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Research on the Innovation of Classroom Teaching Mode in the Era of "5G+Artificial Intelligence"

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Abstracts: Against the background of the rapid development of global information technology, "5G+Artificial Intelligence" has become a key technology to promote innovation in the field of education. 5G technology has excellent network speed and connectivity, which makes large-scale online teaching and learning possible, while AI redefines the way of teaching and learning through accurate data analysis and personalized learning path design. and learning. The convergence of "5G+AI" has brought disruptive changes to traditional education and raises the important question of how to effectively integrate new technologies and educational practices to meet the needs of modern society. In this paper, we will discuss the application of "5G+Artificial Intelligence" in modern vocational education classroom teaching, analyze its potential impact on the quality, equity, and efficiency of vocational education, and how to build a more flexible and interactive learning environment.

Keywords: 5G; Artificial Intelligence; Classroom Teaching; Innovation

Introduction

At present, vocational education should explore the teaching path of "5G+Artificial Intelligence" and combine the mature vocational education model of Germany with the actual situation of China to create a new classroom teaching model of vocational education, which can be based on the action-oriented and project-driven teaching methods of Germany, as well as its rich teacher resources and advanced teaching hardware. We can learn from Germany's action-oriented and project-driven teaching methods, as well as its rich teacher resources and advanced teaching hardware, and integrate the educational resources of China and Germany, to improve the quality and effect of vocational education and cultivate high-quality skilled personnel who can adapt to the future social and economic needs.

1. Existing Problems of Vocational Education in China

1.1 Single education mode, lack of personalized teaching

The current vocational education system is facing the problem of a single education model, which is reflected in the lack of personalized teaching strategies for individual differences in students. Traditional vocational education mostly adopts a unified teaching mode, ignoring the individual needs and potential diversity of students, this one-size-fits-all teaching method not only limits the overall development of students' abilities but also affects the improvement of the quality of education (Jin, 2024). Vocational education curriculum and teaching content are too rigid and lack flexibility and innovation, the content of education is often biased towards the instillation of theoretical knowledge while ignoring the cultivation of practical skills and the stimulation of critical thinking, and the teaching assessment method is too single, mostly relying on the traditional exams and tests, and the lack of assessment of the student's practical ability and problem-solving ability, which can not comprehensively reflect the students' learning achievements and vocational ability. It can't fully reflect students' learning achievements and vocational ability. In addition, the shortage of

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teachers in vocational education is also an important factor restricting the development of personalized teaching. The homogenization of the teaching force in terms of professional knowledge and teaching methods makes it difficult to meet the diversified and high-quality demands of vocational education. Teachers' teaching methods fail to effectively integrate new educational technologies and teaching concepts, resulting in a lack of attractiveness and infectiousness of teaching activities.

1.2 Limitations of vision and educational resources

At a time of globalization and rapid technological development, the vocational education system fails to make full use of international educational resources and advanced educational concepts, leading to deviations in educational content from international standards and a lack of international vision and foresight. Educational resources, especially high-quality teachers and advanced teaching facilities tend to be concentrated in big cities and developed regions, while vocational education institutions in remote and economically underdeveloped regions lack resources, and the unbalanced allocation of resources has exacerbated regional educational differences and affected educational equity (Xu , 2023). The existing vocational education system often pays too much attention to short-term vocational skills training and neglects the cultivation of students' long-term development ability. This short-sighted education model fails to fully take into account the future development trend of the industry and the changes in vocational roles, which limits the students' potential for career development and their ability to adapt to the future market. In addition, many vocational education programs fail to reflect the progress of science and technology and changes in the industry promptly, and the teaching materials and teaching methods used cannot meet the needs of modern vocational positions.

1.3 Practical training facilities and equipment do not meet the needs of modern vocational education

Most of the practical training equipment in China's vocational education colleges is aging and out of touch with the industry's current level of technology and practical application, and students are unable to access the industry's latest technology and working methods, which also leads to the difficulty of their vocational skills to meet the actual needs of the modern workplace (Shi, 2023). Due to financial and management constraints, many vocational schools' practical training bases cannot provide students with continuous and effective practical training support, and the lack of systematic planning and adequate financial investment makes it difficult for the practical training environment to simulate real work scenes, which affects the effectiveness and depth of students' skills training. In addition, the quality of practical training teachers is also a key factor restricting the development of vocational education. Many practical training teachers have the basic teaching ability, but lack sufficient industry experience and knowledge of cutting-edge technology, limiting the depth and breadth of the teaching content, and it is difficult to meet the diversified and high-level professional skills needs of students.

2. What can be Learned from German Vocational Education?

2.1 Teaching ideology

Germany's “dual system” of vocational education has gone through three major phases, namely, the founding (1870-1920), consolidation (1920-1970), and expansion (1970 to the present), combining enterprise apprenticeship training and vocational school education, and forming a unique combination of theoretical and practical education model. Along with its development, German vocational education thought was gradually enriched, absorbing the essence of Enlightenment pedagogy and neo-humanist educational thought, especially the influence of Rousseau and Kant. The development of German vocational education is not only innovative at the technical and educational levels but also characterized by cross-border, integration and reconstruction in its thinking (Yang & Sun, 2024). Famous theorists of vocational education, such as Kaixin Steiner, Spranger, and Fischer, have provided theoretical support and ideological guidance for the development of vocational

education at different stages, emphasized the social and practical nature of vocational education, and explored the relationship between education and occupation, emphasizing the coordination of individual development and social needs. At present, German "dual system" vocational education continues to expand its theoretical and practical boundaries to meet the new requirements of globalization and technological progress. Meanwhile, the cooperation between China and Germany in the field of vocational education also brings new opportunities for the innovation and development of vocational education on both sides and foretells a broader development prospect.

2.2 Teaching objectives

Germany's "dual system" vocational education model closely combines theoretical learning with practical operation, and enterprises and vocational schools work together to complete the educational tasks, focusing on the cultivation of competence, including professional competence, methodological competence, and social competence, and adopting a variety of teaching methods, including traditional teacher-led teaching and modern teaching methods that emphasize active learning, such as project teaching and learning. A variety of teaching methods are used, both teacher-led traditional teaching and modern teaching methods that emphasize students' active learning, such as project teaching method and cooperative learning (Zhou & Wen, 2023). The distinctive feature of German vocational education is its practicality, in which students work in enterprises to gain practical experience, apply the theoretical knowledge they have learned in real working environments, and master vocational skills. During classroom teaching, there is frequent interaction between teachers and students, and teaching methods are adjusted according to the development of society and technology to keep the content of education current and forward-looking, as well as paying attention to the cultivation of students' lifelong learning and career development ability, and encouraging the development of students to become professionals capable of self-renewal and adapting to the needs of the future market.

2.3 Teaching methods

The action-oriented curriculum reform in Germany mainly emphasizes students' active participation and integrated interdisciplinary learning to adapt to rapidly changing social and professional needs, encourages students to apply their theoretical knowledge to real-world situations through project-based learning, internships, and practical experiences as well as digital teaching and learning tools, and focuses on individualized learning paths to make education more flexible, better meet the needs and potentials of individual students, and promote the development of students' overall literacy, as well as improving the adaptability of the education system and the social acceptance of education (Chen & Hu, 2023). The action-oriented teaching process of German vocational education, which incorporates project-based pedagogy, emphasizes students' active participation and practice and is divided into five phases: goal-setting, plan-making, plan execution, project evaluation, and project summary. In the goal-setting stage, the teacher divides the students into small groups to determine the project goals and promotes thematic discussions through the brainstorming method. In the plan development phase, the teacher transforms into a facilitator to help students draw production flow charts, decide on work allocation, and provide students with necessary resources and guidance (Yao, 2017). In the plan execution phase, students implement the project according to the plan and manufacture the product or model, while the teacher observes and records the students' activities and provides guidance when necessary. In the project evaluation phase, students assessed the project outcomes and individual performance based on predetermined criteria, prompting them to examine the project outcomes from multiple dimensions. In the project summarization phase, the teacher and students review the entire project, assess the teaching effectiveness, and propose improvement measures.

3. Design of "5G+Artificial Intelligence" Classroom Teaching Innovation Mode

When vocational colleges rebuild their facilities to meet the basic facility requirements for "5G+Artificial Intelligence" classroom implementation, they should upgrade their

network infrastructure, and install 5G base stations and wireless access points to ensure that all corners of the campus have access to high-speed Internet, configure high-performance computer hardware and servers to support the operation of AI software and big data analytics, and invest in smart data analytics. data analytics, and invest in smart classrooms equipped with smart blackboards, VR/AR devices, and other interactive learning tools to promote immersive learning experiences (He, 2022). Labs and workstations should also be equipped with the latest industry-standard tools and machines so that students can perform hands-on operations and experiments and have direct access to the latest technologies, and a centralized teaching management system should be established to utilize AI for curriculum design, teaching progress tracking, and learning outcomes assessment to ensure effective use of educational resources and continuous improvement of teaching quality.

3.1 Integrating online and offline teaching platforms

Driven by the technology of "5G+Artificial Intelligence", the classroom teaching mode is experiencing an innovative revolution. 5G technology, with its high bandwidth and low latency, makes the transmission of video and real-time data smoother, which can achieve nearly no delay interaction effects for the realization of no delay interaction effects. The delayed interaction effect provides the basis for realizing a seamless online and offline teaching environment, enriches the means and ways of teaching, and enhances the participation and interactivity of teaching activities. The application of artificial intelligence in personalized teaching analyzes students' learning behavior, performance, and learning habits through algorithms, and can recommend the most suitable teaching materials and learning activities for each student's learning path (Li et al., 2022). The AI system can dynamically adjust the teaching plan and content according to the students' feedback and learning progress, realizing personalized teaching in the true sense technology can also predict the difficulties that students may encounter and intervene in advance through the learning analysis. possible difficulties intervene in advance and provide customized learning resources through the intelligent recommendation system to enhance the learning effect. In terms of teaching evaluation, AI can automatically collect students' learning data, such as online assignments, test results classroom performance, etc., and comprehensively evaluate students' learning effectiveness through data analysis, reducing teachers' workload, objectively and accurately reflecting students' learning status, and providing teachers with accurate teaching feedback and adjustment basis.

3.2 Seamless combination of theory and practice

With the high-speed transmission capability of 5G and the real-time data analysis function of artificial intelligence, teachers can optimize the teaching content and methods, and apply virtual reality (VR) and augmented reality (AR) technology to improve the quality and efficiency of students' skills training (Shan, 2022). The application of VR and AR technology in vocational skills training provides students with simulated practice environments, and they can be able to in lower-risk virtual environments and practice complex operations, such as medical education, students can simulate surgical operations through VR, reproduce real surgical environments, and provide real-time guidance and error correction based on AI technology; in engineering education, AR technology can combine design drawings and physical objects to help students better understand the connection between theory and practical application.VR and AR technology can also increase the learning fun and interactivity, and improve students' learning motivation and participation. Through real-life simulation and interactive experience, students can understand complex concepts and processes more intuitively, and this immersive learning experience is especially important for improving the teaching effect. e.g. Teachers apply the project-driven methodology that is widely used in German vocational education in their lectures and design teaching projects that are closely related to the actual occupations so that the students can study and apply the theoretical knowledge in the actual projects. and apply theoretical knowledge, cooperate with German enterprises in the virtual environment,

participate in real work scenarios, mechanical operation training, architectural design simulation, etc., which are carried out by applying VR or AR technology, to enhance students' vocational skills and improve their international vision and cross-cultural communication skills with cross-border and practical project teaching (Shen & Cui, 2021). Combined with 5G and AI technologies, VR and AR enhance the flexibility and adaptability of teaching, making the education mode more personalized and intelligent, and teachers can customize the teaching content and difficulty according to each student's situation, realizing the true meaning of tailor-made teaching.

3.3 Integration and optimization of Chinese and German resources

German vocational education is famous for its rigorous teaching system, advanced educational concepts, and close cooperation in the industry, which provides a valuable reference for vocational education in China, cooperation with German educational institutions can introduce the German education model, teaching methods, and advanced vocational skills training system. Given the high-speed data transmission of 5G technology and the data processing capability of artificial intelligence, the two countries can jointly develop vocational training programs adapted to the Chinese market, which should pay attention to localized needs and be customized for the development trends and technological needs of specific industries in China, such as intelligent manufacturing, green energy, digital management and other fields, to ensure that the training content is practical and forward-looking, and to meet the needs of China's rapidly changing vocational market (Lv & Huang, 2021). In addition, using 5G and AI technologies, a shared online learning platform can be constructed, which can update teaching resources in real-time, provide cross-border interactive and collaborative learning opportunities, enable wider sharing and application of Sino-German educational resources, and also optimize teaching content and teaching methods through real-time feedback and data analysis, to improve the quality and efficiency of education. The integration of Sino-German educational resources should pay attention to cultural differences and differences in educational traditions, respect and integrate local cultural characteristics and educational habits, promote the innovation and development of the education model of the two sides through in-depth cultural exchanges and mutual learning of educational concepts, cultivate vocational talents with an international outlook and high-level skills (Yang, 2021), and promote the overall upgrading and internationalization of China's vocational education system to provide solid human resources support and technical progress for China's economic development and technological progress to provide solid talent support and educational guarantee.

Conclusion

In summary, the application of “5G+Artificial Intelligence” technology is gradually deconstructing and reshaping the traditional education model, providing unprecedented personalization, interactivity, and flexibility for vocational education. Through the introduction of real-time data analysis, interdisciplinary comprehensive learning, and virtual reality, it can meet the personalized needs of students and improve the practicality and fun of teaching. As technology continues to advance and educational practices deepen, vocational education classrooms will focus on active student participation and practical application of skills, and the boundaries of education will be further expanded. Therefore, it can be expected that continuous technological innovation and education concept updates will continue to promote the vocational education industry in a more efficient, fairer, and more personalized direction, China is accelerating the development of modern vocational education, and would like to learn from the advanced concepts and experiences of Germany's vocational education so that the concept of “respecting a skill” will become a social trend, and contribute to the promotion of the “mass entrepreneurship, the masses of people's livelihood”. We are willing to learn from Germany's advanced concepts and experiences in vocational education so that the concept of “respecting one's skill” will become a social trend and provide support for promoting “mass entrepreneurship and innovation”

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Conflict of Interest

The authors declare that they have no conflicts of interest to this work.

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