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Research on the Practice of Virtual Digital Humans Empowering the Digital-Intelligent Transformation of Higher Vocational Education

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Abstract: With the in-depth integration of digital technology and modern vocational education, virtual digital humans have become an important factor driving the digital-intelligent transformation of vocational education in the new era. Based on this research background, this paper deeply analyzes the connotation and characteristics of virtual digital human technology, expounds its application value in modern higher vocational education, and then puts forward practical strategies and scientific measures for virtual digital humans to empower the digital-intelligent transformation of higher vocational education from four dimensions: teaching scenario reconstruction, training mode innovation, evaluation system reshaping, and school-enterprise collaboration mechanism. It aims to provide assistance and support for breaking through educational reform dilemmas in aspects such as the teaching ecosystem, educational resources, evaluation systems, and talent supply and demand.

Keywords: Virtual digital humans; Higher vocational education; Digital-intelligent transformation; Virtual simulation; Practical strategies

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1. Introduction

In the context of a digital society, the integration of technologies such as artificial intelligence, big data, and virtual reality with vocational education has continuously deepened, promoting the reform and reconstruction of the educational ecosystem and talent training models. In the process of building an educational digitalization strategy, higher vocational colleges should continuously explore the development path of the organic combination of emerging digital technologies and vocational skills education. As an integration achievement of generative artificial intelligence technology and virtual simulation technology, virtual digital human technology has shown a good application trend in various industries and fields. Higher vocational colleges should create highly realistic digital images and interactive environments to provide innovative solutions for vocational education that break time and space limitations, reduce training costs, and improve teaching efficiency, providing reference for the

digital-intelligent transformation of vocational education.

2. Overview of virtual digital human technology

Virtual digital humans are digital images with human appearance characteristics, behavioral patterns, and interactive capabilities created relying on information technology. They are mainly supported by multiple technologies such as computer graphics, virtual reality, and artificial intelligence, and are driven through character modeling, speech synthesis, and animation driving [1].

From the perspective of technological evolution, current virtual digital humans have transitioned from "pre-recorded animations" to "real-time interactive agents", which can dynamically adjust behaviors and feedback according to interactive scenarios [2]. The introduction of this technology into the context of higher vocational education can be applied at three levels. Firstly, construct digital avatars of teachers to assist them in completing routine teaching tasks and answering questions. Secondly, build virtual training mentor roles to provide practical guidance for students on simulation environments or virtual platforms. Thirdly, simulate interactive objects, such as patients for medical majors and customers for business majors, to provide students with a realistic training atmosphere.

Virtual digital human technology has a good adaptation relationship with higher vocational education, which can also be analyzed from three aspects. Firstly, the plasticity of teaching scenarios: virtual digital humans can simulate complex situations in real work environments [3] to help students solve practical training problems. Secondly, the personalized support characteristic: virtual digital humans can analyze students' learning behaviors and habits based on big data technology, and then provide adaptive learning paths. Thirdly, the resource reuse characteristic: virtual digital humans can be reused in different scenarios and projects, which is conducive to reducing teaching costs.

3. Application value of virtual digital humans in higher vocational education

3.1. Reshape the teaching paradigm and build a "teacher-machine-student" ternary teaching ecosystem

In traditional higher vocational education, a "teacher-student" binary interaction structure is mainly adopted, but the number of teachers and teaching time directly limit the teaching level, making it impossible to achieve in-depth guidance for personalized education. Virtual digital humans can break this limitation by building a "teacher-machine-student" ternary teaching ecosystem. By replacing some teacher responsibilities with machines, repetitive tasks such as knowledge transmission and answering questions can be entrusted to intelligent assistants [4], which are tireless and can provide students with 24/7 full-cycle learning support. Firstly, the intelligent teaching management function: the intelligent assistant can automatically classify generated teaching resources, set labels and indexes for easy access and use by teachers and students [5]. Secondly, the real-time data analysis function: the intelligent assistant can intelligently analyze students' online interaction records and learning behaviors to understand their learning habits and achievements. Thirdly, the immersive simulation function: the intelligent assistant can provide students with diverse practical opportunities through highly realistic simulation environments.

3.2. Solve training difficulties and create a safe and efficient simulated training environment

In modern higher vocational education, practical training teaching is one of the core dilemmas. Especially in professional fields such as chemical engineering, medical care, and intelligent manufacturing, the obstacles are mainly reflected in the "three highs and three difficulties", namely "high investment, high difficulty, high risk; difficult to implement, difficult to observe, difficult to reproduce". Virtual digital human technology can break through training difficulties by creating a highly simulated virtual training environment. Firstly, it can provide standardized operation demonstrations. Through video demonstrations, text descriptions, graphic guidance, etc., it can accurately restore operation processes, practical skills, and precautions [6], providing students with standardized guidance and suggestions. Secondly, it can create training projects in dangerous scenarios. Virtual digital humans can use virtual environments to create extreme practical environments and emergencies, allowing students to solve problems while avoiding actual risks. Thirdly, it helps share scarce resources. Virtual digital humans can reuse and promote relevant educational resources, including virtual equipment and high-quality training cases [7].

3.3. Achieve precise evaluation and draw dynamic portraits of students' skill growth

The evaluation of higher vocational education currently relies heavily on teachers and summative examinations, which cannot fully and comprehensively reflect changes in students' abilities and mastery of skills throughout the process. Virtual digital humans can not only conduct tracking observations and multi-dimensional evaluations of students through data collection, behavioral analysis, and pattern recognition, but also build quantitative and refined evaluation tools to assist teachers in constructing student portraits.

4. Practical strategies of virtual digital humans empowering the digital-intelligent transformation of higher vocational education

4.1. Build a new "teacher-machine-student" ternary teaching ecosystem and innovate teaching organization forms

The in-depth integration of virtual digital human technology and higher vocational education should start with the reconstruction of teaching organization, and promote the reform and development of vocational education simultaneously through the construction of a ternary teaching ecosystem of "teacher guidance, digital human assistance, and student-centeredness".

Firstly, from the perspective of technical architecture, schools should fully establish a highly integrated intelligent teaching platform that integrates the functions of virtual digital humans, resource libraries, teaching management platforms, and other modules. At the same time, this integrated platform needs to meet two-way interaction functions: it can not only transmit knowledge to students through virtual digital humans and provide personalized educational support by automatically collecting student behavior data but also allow students to independently raise questions and doubts to virtual digital humans [8] to help them solve learning difficulties.

Secondly, from the perspective of role division, schools should reposition teachers' teaching positions and responsibilities, and clearly divide the teaching division of labor between them and virtual digital humans. Teachers should transition from "knowledge transmitters" to roles such as "growth guides" and "learning designers", mainly creating learning scenarios, planning learning paths, and conducting emotional exchanges for students [9]; virtual digital humans assume tasks such as knowledge transmission, skill demonstration, and

answering questions, thereby releasing teachers' subjective initiative to develop more valuable teaching activities.

Thirdly, from the perspective of interaction mechanisms, schools should build multi-level and multi-form interaction models. For example, "teacher-student interaction" should emphasize heuristic teaching behaviors led by teachers; "student-machine interaction" should highlight independent learning activities carried out between students and virtual digital humans; "teacher-machine-student interaction" involves teachers organizing students to carry out collaborative learning activities with the help of virtual digital humans, so as to meet the actual needs of different learning scenarios [10].

4.2. Develop virtual simulation training resources to address the "three highs and three difficulties" dilemma in higher vocational education

In higher vocational colleges, the development of virtual simulation training resources is an important link in the application of virtual digital humans and a key factor affecting the value implication of technological empowerment. In response to the current problems of homogenization, gamification, and fragmentation of virtual training resources, schools should systematically solve them with the help of virtual digital humans.

Firstly, establish a dynamic content generation mechanism based on real work scenarios. The development of training resources should be connected with the needs of industries and enterprises. Therefore, schools can dynamically optimize training courses and projects based on generative artificial intelligence technology. Taking the animation design major as an example, schools can create a full-process simulation environment for animation production based on the virtual digital human system [11], where digital humans simulate project managers to guide students to master core skills such as character design and action debugging through interaction with them.

Secondly, build a modular and systematic virtual training resource system. Resource fragmentation is one of the core problems faced in practical training teaching in higher vocational colleges. In this regard, schools should adopt a "platform + module" plan to establish unified resource standards and a flexible and free resource system. On the one hand, they can plan virtual training projects covering three gradients of "basic skills—specialized skills—comprehensive abilities" around professional groups; on the other hand, they should provide corresponding virtual digital human teaching plans and projects based on the corresponding training resource modules to form a complete learning path.

Thirdly, focus on safety awareness training and balance interestingness and professionalism. In practical training teaching, some majors or projects have high-risk characteristics, which requires schools to use virtual simulation equipment and resources to assist in completing teaching with the help of virtual digital humans [12]. In this process, virtual digital humans can simulate the consequences of wrong operations and assess responsibility weights, allowing students to understand the hazards caused by illegal operations, recognize the significance of responsibilities, and improve their awe of safety norms.

4.3. Build an AI-driven dynamic evaluation system to achieve precise portraits of skill growth

The digital-intelligent transformation of higher vocational education is reflected not only in teaching methods and models but also in teaching evaluation and assessment. Virtual digital human technology can realize the transformation of the "experience-driven" evaluation system to "data-driven", forming an objective and complete evaluation carrier.

Firstly, construct a full-process and multi-dimensional data collection system. Schools can collect microdata

such as students' learning behaviors, operation processes, decision-making paths, and reaction times based on the interaction process with virtual digital humans, thereby establishing a student personal portrait database [13]. In teaching evaluation, teachers can conduct a comprehensive evaluation based on the results of process data analysis and traditional test scores to more comprehensively present students' learning achievements.

Secondly, establish a skill assessment model based on big data. With the support of big data technology, schools can also use machine algorithms to analyze students' learning behavior data, deeply interpret the correlation between students' learning behaviors and skill mastery, and thus establish a more scientific competency assessment index system, providing more objective and relevant evaluation indicators for teachers to implement teaching evaluation. For example, schools can establish an integrated system of intelligent analysis, evaluation and teacher evaluation. On the one hand, algorithms assist in analyzing students' behavior records, and virtual digital humans evaluate and provide feedback to students; on the other hand, teachers evaluate students based on their actual learning achievements and performance, forming a "qualitative + quantitative" evaluation path [14].

Thirdly, develop personalized feedback and intervention mechanisms. The purpose of teaching evaluation is not evaluation itself, but to promote students' learning through evaluation feedback. Therefore, schools should also establish feedback and intervention mechanisms with the help of virtual digital human systems, automatically generate personalized learning suggestions and resource recommendations based on intelligent evaluation results, and infiltrate and guide them in subsequent "student-machine" interactive learning to achieve the effect of promoting learning through evaluation.

4.4. Deepen the school-enterprise collaboration mechanism and co-construct a virtual training resource library

From the perspective of integration of production and education, the collaborative development of virtual digital human technology and higher vocational education also needs to be based on school-enterprise cooperation to assist in resource development and updating, provide students with cutting-edge knowledge and skills, and avoid the disconnection between teaching and industry.

Firstly, co-construct a virtual training resource development team. Professional teachers from schools should be responsible for the design of teaching content and the guidance of educational theories to ensure the educational characteristics of virtual training resource development. Enterprise experts should clarify the details of real work scenarios and case construction to ensure the scientificity and accuracy of virtual resources. Technology companies should develop a virtual digital human system with in-depth integration of "education + industry + technology" according to the requirements of school teachers and enterprise experts [15].

Secondly, co-cultivate a teaching team proficient in digital technology. Virtual digital human technology cannot replace teachers, and teachers are needed as the core subject for its application. Therefore, schools also need to improve teachers' digital literacy and technical operation capabilities through enterprise practice, technical training, and project cooperation.

5. Conclusion

In summary, virtual digital human technology is a cutting-edge field in the digital-intelligent transformation of modern education, and is reshaping the higher vocational education ecosystem with unprecedented depth and breadth. Schools should comprehensively solve the practical dilemmas faced by vocational education by building

a new "teacher-machine-student" ternary teaching ecosystem, developing virtual simulation training resources, innovating dynamic evaluation systems, and deepening school-enterprise collaboration. They should give full play to its educational values, such as personalized teaching, precise evaluation, and immersive experience, thereby promoting the transformation of higher vocational education from standardized and large-scale training to personalized and adaptive development, and opening up a new path for cultivating high-quality technical and skilled talents adapting to the digital era.

Disclosure statement

The author declares no conflict of interest.

References

[1] Lu W, 2025, Innovative Exploration of Virtual Digital Humans Embedded in University Education and Teaching. China Journal of Multimedia & Network Teaching, 03: 25–28.

[2] Gao J, Hou L, 2024, The Development of Virtual Digital Humans and Their Application in Education. Primary and Secondary School Educational Technology, 11: 13–16.

[3] Han J, 2024, Research and Scenario Analysis of the Application of Virtual Digital Humans in Popular Science and Teaching. Knowledge Management Forum, 9(05): 460–476.

[4] Wu F, 2024, Innovative Paths of Educational Management in Higher Vocational Colleges in the Digital-Intelligent Era. Academy, 17(26): 75–77.

[5] Huang X, 2024, Exploration on Virtual Digital Humans Empowering Vocational Education Curriculum Reform from the Perspective of Metaverse—Taking the Course "New Media Marketing" as an Example. Journal of Western, 17: 121–125 + 172.

[6] Liu J, 2024, Challenges and Countermeasures of Digital-Intelligent Empowerment in Higher Vocational Education Governance. Journal of Tianjin Vocational Institutes, 26(08): 83–87.

[7] Jiang T, 2024, Innovative Application and Strategy Research of Virtual Digital Human Technology in Digital Education. Science & Technology Information, 22(14): 211–214 + 219.

[8] Ye W, 2024, Research on the Evaluation Index System of Digital-Intelligent Competence of Higher Vocational Teachers Under the Background of Smart Education. Journal of Nanning Vocational and Technical College, 32(01): 36–43.

[9] Huang G, 2024, The Application of Virtual Digital Humans in Higher Vocational Education. Digital Technology and Application, 42(01): 36–38.

[10] Wang Q, Kan Z, 2024, Digital-Intelligent Transformation of Vocational Education from the Perspective of Metaverse: Motivation, Value and Path. Journal of Weifang Engineering Vocational College, 37(01): 64–70 + 76.

[11] Song H, 2023, The Application and Development Trend of Virtual Digital Humans in Film and Television Animation Teaching. Times Report (Benliu), 12: 28–30.

[12] Ma X, Lou F, Dai H, 2023, Educational Virtual Digital Humans from the Perspective of Metaverse: Implications, Scenarios and Reflections. China Adult Education, 22: 11–16.

[13] Wang X, 2023, Research on the Application of Virtual Digital Humans in Microlecture Teaching. Engineering and Technology Research, 8(21): 155–157.

[14] Pan M, Lü X, Chen S, et al., 2023, Innovation and Practice of Online Teaching Based on AI Virtual Digital Human

Technology. Modern Vocational Education, 31: 1–4.

[15] Huang R, Guo H, 2023, Research on the Path of “Digital-Intelligent” Empowering Entrepreneurship Education in Higher Vocational Colleges. China Journal of Multimedia & Network Teaching, 01: 144–147.