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A Study on the Application of Virtual Simulation Technology in Dual-creation Education

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Abstracts: Virtual simulation technology can significantly improve the quality of teaching and the efficiency of resource utilization, through the creation of a simulated real work environment, which not only enhances the practical operation ability of students but also stimulates their innovative thinking and technology application ability. This paper discusses the application and impact of virtual simulation technology in dual-creation education and analyzes in detail the four major application strategies of virtual simulation technology in dual-creation education, including the integration of virtual simulation technology and curriculum design, the enhancement of teachers' skills and teaching methods, the enhancement of students' participation and practical experience, and the establishment of an effective evaluation and feedback mechanism. Through these strategies, virtual simulation technology not only solves the existing challenges in dual-creation education but also provides an innovative approach to education.

Keywords: virtual simulation technology; dual-creation education; curriculum design; teaching strategies; industry cooperation

Introduction

Under the background of innovation-driven development, entrepreneurship and innovation education have become an important part of the education field, aiming to cultivate students' innovative thinking and entrepreneurial ability. With the rapid development of science and technology, the traditional education model is also facing the demand for transformation and upgrading, in which virtual simulation technology shows great potential. By constructing realistic simulation environments, virtual simulation technology can not only provide a risk-free experiment and operation platform to enhance the learning experience but also greatly improve the utilization efficiency and accessibility of educational resources. Utilizing this technology, dual-creation education can break through the limitations of time and space, more effectively stimulate students' creativity and practical ability, and provide strong technical support for the cultivation of innovative talents.

1. The Current Situation and Demand for Dual-creation Education

In the stormy information age, cultivating students' creativity and innovation has become the core task of education. As a forward-looking education model, dual-creation education aims to shape new talents who can adapt to future social and economic development needs by systematically cultivating students' innovative thinking and entrepreneurial consciousness. This kind of education not only emphasizes the teaching of theoretical knowledge but also the cultivation of practical skills and the stimulation of innovation ability, to inject continuous vitality into the development of the digital economy. Tsinghua University has always been at the forefront of reform, and through the implementation of engineering

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practice education reform, it has successfully planted the spirit of innovation and stimulated students' innovative thinking through the Tsinghua Craftsmanship Competition. This education model emphasizes the combination of theory and practice, improves students' ability to solve complex engineering problems, and also cultivates their sense of innovation and entrepreneurial ability.

Bicentennial education is also bound to usher in many challenges along the way. First, many educational institutions lack the necessary laboratory facilities and financial support, and resource allocation does not limit the popularization of high-quality practical education. Second, faculty need to further enhance their professional competence and reform their teaching methods to meet the changing educational needs. Once again, the linkage between education and industry is insufficient, and students are unable to learn knowledge that meets the actual needs of enterprises or gain practical experience that is closely related to the industry, which restricts the cultivation of their innovation and entrepreneurial ability. Finally, dual-entrepreneurship education needs to fully integrate advanced technological tools and concepts in the curriculum system to ensure that students can master cutting-edge knowledge and skills. To address these challenges, education policymakers and school administrators must work together to explore effective solutions. Building an effective dual-creation education system requires institutions of higher education to optimize their education strategies and integrate their resources to produce innovative individuals who can adapt to the needs of the future. This not only helps to improve the quality of education but also ensures the maximization of the return on investment in education, thus promoting the overall development of society and the economy.

2. Fitting Point of Virtual Simulation Technology and Dual-creation Education

2.1 Improve the quality and accessibility of practical and experimental teaching

Virtual simulation technology has revolutionized experimental and practical teaching through high-quality simulation environments. It improves the practical effect of teaching and greatly expands the accessibility of experimental teaching by constructing realistic virtual scenarios that enable students to perform complex experimental operations in a safe and risk-free environment (Zhang, 2024). In educational institutions with limited resources or in areas where large-scale experiments cannot be conducted, virtual simulation technology provides students with ample opportunities for practice without the need for expensive experimental facilities and materials. For example, in the modern meat sheep production process, the production process cycle is long, the epidemic prevention requirements of high standards, and the use of virtual simulation technology can enable students to carry out extensive practical training in a risk-free environment. Students can learn breed selection, estrus identification, artificial insemination, and other complex technologies through the virtual simulation system without direct contact with animals, thus avoiding the risk of animal stress and zoonotic diseases. Through the human-computer interaction interface, students can customize the setting of technical parameters of production steps and submit online reports of experimental results, thus realizing the close integration of theory and practice.

2.2 Optimize resource allocation and reduce costs

By creating highly realistic simulation environments, virtual simulation technology eliminates the need for educational institutions to invest heavily in physical laboratories and expensive specialized equipment. For example, for learning in the field of engineering or medicine, which traditionally requires a large amount of equipment and materials to carry out experimental operations, through the virtual simulation platform, students can reproduce the same operational processes and experimental settings in the virtual world, not only the same effect and a substantial reduction in costs. Virtual simulation technology reduces the need for physical facilities and materials by simulating experiments and practical activities. Students can repeat experiments an unlimited number of times in a virtual environment with no additional cost for each modification and adjustment. This not only reduces the financial burden of educational institutions in

maintaining and updating laboratory equipment and materials but also makes the use of educational resources more efficient and sustainable (Zheng, 2024). Therefore, virtual simulation technology not only improves the quality of teaching and learning but also achieves the optimization of educational costs, which is an important tool to promote the development of bi-institutional education. This increase in cost efficiency makes it possible for more educational institutions to implement advanced teaching methods, especially in resource-limited environments.

2.3 Strengthening students' creative ability and technology application

The application of virtual simulation technology in dual-creation education greatly strengthens students' innovation ability and technology application. This technology enables students to explore and experiment freely without the limitations of the physical world by providing a simulated experimental and operational environment. In such an environment, students can try out various solutions to solve complex problems, thus stimulating and developing their innovative thinking and problem-solving skills. In a virtual engineering design project, students can test different building materials and structural designs and understand the impact of each choice, thus promoting the development of innovative thinking. Virtual simulation environments provide students with the opportunity to interact directly with the latest technologies and tools in the industry (Wu & Liu, 2024). By manipulating these advanced tools and technologies, students not only familiarize themselves with their operation and functionality but also see in real-time their performance and results in real-world applications. This hands-on experience is invaluable, especially in rapidly evolving fields such as industry, medicine, and technology, where the latest technological tools are often the key to moving the industry forward. Therefore, virtual simulation technology not only improves students' technical skills but also deepens their understanding and application of specialized knowledge through hands-on experience, laying a solid foundation for their future careers and innovative activities.

2.4 Strengthening the interface between educational content and market demand

The application of virtual simulation technology in dual-creation education can significantly strengthen the interface between educational content and market demand. This technology allows educational institutions to update their teaching content in real-time to adapt to rapidly changing industrial needs. For example, in the field of engineering or technology, as new materials and technologies evolve, relevant teaching modules can be quickly adapted and updated to ensure that students can learn cutting-edge knowledge and skills. By simulating actual working environments and challenges, virtual simulation not only provides theoretical teaching but also emphasizes practical operation and problem-solving, thus more closely matching the actual needs of the industry. This close match between educational content and market demand directly enhances students' competitiveness in employment. The skills cultivated in the virtual simulation environment directly correspond to the job requirements in the market, and students can quickly adapt to the work environment after graduation, which reduces the time and resources invested by enterprises in the training of new employees (Liu et al., 2024). At the same time, students are also more popular with employers because they can use the latest technology. Therefore, through virtual simulation technology, dual-creation education not only provides high-quality education that meets the needs of the times but also ensures that the educational outcomes are kept in sync with the market demand, to better serve the career development of students and the progress of the industry.

3. Application Strategy of Virtual Simulation Technology in Dual-creation Education

3.1 Integration of virtual simulation technology and curriculum design

To effectively integrate virtual simulation technology and curriculum design in dual-creation education, it is first necessary to thoroughly analyze the existing curriculum and compare the gap between the curriculum design and industry needs. By working with industry experts, it is possible to

identify which key skills and knowledge points are most in short supply, and these will be the parts of the curriculum design that will be focused on updating. On top of this, feedback directly from the market needs to be collected through questionnaires and industry interviews to ensure that the educational content is relevant and forward-looking (Liu, 2024). The curriculum design can use modularized teaching, which is conducive to promoting the closeness of dual-creation education to the industry by introducing the latest industry software, tools, and technologies, thus better preparing students for their career development. In Tsinghua University's dual-creation education reform, the curriculum is designed into modules with independent functions, and "general modules" and "specialized modules" can be freely combined, which not only meets the students' basic training needs but also adapts to their needs for in-depth practice. According to the characteristics of different specialties, the modules can be further spliced and combined to form a complete set of course modules. For example, automobile students can choose to start from the basic casting and welding technology, and gradually deepen into automobile material processing, design and manufacturing, and even industrial management of practical learning. In the modularized teaching system, the dynamic course management system has more obvious advantages, the system can automatically recommend updated or new module content according to the development of the industry. When new technology emerges, the course content can be quickly adapted to new technological trends by simply adding or removing modules as appropriate. This dynamic updating mechanism ensures that the educational content is always in sync with industry standards and technological advances, thus effectively supporting students' career development and the cultivation of innovation.

3.2 Upgrading teachers' skills and teaching methods

To enhance teachers' skills and teaching methods in dual innovation education and ensure the effective application of virtual simulation technology, specific strategies can be adopted as follows. First, organize special training to help teachers familiarize themselves with and master the operation of virtual simulation software and tools so that they can understand and apply virtual simulation technology in teaching practice. This includes not only basic software operation skills but also how to design and implement virtual simulation teaching activities, as well as how to assess students' performance in the virtual environment. Second, a blended teaching approach is used to combine traditional classroom teaching with virtual simulation technology. This method can improve the interactivity and practicability of teaching and enable students to establish a more direct connection between theoretical learning and practical operation. For example, the teacher can first explain the theoretical knowledge in the traditional classroom and then guide the students to enter the virtual simulation environment to practice the actual operation, through which the students can better understand the knowledge and apply it in practice. In this process, teachers' roles are also gradually changing from traditional knowledge transmitters to mentors and coordinators, who are no longer the dominant players in the classroom, but stand aside and support students' independent learning and teamwork more by observing and listening (Bo, 2024). Finally, teachers are encouraged to engage in continuous learning and research to keep their teaching content forward-looking and innovative. Teachers can continually update their knowledge base by attending academic conferences, reading the latest educational technology literature, and conducting educational research. Teachers should also be encouraged to explore new teaching methods and technologies, such as utilizing data analytics to assess teaching effectiveness or developing new virtual simulation teaching modules to adapt to changing educational needs and technological developments. Through these strategies, teachers will be able to utilize virtual simulation more effectively to provide students with a richer and more dynamic learning experience while enhancing their teaching skills and professional development. This will not only help to improve the quality of teaching but also stimulate students' innovative spirit and practical ability.

3.3 Enhancement of student participation

To enhance students' engagement and practical experience in dual-creation education, virtual environments that simulate real-world problems need to be created so that students can learn to solve problems through practice. Taking the reform of the "Server Configuration and Management" course in Guangdong Institute of Transportation Technology as an example, the institute has built an interactive virtual classroom, a virtual simulation training room, and a virtual equipment training room with virtual simulation technology, and this three-dimensional teaching mode effectively simulates the real server management environment. Students can carry out a full range of operations from basic server assembly to advanced network configuration on the virtual platform. This kind of simulation practice not only improves students' technical operation ability but also greatly enhances their understanding of and interest in the course content. Teachers can monitor each student's operation process in detail in this way, providing instant feedback and customized guidance to ensure that the quality of teaching and learning effects are maximized. In other specialties, such as market analysis, product development, and operations management, students can also be guided to apply their knowledge to find solutions by setting up complex virtual business projects. In virtual projects, students can try out various strategies in a risk-free environment and receive immediate feedback, which is crucial for them to understand the course content and assess their performance. On this basis, organizing interdisciplinary projects to promote student teamwork and simulate real work environments are also important measures. By organizing students from different disciplinary backgrounds to collaborate on a virtual platform to develop new technical products or improve service processes, students' teamwork and cross-disciplinary communication skills can be effectively enhanced (Kou, 2024). In addition, combining competitions and challenges is conducive to motivating students to think innovatively and apply new technologies. Common on- and off-campus technological innovation competitions, such as programming marathons or design thinking challenges, can encourage students to use virtual simulation to complete and explore innovative solutions, which not only stimulates students' creativity but also improves their ability to apply new technologies. Through the implementation of these strategies, not only can students' practical experience be enhanced, but also their innovation ability and technology application level can be effectively improved, laying a solid foundation for their future careers.

3.4 Establishment of assessment and feedback mechanism

When applying virtual simulation technology in dual-creation education, it is crucial to establish an effective assessment and feedback mechanism. The first step requires clear assessment criteria, which should specifically quantify students' performance in the virtual simulation environment, including problem-solving ability, application of innovative thinking, mastery of technical skills, and efficiency of teamwork. These assessment criteria should not only be closely related to the teaching objectives but also aligned with industry standards to ensure that students' skills can be directly translated into competitiveness in the workplace. Next, through continuous monitoring and analysis of these assessment data, educational institutions should make timely adjustments to their teaching strategies and course content. For example, if the data show that students are underperforming in a key skill, course leaders need to reconsider teaching methods or add more practical sessions to enhance students' understanding and application. Teaching content should be updated not only to reflect technological developments but also the latest needs of the industry to ensure that education remains in sync with the market (Zhang, 2024). The whole process of assessment should make full use of student and instructor feedback to optimize the virtual simulation experience and improve teaching effectiveness. Student feedback can provide direct information about the effectiveness of teaching methods, while instructor feedback can help identify potential problems and improvement points in course design. Establishing an open feedback mechanism that encourages all participants to express their views and suggestions not only enhances the transparency of teaching but also builds an

educational environment for continuous improvement and self-improvement. Through this systematic evaluation and feedback process, the application of virtual simulation technology in dual-creation education will be fruitful.

Summary

The application of virtual simulation technology in dual-creation education is extremely important, as it not only improves the quality of teaching and the practical ability of students, but also optimizes the allocation of resources, reduces costs, and strengthens the interface between educational content and market demand. The utilization of this technology provides students with the opportunity to simulate a real work environment, enabling them to explore and experiment in a risk-free environment, thus fostering their innovative thinking and technological application capabilities. Future research directions could explore the development of more refined and customized virtual simulation tools to suit the specific needs of different disciplines. Meanwhile, research should focus on improving the interactivity and realism of virtual simulation technology to enhance students' learning experience. By working more closely with the industry, schools can continuously update their teaching content to ensure that they stay up-to-date with the latest industry technologies and needs. With these improvements, virtual simulation technology will play a greater role in promoting the development of dual-creation education and provide more comprehensive educational support for students.

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Conflict of Interest

The author declares that she has no conflicts of interest to this work.

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