technology empowering education, are driving vocational undergraduate education into a brand-new stage of development characterized by precision, personalization, and scenario-based approaches [1]. This transformation not only provides innovative ideas for solving the structural problems, such as low efficiency, mismatch between supply and demand, and disconnection from practice in the

traditional model of vocational undergraduate professional course teaching, but also makes the deep integration of technology and education a new topic in the cultivation of vocational undergraduate talents [2]. Vocational undergraduate education is a key front for cultivating high-end skilled talents. The intelligent transformation of its professional course teaching directly affects whether the quality of talent cultivation can precisely match the actual needs of the industry [3]. However, it is worth noting that while the in-depth application of agents is giving rise to revolutionary changes in teaching models, it also inevitably brings new practical challenges. For instance, technical rationality may override the essence of education, skills cultivation is prone to fall into a fragmented predicament, and practical training may also tend to be virtualized [4]. A review of existing research shows that scholars mostly focus on exploring the application paths of agents in teaching scenarios or constructing traditional teacher competency models, while fewer start from the type characteristics of vocational undergraduate education to systematically and specifically discuss the core components, reshaping logic and implementation paths of professional course teacher competency under the background of technology empowerment [5]. This research gap clearly makes it difficult to effectively respond to the new requirements for teachers' professional development put forward by the intelligent transformation of education. It is precisely based on such research status and practical demands that this study, based on the unique attributes of vocational undergraduate education and the application laws of embodiment intelligence, attempts to combine dimensional deconstruction with logical reconstruction to construct a framework for reshaping the competence of vocational undergraduate professional course teachers empowered by agents. The core purpose is to clarify the core dimensions and practical directions for optimizing teachers' competence. This further provides a reference that is both theoretically valuable and practically significant for improving the quality of vocational undergraduate education and teaching and promoting the professional development of teachers.

2. Rebuilding the competence of professional course teachers in vocational undergraduate schools based on agents

2.1. Balancing technology and value, and strengthening the integration of teaching technology based on ability-oriented approaches

Relying on core technologies such as large models, agents have demonstrated efficient adaptation advantages in vocational undergraduate teaching. However, influenced by instrumental rationality, some applications overly pursue explicit effects, leading to an alienating tendency where technology overrides the essence of education. This alienation is manifested in three aspects: First, the training objectives are toolized. The agents push standardized content, simplifying students to "skill training objects" while neglecting the cultivation of professional qualities and sustainable development capabilities. Second, the teaching process is procedural, with teaching links completed according to preset algorithms, lacking empathetic responses and creative guidance, making it difficult to meet individualized needs. Third, value guidance has weakened, with a focus on the efficiency of skills imparting. There is a lack of operational paths for cultivating values such as the spirit of craftsmanship and professional ethics. Based on the training orientation of "technical skills + professional qualities" in vocational undergraduate education, teachers need to promote the deep integration of teaching technology and ability-oriented teaching: clarify the attribute of intelligent agent auxiliary tools and incorporate quality cultivation modules into skills training; Standardize the boundaries of data collection and usage to safeguard students' rights and interests; Embed elements such as industry norms and the spirit of craftsmanship into the teaching plan, and achieve a harmonious resonance between skill cultivation and value guidance through algorithm optimization, adhering to the essence of nurturing people.

2.2. Breaking down the barriers of skills and optimizing the supply capacity of teaching content based on job, courses, competitions, and certificates

The agent algorithm recommendation mechanism is

the core support for personalized teaching. However, in the teaching of professional courses in vocational undergraduate programs, over-reliance on this mechanism can easily lead to a "skill cocoon," where agents continuously push homogeneous and fragmented content based on students' past learning data and skill preferences, solidifying their knowledge structure and limiting the boundaries of skill expansion. This phenomenon has significant negative impacts: Under the transformation and upgrading of industries, there is an urgent demand for compound skills in professional positions. The "skill cocoon" makes it difficult for students to build a comprehensive ability system, resulting in a structural disconnection from the demand for industrial talents. Meanwhile, the intelligent agent push is biased towards strengthening single skills, neglecting the organic connection of "job, course, competition, and certificate." The teaching content is not fully aligned with the professional qualification standards, industry competition orientation, and job application scenarios, weakening the pertinence and effectiveness of talent cultivation. Teachers of professional courses in vocational undergraduate programs should aim to break the "skill cocoon" and enhance the supply capacity of teaching content that integrates job positions, courses, competitions, and certificates. First, they should strengthen the coordination between pre-setting and customization, clearly define core skill modules based on the talent cultivation plan and industry standards, and use intelligent agents to collect students' shortcomings and demands, and customize differentiated supplementary content. Second, it is necessary to balance unity and diversity, adhere to the unified standards of core skills, and integrate multiple resources to build a stratified teaching system. Third, promote the integration of independent training and collaborative sharing, broaden students' skill horizons through multiple channels, and build a skill-sharing platform to facilitate experience exchange and complementarity.

2.3. Building virtual and real integrated scenarios and deepening the innovation of teaching methods based on practical orientation

The combination of intelligent agents with technologies such as digital twins and VR/AR has created a new virtual-real integration scenario for the practical teaching of professional courses in vocational undergraduate programs. It can simulate complex production processes, high-risk environments, and other real scenarios, reduce material consumption and safety risks, and help students consolidate their operational proficiency and standardize operation procedures. However, the practical teaching led by agents has limitations: First, there is "virtualization disconnection," and students lack experience in dealing with equipment wear and tear, sudden failures, and cross-position collaboration in real environments; The second is "weakening of stylization," with preset scenarios restricting students' independent exploration and innovation. The third issue is "insufficient surface coverage." Human-computer interaction lacks in-depth guidance, thought tracking, and emotional support, which weakens teaching effectiveness. Vocational undergraduate education centers on the cultivation of practical abilities and innovative qualities. Teachers need to be supported by intelligent agents to deepen teaching innovation. First, it should be used as a "rehearsal platform," and teaching content should be made concrete through digital twins and 3D modeling to consolidate students' cognitive and skill foundations. The second is to build a dual-track model of "virtual simulation + real operation" to form a closed-loop teaching system. Third, a collaborative and interactive model of "teacher–agent–student" is established. Teachers use agents to collect and analyze data, provide precise guidance, set open-ended tasks, and cultivate students' comprehensive abilities and innovative thinking.

2.4. Transcending the limitations of human-computer interaction and enhancing the realization of teaching effectiveness based on the spirit of craftsmanship

Intelligent agents represented by industrial robots and intelligent training terminals, with their advantages of real-time response, precise adaptation, and efficient and convenient human-computer interaction, have become important auxiliary tools for vocational undergraduate professional course teaching. They can quickly answer technical questions, provide personalized training guidance, and generate standardized operation reports, significantly improving teaching efficiency. However, over-reliance on this human-computer interaction

mode is causing three major problems: First, the spirit of craftsmanship is fading. Although the standardized guidance of intelligent agents can quickly achieve skill goals, it is easy for students to lose their attitude towards research and tenacious character, and it is difficult for them to develop rigorous professional habits. Second, the educational function is weakened. The intelligent agent lacks emotional empathy and value guidance, and is unable to convey professional dedication, innovative spirit, and sense of responsibility, resulting in a disconnection between skill cultivation and professional quality. The third issue is the decline in autonomy. If students overly rely on immediate feedback and assistance, they will lose their ability to think independently, diagnose problems, and solve problems on their own, making it difficult for them to adapt to the complex demands and dynamic changes of professional positions. Teachers of professional courses in vocational undergraduate programs need to break through the limitations of the tool attributes of agents and construct a teaching efficiency improvement system based on the spirit of craftsmanship. First, it is necessary to strengthen value guidance, present industry benchmarks and cases of craftsmanship spirit through intelligent agents, and integrate value elements such as professional dedication and innovative breakthroughs into skills teaching. Second, it is necessary to enhance emotional interaction. Emotional connections should be established through face-to-face communication, practical companionship, etc. At the same time, intelligent agents should be utilized to collect and learn emotional data to provide personalized emotional support. Third, it is necessary to cultivate the ability of human-machine collaborative control, clarify the positioning of teachers as the leading role and intelligent agents as the auxiliary role, guide students to use them reasonably, and cultivate independent thinking and innovation abilities through project-based teaching, team collaboration training, etc., to promote the transformation of teaching from “human-machine collaboration” to “human-machine symbiosis.”

3. Conclusion

The iterative evolution of agent technology is driving the teaching of vocational undergraduate specialized courses from tool-assisted and human-machine collaboration to a new stage led by intelligence. This change not only provides new ideas for solving the long-standing problems, such as low efficiency and disconnection from practice in traditional teaching, but also becomes the core support for improving the quality of talent cultivation. It is precisely based on the dual consideration of the type characteristics of vocational undergraduate education and the application laws of embodied intelligence that, in this study, we attempt to reshape teachers’ competence from four dimensions: the integration ability of teaching technology, the supply ability of teaching content, the innovation ability of teaching methods, and the realization ability of teaching effectiveness. From a specific perspective, for this framework to take effect effectively, teachers should not merely focus on enhancing their individual capabilities. Instead, they need to balance the application of technology with value guidance, break through traditional skill barriers, build integrated virtual and real teaching scenarios, and strengthen the infiltration of the spirit of craftsmanship. Only by systematically forging the integration power of teaching technology, the supply power of teaching content, the innovation power of teaching methods and the realization power of teaching effectiveness can we not only respond to the current practical demands of teaching model transformation empowered by intelligence, but also solve the deep-seated contradictions such as technology overriding the essence of education and the disconnection between skill cultivation and quality cultivation. Looking to the future, the improvement of the competence of professional course teachers in vocational undergraduate programs clearly cannot be separated from the dual drive of industrial demands and technological development. It is still necessary to continuously explore in-depth the human-machine collaborative symbiotic mechanism. The core value of the framework constructed in this study lies in providing operational, practical guidance for teachers’ professional development, thereby facilitating vocational undergraduate education to more accurately align with industrial demands, ultimately achieving the compound training goal of “technical skills + professional qualities” for high-end skilled talents, and injecting impetus into the high-quality development of vocational undergraduate education.

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