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Immersive Learning for Network Security Education: The Role of Virtual Reality Technology in Higher Vocational Colleges

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Abstract: ***As a core course in higher vocational education, enhancing the teaching quality of computer network security is essential for fostering students' comprehensive development and for the construction of high-quality learning environments. The emergence and advancement of virtual reality (VR) technology have created new opportunities for innovation in network security education within higher vocational colleges. By applying VR technology to construct realistic simulation environments, instructional formats can be enriched while effectively improving students' practical technical skills and facilitating the integration of theoretical knowledge with hands-on application. This study explores the pedagogical value and specific implementation strategies of VR technology in computer network security instruction within higher vocational colleges, aiming to deepen the application of VR technology across educational contexts.***

Keywords: Virtual Reality Technology; Higher Vocational Colleges; Computer Network Security; Teaching Application.

1. INTRODUCTION

In the process of educational development in higher vocational colleges, computer network security has always been regarded as an important course. The core goal of the course is mainly to improve students' network security awareness and skills, and enhance their awareness of preventing network risks and their ability to respond to network security threats. However, current network security issues are becoming increasingly complex, and the challenges to deal with them continue to intensify. The traditional teaching model has become increasingly difficult to meet the needs of practical applications. Therefore, this paper mainly explores how to use the new virtual reality technology to create a more vivid and interactive learning environment for students, thereby improving their hands-on operation ability and network security awareness, and promoting the high-quality development of computer network security courses in higher vocational colleges. After China resumed the issuance of national debt in 1981, it has gone through a seven-year history of debt and no market. The start of the bond market will begin with the trial of the Ministry of Finance's transfer of national debt in 61 cities across the country in 1988. This is an over-the-counter transaction of cash bonds over the bank counter and the official beginning of the secondary market for China's treasury bonds.

From the perspective of my country's spot bond transaction volume, the volume of spot bond market in my country's bond market showed a fluctuating upward trend from 2015 to 2020, and only a certain degree of decline occurred in 2017. In 2020, the trading volume of spot bonds in my country's bond market hit a new high in five years, at 253 trillion yuan, an increase of 35.6 trillion yuan compared with 2018, an increase of 16.4%.

From the perspective of the structure of spot bond transactions, the most active part of spot bond transactions is the inter-bank bond market, whose transaction volume accounts for more than 90% of the total bond market transaction volume. In 2020, the trading volume of spot bonds in the bond market was 253 trillion yuan, a year-on-year increase of 16.5%. Among them, the volume of spot bond transactions in the inter-bank bond market was 232.8 trillion yuan, with an average daily turnover of 935.04 billion yuan, a year-on-year increase of 12%. However, from 2015 to 2020, the trading volume of spot bonds in my country's exchange market has shown a continuous upward trend. In 2020, spot bond transactions in my country's exchange bond market were 20.2 trillion yuan, with an average daily turnover of 83.04 billion yuan, a year-on-year increase of 142.6%.

At present, the degree of openness of the exchange bond market to the outside world is not high. In accordance with the overall deployment of my country's financial opening up, my country's bond market will steadily promote the implementation of relevant measures for opening up, expand investment channels, and facilitate the issuance of bonds and financing by overseas institutions.

2. CONCEPT AND IMPORTANCE OF VIRTUAL REALITY TECHNOLOGY

2.1 Concept of Virtual Reality Technology

Virtual Reality (VR) technology is an advanced computer simulation method. Through virtual reality technology, users can construct an interactive three-dimensional virtual space completely generated by computers and be fully immersed in such an environment. This technology creates an extremely realistic and multi-sensory immersive experience environment by simulating real-world environments, behaviors, and interactive scenarios, relying on various advanced technologies such as simulation, computer interaction technology, sensing technology, big data processing, and face recognition. Through immersive experience, users can perceive virtual objects in multiple dimensions such as vision, hearing, and touch and interact with them, thereby understanding and cognizing the virtual world more deeply and intuitively.

The main characteristics of virtual reality technology include immersion, interactivity, multi-perception, and conception. First, immersion emphasizes that users feel as if they are in a real virtual world, where they can operate freely and experience sensory stimuli similar to the real world. Second, interactivity mainly refers to the ability of users to directly interact with various objects in the virtual environment, and this interaction is two-way; for example, when a user performs a click operation, the virtual environment will provide feedback. Multi-perception refers to allowing users to simulate the real environment in an all-round way through various sensory channels such as vision, hearing, and even touch, so as to obtain a more comprehensive and in-depth virtual experience.

2.2 Significance of Applying Virtual Reality Technology in Computer Network Security Teaching in Higher Vocational Colleges

2.2.1 Conducive to Carrying Out Differentiated Teaching

For students in higher vocational colleges, there are significant differences in individual knowledge reserves and learning abilities, so learning needs are diverse and personalized. Virtual reality technology can effectively solve the problem of differentiated learning needs, especially in the field of computer science, where the application effect of virtual reality technology is more significant. For students seeking advancement, teachers can use virtual reality technology to build learning tasks with high complexity and difficulty, enabling students to better immerse themselves in a research-oriented learning environment and stimulate their potential and creativity. For students with basic abilities to be improved, virtual reality technology can also play a role, helping teachers present teaching knowledge more intuitively, assisting students in better mastering solid foundations, and at the same time, using such learning methods to enhance their learning confidence. In the entire teaching process, teachers can flexibly apply virtual reality technology to tailor teaching plans by understanding students' learning needs, so as to meet differentiated learning needs.

2.2.2. Conducive to Enhancing Learning Interest

Traditional computer network security teaching in higher vocational colleges is carried out by combining classroom blackboard theoretical teaching with computer practical operations, often focusing more on theoretical knowledge teaching while relatively neglecting practical operations. In this case, applying virtual reality technology in computer network security course teaching can enhance the fun of teaching. Virtual reality technology creates an extremely realistic simulation environment for teachers and students, which can meet various requirements for practical operations and software and hardware conditions in computer teaching. Students learn in an immersive network environment and personally experience various threats brought by network security, which can effectively improve students' enthusiasm and passion for learning network technology security.

2.2.3. Conducive to Improving Learning Efficiency

Computer network security teaching is a highly specialized discipline, and its theoretical knowledge is often abstract and complex. However, the current cultural literacy of students in higher vocational colleges is relatively low, making it difficult for them to understand network security technical knowledge and master professional knowledge efficiently. By applying virtual reality technology in the teaching process of computer network security, teachers can construct the entire process of building, operating, and managing a network platform in a virtual environment. This teaching method can effectively break through the limitations of traditional classroom teaching,

enabling students to deeply understand and master core content such as basic data structures in computer science and the design principles of complex algorithms in a more three-dimensional and intuitive way. In addition, virtual reality technology can simulate a real network environment, allowing students to conduct practical operations of network security management in this environment, personally experience the formulation and implementation of network security prevention measures, thereby effectively improving overall learning efficiency and practical operation ability.

3. APPLICATION PROBLEMS OF VIRTUAL REALITY TECHNOLOGY IN COMPUTER NETWORK SECURITY TEACHING IN HIGHER VOCATIONAL COLLEGES

3.1 High Requirements for Technical Equipment Construction

Although virtual reality technology has been widely applied in the teaching field and has brought unprecedented innovation and vitality to computer network security teaching in higher vocational colleges, the high construction cost of virtual reality technology also makes the application of this technology face investment and cost challenges. First, the cost of hardware facilities is huge. The implementation of virtual reality teaching is inseparable from the support of key equipment such as VR headsets, handle controllers, and motion tracking systems. These devices not only require initial procurement costs but also require continuous investment in updating and maintaining equipment as technology evolves. In particular, high-performance VR hardware is expensive and often becomes the main investment part when applying virtual technology in education. In addition, the acquisition and customization of software platforms and development tools are also expensive. In the field of computer network security teaching, professional virtual reality software is often needed to support complex scene construction and role design processes. Furthermore, to meet specific teaching needs, it is necessary to hire professional teams for software customization and development, which all increase teaching costs.

3.2 Limited Application Ability of Teachers

The application of virtual reality technology in computer network security teaching, as an emerging online teaching model, poses new challenges to the quality and capabilities of teachers in vocational colleges. First, teachers need to possess excellent information literacy and solid technical skills to ensure they can flexibly use virtual reality technology to design the teaching process of computer network security courses. Second, in the planning and organization of course content, teachers need professional subject knowledge to accurately select teaching materials from the vast knowledge system and create virtual learning scenarios that are close to reality. Although current computer network security teachers have a certain basic knowledge of VR technology in their profession, there is no mature curriculum system for how to apply VR technology in the computer network security course system. This requires teachers to have a high degree of professional sensitivity and learning creativity to keep up with the pace of technological development.

3.3 Single Teaching Content and Form

In the application process of virtual reality technology in computer network security professional teaching, although it can enrich teaching content and resources, there is also the problem of insufficient teaching resources. On the one hand, many vocational colleges currently do not have virtual scene resources specifically designed for this professional teaching. The existing resources are not only limited in quantity but also often uneven in quality and single in content, making it difficult to support high-quality teaching needs. Teachers and students often face restricted resource choices in teaching, and in such cases, students cannot obtain rich and diverse learning experiences. On the other hand, this current situation of resource shortage further limits the diversified development of teaching forms, preventing the full utilization of the educational potential of virtual reality technology. At the beginning of applying virtual reality technology in teaching, students, out of curiosity about emerging technologies, often focus more on virtual reality technology equipment and simulation environments. However, as the novelty fades, the attractiveness and advantages of virtual reality technology in teaching will become increasingly weak.

4. APPLICATION STRATEGIES OF VIRTUAL REALITY TECHNOLOGY IN COMPUTER NETWORK SECURITY TEACHING IN VOCATIONAL COLLEGES

4.1 Building a Resource Sharing Platform

To address the issues of high costs and insufficient resources when applying virtual technology in computer network security teaching, on the one hand, higher vocational colleges can strengthen cooperation with enterprises. Through the "integration of industry, academia, research, and teaching" school-enterprise cooperation model, strong impetus can be injected into the application of virtual reality technology in computer network security teaching. This model not only enables enterprises to provide necessary financial assistance and technical support to higher vocational colleges, helping them cultivate more high-quality professionals in the field of computer network security, but also promotes the transformation of university research achievements into enterprises, assisting enterprises in technological innovation and market expansion, thereby achieving a win-win situation for both schools and enterprises. On the other hand, higher vocational colleges should strengthen cooperation among themselves to jointly build a shared platform for virtual reality technology application teaching resources. By making full use of the convenience of internet technology, enhancing exchanges and cooperation between higher vocational colleges, deeply integrating and optimally allocating existing virtual reality teaching resources, an open and shared online platform can be established to jointly promote the widespread application and in-depth development of virtual reality technology in computer network security teaching.

4.2 Strengthening the Construction of Teaching Staff

To strengthen the construction of the teaching staff, first, a comprehensive and systematic teacher training system needs to be established. Targeted virtual reality technology teacher training should be designed and carried out to help teachers in higher vocational colleges fully master the basic theories and application skills of virtual reality technology. The training content should not only include theoretical explanations but also practical exercises and case analyses, ensuring that teachers can deeply understand virtual reality technology and skillfully apply it to network security teaching. Secondly, to ensure the smooth and efficient teaching process of teachers, higher vocational colleges should, at least in the initial stage of technology application, form a professional technical support team that can provide technical support and consulting services to teachers at any time. In addition to answering questions and assisting in solving technical problems, regular technical sharing sessions should be held to promote technical exchanges and cooperation among teachers, jointly improving teaching quality. Furthermore, teachers themselves should actively engage in the practical teaching of virtual reality technology and strengthen their learning and growth in related technical application fields. Schools can provide teachers with practical exercise opportunities, encourage them to participate in external training, seminars, and academic conferences, keep up with technological frontiers, broaden academic horizons, and continuously improve their professional literacy and virtual technology application teaching capabilities.

4.3 Integration of Technology Application and Practice

4.3.1 Building Teaching Scenarios Focused on Teaching Objectives

Teachers should take the curriculum objectives of computer network security teaching as the core starting point, rely on virtual reality technology, carefully construct the pre-class teaching environment, and provide an intuitive and immersive teaching platform for students to effectively complete learning tasks. First, teachers should carefully select and design teaching scene construction schemes suitable for virtual reality technology display based on actual teaching conditions. In the process of building teaching scenes, ensure that teaching content, especially key knowledge points, should be closely combined with learning tasks, so that students can intuitively perceive and deeply understand pre-learning materials through immersive virtual reality technology experience, while clarifying learning tasks and requirements. Secondly, after the deployment of the virtual reality technology teaching scene is completed, teachers should provide good technical guidance to instruct students to correctly use this environment for learning. It is necessary to allow them to fully experience the subtleties of virtual reality technology, while preventing students from focusing more on the virtual scene itself and instead concentrating on the learning tasks. For example, taking the learning task of "Getting to Know Computers" as an example, since vocational college students are generally familiar with computer operations but have obvious deficiencies in the cognition of core computer theories, teachers should focus on deepening students' understanding of core computer

knowledge concepts when designing the teaching plan for this course. When applying virtual technology for scene design, first, focus on the popularization of basic theories; second, strengthen students' ability to apply knowledge to practice through the implantation of real scenes; in addition, stimulate students' interest and curiosity in computer science through innovative teaching scenes.

4.3.2 Building an Experimental Environment Based on Actual Needs

The core of applying virtual reality technology in computer network security teaching activities in higher vocational colleges lies in the deep integration of this technology with practice, which serves as a driver for the high-quality development of computer network security education in higher vocational colleges. Currently, in real life, information security challenges such as data leaks and cyber attacks are becoming increasingly severe, and traditional teaching methods struggle to efficiently cultivate students' ability to face and resolve real security threats. The application of virtual reality technology allows for the design of a series of combat-oriented teaching scenarios. For example, students can role-play as company employees, experiencing the process of opening an office email and receiving a carefully disguised phishing email in a virtual office environment, where the email contains highly deceptive malicious links. During the teaching process, students are guided to identify key characteristics of phishing emails, such as the suspiciousness of the source, the camouflage techniques of links, and attempts to induce the disclosure of personal sensitive information, and are taught how to use defense strategies such as firewall configuration and intrusion detection systems (IDS) to respond to such threats. At the same time, the application of virtual reality technology effectively solves difficulties faced by traditional experimental teaching, such as bandwidth and device compatibility issues, providing a more flexible and efficient solution for teaching. In addition, through the intuitive display of VR technology, students can more deeply understand the importance of information security and the key role of core knowledge such as password algorithm design, security protocols, and authentication mechanisms in ensuring information security.

5. CONCLUSION

In conclusion, the development and widespread application of virtual reality technology have become a trend. However, the current application of virtual technology in computer network security teaching is still in its initial stage. To enhance the effectiveness of virtual reality technology in optimizing the online teaching environment and improving the quality of computer network security teaching in higher vocational colleges, this paper explores the application of virtual reality technology in computer network security teaching in higher vocational colleges, aiming to achieve deep integration of virtual reality technology with teaching practice, improve the quality of computer network security teaching in higher vocational colleges, and cultivate high-skilled computer network security technical talents for society.

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