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Research on the AI-empowered Path of Industry-Education Integration in Vocational Undergraduate Education from the Perspective of Digitalization and Intelligence

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Abstract: In the digital and intelligent era, the quality of industry-education integration in vocational undergraduate education exerts a direct impact on the cultivation of high-quality vocational skilled talents. As a new quality productive force, AI technology brings new development opportunities to industry-education integration in vocational undergraduate education. On this basis, this paper briefly analyzes the value of AI empowering industry-education integration in vocational undergraduate education from the perspective of digitalization and intelligence, discusses the current situation as well as AI-empowered paths of industry-education integration in vocational undergraduate education under such perspective, so as to provide theoretical reference and practical guidance for in-depth industry-education integration and the improvement of talent cultivation quality in vocational undergraduate education.

Keywords: Digitalization and intelligence; Vocational undergraduate education; Industry-education integration; AI empowerment

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1. Introduction

As an important component of China's vocational education system, vocational undergraduate colleges undertake the important task of cultivating high-quality vocational skilled talents with solid professional skills and innovative abilities who can adapt to the development of the digital and intelligent era. Industry-education integration is the key for vocational undergraduate education to realize industry-education coordination and the integration of knowledge and practice. Featuring intelligent analysis, precise matching and scene simulation, AI technology helps industry-education integration in vocational undergraduate education shift from "formal integration" to "in-depth integration", and realize synchronous development between talent cultivation and industrial demands. Therefore, researching the AI-empowered path of industry-education

integration in vocational undergraduate education from the perspective of digitalization and intelligence bears important practical significance and theoretical value.

2. The value of AI empowering industry-education integration in vocational undergraduate education from the perspective of digitalization and intelligence

2.1. Realize precise matching between talent cultivation and industrial demands

With the help of big data analysis, AI technology can accurately grasp the development trend of digital and intelligent industries and the demand status of enterprise posts, so as to provide data support for vocational undergraduate colleges to formulate talent training programs and optimize curriculum setup. It can also build an intelligent training environment to simulate the actual production process of enterprises, placing students in an immersive training environment to improve their practical skills and innovative abilities through practice, thus realizing precise docking between talent cultivation and industrial demands [1].

In addition, vocational undergraduate colleges can utilize AI technology to break information barriers among colleges, industries and enterprises, timely acquire the direction of industrial technological updates and changes in talent competence requirements, and dynamically adjust teaching contents. This solves the problem that vocational undergraduate colleges cannot keep up with industrial technological iteration in traditional industry-education integrated teaching, resulting in talent cultivation lagging behind industrial demands.

2.2. Optimize the allocation and utilization of training resources for industry-education integration

AI technology can be adopted to intelligently integrate training resources of vocational undergraduate colleges and production resources of enterprises, build a resource sharing platform, and realize the sharing of training resources among colleges as well as between colleges and enterprises, so as to raise the utilization rate of industry-education integrated training resources. Meanwhile, virtual simulation technology can be used to construct virtual training bases, reduce the input cost of training resources, and provide students with diversified and high-quality training environments. For example, a vocational undergraduate college accesses mainstream large models to assist research, innovatively develops digital textbooks, which not only optimizes resource allocation but also improves their accuracy [2].

Besides, relying on the data analysis capability of AI, vocational undergraduate colleges can monitor the usage of various industry-education integrated resources in real time, eliminate outdated resources that fail to meet industrial demands in a timely manner, and supplement high-quality teaching resources related to emerging industries, so as to maximize the educational value of all kinds of resources.

2.3. Improve the digital and intelligent literacy and teaching ability of teachers

Based on AI technology, vocational undergraduate colleges can build an intelligent training platform for teachers. Online courses, virtual training, case analysis and other approaches can be adopted to improve teachers' digital and intelligent literacy as well as teaching capabilities [3]. In addition, AI technology can be used to construct a two-way teacher exchange platform between colleges and enterprises to realize precise docking between enterprise technical experts and college teachers, promote two-way teacher mobility and optimize the structure of teaching staff to lift the overall standard.

Furthermore, most vocational undergraduate teachers lack frontline industrial practical experience

and have limited understanding of enterprise actual production processes and the application of digital and intelligent production tools. The introduction of AI technology breaks the restrictions of space and information. Enterprise technical backbones can share real problems and technical application experience from frontline production with college teachers at any time on the industry-education integration platform based on AI or virtual reality technology, helping teachers update their knowledge reserves in a timely manner and improve their digital and intelligent literacy and teaching abilities [4].

3. Current situation of industry-education integration in vocational undergraduate education from the perspective of digitalization and intelligence

3.1. Insufficient adaptation between talent cultivation and industrial demands

The talent training programs of some vocational undergraduate colleges still follow the traditional model and fail to timely connect with the development demands of digital and intelligent industries. The curriculum system lacks contents related to digitalization and intelligence or the relevant contents lag behind, without integrating new productive forces such as AI and big data. Meanwhile, the talent cultivation process features emphasis on theories while ignoring practice, and training scenarios are disconnected from actual enterprise production scenarios, making students' practical skills and innovative capacities unable to meet enterprise post requirements.

For instance, in the industry-education integrated teaching of mechanical and electrical majors of some vocational undergraduate colleges, training on digital and intelligent skills such as industrial robot operation and maintenance and digital twin modeling is rarely involved [5]. Graduates need to spend extra time relearning after taking posts, which is unfavorable to their career development. Moreover, communication between colleges and enterprises remains superficial, making the adjustment speed of talent cultivation unable to keep pace with industrial upgrading.

3.2. The depth and efficiency of college-enterprise coordination need to be strengthened

At present, college-enterprise cooperation of some vocational undergraduate colleges mostly stays at superficial levels such as enterprises providing internship posts and donating equipment. Enterprises lack in-depth participation in the whole process, including the formulation of talent training programs, curriculum development, teaching implementation, and teaching evaluation. Information barriers exist between colleges and enterprises, so enterprise technical demands and post requirements cannot be delivered to colleges in a timely manner, while talent cultivation achievements and scientific research results of colleges can hardly be converted into enterprise productivity effectively.

Meanwhile, college-enterprise coordination lacks systematic incentive and guarantee mechanisms, and most cooperation between the two sides is short-term, failing to form a long-term coordinated development mechanism. For example, when some vocational undergraduate colleges carry out industry-education cooperation with local enterprises, enterprises only accept a small number of students for post practice every graduation season. There is no follow-up of results after cooperation ends, and the cooperative relationship is easy to be interrupted due to personnel changes or enterprise operation adjustments, failing to form a stable win-win collaborative education model [6].

3.3. Insufficient practical effect of training resources for industry-education integration

Affected by factors such as capital and venue, the industry-education integrated training resources of some vocational undergraduate colleges suffer from outdated equipment and insufficient quantity, which cannot adapt to the technical demands of digital and intelligent industries. At the same time, although professional curricula of many vocational undergraduate colleges consist of both theoretical and practical courses, the extensive and in-depth application of artificial intelligence and big data in all walks of life has replaced a large number of repetitive and massive basic jobs with artificial intelligence or high-quality vocational talents proficient in modern data tools [7].

Nevertheless, some vocational undergraduate colleges fail to keep pace with the times and introduce training resources such as generative AI software and virtual laboratories. Practical teaching still relies on traditional offline exercises, and the introduction of real enterprise production projects is insufficient. Students rarely come into contact with actual industrial project tasks, making industry-education integrated training resources unable to exert their due educational effects.

4. AI-empowered paths of industry-education integration in vocational undergraduate education from the perspective of digitalization and intelligence

4.1. AI empowers the innovation of talent cultivation mode to realize precise industry-education docking

Vocational undergraduate teachers can adopt AI technologies including machine learning and big data analysis to integrate data such as information on the development of digital and intelligent industries, enterprise post demands and graduate employment, grasp the latest industrial technological development and post skill requirements, and improve the scientificity and forward-looking nature of talent training programs of vocational undergraduate colleges. Meanwhile, AI technology can intelligently count and integrate various post demands of each major to realize dynamic matching between talent training programs and industrial demands.

For example, a vocational undergraduate college uses AI technology to predict the transformation and upgrading trend of the manufacturing industry and changes in relevant post capabilities. On this basis, it adds teaching modules related to digitalization and intelligence, such as digital twin and industrial internet operation and maintenance, adjusts the original curriculum system, and increases the credit weight of practical sessions on digital and intelligent skills, making talent training programs adapt to the actual demands of manufacturing development.

At the same time, vocational undergraduate colleges and professional teachers shall cooperate with industrial enterprises and technical experts to introduce digital and intelligent technologies including AI and big data and the Internet of Things, and develop modular and intelligent curriculum systems. Teachers can utilize AI technology to statistically analyze students' learning rhythm, learning ability and career development, and push personalized curriculum learning resources to students accordingly [8]. For example, the teaching platform can judge students' mastery of digital modeling skills combining their classroom answer data and training operation records, and automatically push virtual simulation training projects of modeling based on VR/AR technology, enabling students to internalize professional knowledge and skills through simulated practice [9].

4.2. AI empowers the improvement of college-enterprise coordination mechanism to promote in-depth industry-education integration

Integrate resources of vocational undergraduate colleges and enterprises to build an intelligent college-enterprise coordination platform covering talent cultivation, technology research and development, achievement transformation, employment and entrepreneurship. While realizing real-time sharing and precise docking of information such as enterprise demands, college resources and talent cultivation achievements, it promotes interactive communication and collaborative work between colleges and enterprises, and establishes a sound long-term coordination mechanism of "co-cultivating talents, jointly managing the whole process and sharing achievements".

For example, relying on this intelligent college-enterprise coordination platform, enterprises can release the latest post competence demands and technology research and development project demands at any time, and colleges can synchronize the progress of talent cultivation and scientific research achievements with enterprises in a timely manner. This facilitates enterprises to participate in the whole process of vocational undergraduate talent cultivation, including the revision of talent training programs, curriculum content development, training project design, and teaching quality evaluation, breaking the previous superficial cooperation mechanism where enterprises only participate in internships [10].

In addition, both vocational undergraduate colleges and industrial enterprises shall clarify their rights, obligations and division of labor in platform construction, operation and maintenance, consciously safeguard platform data security and update training resources to guarantee the efficient operation of the platform [11]. For instance, enterprise technical personnel and professional teachers can integrate real enterprise projects that do not involve commercial secrets into project cases and training resources suitable for professional practical teaching. AI algorithms can be adopted to realize intelligent matching of college-enterprise demands, reduce communication and docking costs for both sides, and solve the problems of delayed information transmission and low docking efficiency in traditional college-enterprise cooperation.

4.3. AI empowers the integration and optimization of training resources to raise resource utilization efficiency

Firstly, AI technology shall be used to intelligently sort, classify, and integrate training resources of vocational undergraduate colleges, including training equipment, venues, and courses, build a training resource database, and promote standardized and normalized management of training resources. Meanwhile, construct an AI-empowered training resource sharing platform to realize the sharing of training resources among colleges as well as between colleges and enterprises, optimize resource utilization efficiency and cut resource input costs. For example, a college integrates resources such as national basic science centers and laboratories to build dozens of digital and intelligent laboratories and "Intelligent Base" industry-education integration bases, realizing efficient integration and sharing of training resources via AI technology [12].

Secondly, AI technology shall be utilized to develop digital teaching resources such as online courses, virtual courseware, training videos and project tasks. AI technologies including natural language processing and computer vision can be adopted to intelligently generate, optimize and update these teaching resources, ensuring resource contents keep pace with industrial technological upgrading and avoiding the aging and lag of training resource contents.

Finally, VR/AR technology can be used to build virtual laboratories. On the basis of solving problems such as insufficient offline training resources and venue and equipment restrictions, it provides students with

a virtual environment to get familiar with real industrial processes and operation specifications, improving the practical effect of industry-education integration [13]. For example, many mechanical and electrical majors in vocational undergraduate colleges introduce AI virtual simulation training systems. Students can conduct practical exercises such as industrial robot debugging and production line assembly on the system, which not only solves the difficulty of carrying out complex project training in offline practical teaching, but also provides students with opportunities to repeatedly practice and polish operational skills.

4.4. AI empowers the construction of professional teachers to improve their digital and intelligent literacy

Firstly, personalized training courses covering the application of AI technology, digital and intelligent teaching methods and enterprise practical skills shall be pushed to teachers according to their digital and intelligent literacy and teaching demands. AI technology can be used to build virtual training scenarios for teachers to improve their digital and intelligent teaching ability and practical level in simulated environments [14]. Meanwhile, AI technology shall be adopted to carry out intelligent evaluation of teacher training effects, identify deficiencies of teachers in the training process, adjust and improve training schemes accordingly, so as to strengthen training effects.

Secondly, AI technology can be used to build a college-enterprise teacher coordination platform, promoting online communication and cooperative teaching research between enterprise technical backbones and college teachers to jointly develop practical courses or scientific research projects, thus lifting the professional ability and teaching capacity of both sides. At the same time, AI technology can provide intelligent teaching research tools for college and enterprise teachers to assist them in teaching design and teaching research, so as to improve teaching research efficiency and standards.

Finally, AI technology shall be adopted to build an intelligent teacher evaluation platform, incorporating data such as teachers' teaching performance, scientific research achievements, enterprise practical experience and student evaluations, and establishing a diversified and intelligent teacher evaluation index system. Real-time monitoring and data analysis can be conducted on teachers' teaching and scientific research processes to provide data support for the construction, assessment and incentive of vocational undergraduate teaching staff, thus evaluating teachers' digital and intelligent literacy and teaching ability more accurately [15].

5. Conclusion

In summary, AI technology helps solve problems such as insufficient adaptation between talent cultivation and industrial demands, inadequate depth and efficiency of college-enterprise coordination and insufficient practical effect of industry-education integrated training resources. Through paths including innovating talent cultivation modes, perfecting college-enterprise coordination mechanisms, optimizing the integration of training resources and constructing professional teaching staff, it promotes the intelligent and precise upgrading of industry-education integration in vocational undergraduate education. In the future, with the rapid development of AI technology, the AI-empowered paths of industry-education integration in vocational undergraduate education will advance with the times, cultivating more high-quality technical and skilled talents meeting the development demands of digital and intelligent industries.

Disclosure statement

The author declares no conflict of interest.

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