Scientific
Research
Publishing

Reform Exploration of Proteus Virtual Simulation Practice Teaching in Electronic

Xin Wang, Junlin Wang*, Zhi Weng, Yongfeng Wei, Ding Han, Caili Gong

College of Electronic Information Engineering, Inner Mongolia University, Hohhot, China
Email: *wangxin219@imu.edu.cn

Abstract

Introducing virtual simulation technology into practical teaching reform, building a highly simulated virtual experimental environment and experimental objects, and allowing students to carry out experiments and practical training in the virtual environment can effectively promote practical teaching reform and comprehensively improve college students' innovative spirit and practical ability. This paper discusses the path and feasibility of combining the teaching of electronic information courses with Proteus virtual simulation platform to promote innovation and entrepreneurship education reform from the aspects of strengthening teachers' team building, improving teaching methods, constructing a new experimental teaching system and resource environment, and innovating practical teaching mode.

Keywords

Innovation and Entrepreneurship Education, Electronic Information,
Practice Teaching, Virtual Simulation, Proteus

1. Introduction

In 2015, the General Office of the State Council issued the "Implementation Opinions on Deepening the Reform of Innovation and Entrepreneurship Education in Higher Education", which gives a clear goal for innovation and entrepreneurship education in higher education in the next five years and requires to deepen the reform of innovation and entrepreneurship education in higher education. As the new force of China's future, college students are the driving force of the innovation-driven development strategy and the promotion of "mass entrepreneurship and innovation", and they play a crucial role in the realization of the Chinese dream. The Ministry of Education emphasizes that the innovative and entrepreneurial vitality of millions of college students should be allowed to

burst forth and be fully released! Under the background of "mass entrepreneurship and innovation", universities across the country have set off a wave of deepening innovation and entrepreneurship education reform (Ma & Wang, 2021; Xu, Shen, & Zhong, 2021).

Innovation and entrepreneurship education is an educational concept and model generated by the national innovation development strategy, which aims to gather innovative and entrepreneurial educational resources from inside and outside the university and the whole society to cultivate students' innovative spirit, innovative thinking, entrepreneurial consciousness and innovative and entrepreneurial ability, so as to improve the comprehensive quality of talents (Zhao, 2021). In the process of cultivating applied talents with innovative spirit and entrepreneurial consciousness, practical teaching is an important link to consolidating theoretical knowledge and transforming knowledge into ability, and it is the way to cultivate students to master scientific methods and improve operational ability. The rapid development of network interconnection technology and computer technology provides a broad space for the combination of virtual and real in the practical teaching mode, which is important for improving the quality of talent training and realizing high-quality talent training.

Virtual simulation practice teaching resources are an important part of higher education informatization and experimental teaching demonstration center construction, which is the product of deep integration of education informatization with subject characteristics and teaching contents. Virtual simulation practice teaching relies on virtual reality, multimedia, human-computer interaction, database and network communication technologies to build a highly simulated virtual experimental environment and experimental objects, allowing students to carry out experiments and practical training in the virtual environment, realizing teaching functions that cannot be carried out or difficult to complete in real experiments, make up for the defects that offline experimental teaching could not be carried out normally during the Covid-19 epidemic, and ensure that some experimental courses can be opened as scheduled, so as to comprehensively enhance the innovation spirit and practical ability of college students.

2. Virtual Simulation Technology and Proteus Software

Virtual simulation technology started in the early 1990s and is a comprehensive technology based on similar principles, model theory, systems technology, information technology, computer technology and related disciplines in its application areas, and uses computers and related physical effect equipment as tools to study actual or conceived systems (Li, 2018). Virtual simulation technology uses simulation software and the corresponding hardware platform to form a multifunctional experimental platform from virtual to actual, from software to hardware, and from concept to product design of the whole process. In just a few decades, virtual simulation technology has been developed rapidly and become the third method to understand the objective world in addition to theory and

experiment.

Virtual simulation experimental teaching is an important direction of modern experimental teaching reform, with many advantages that traditional experimental teaching does not have. Applying virtual simulation technology to the teaching of electronic information courses and building innovative practice conditions and environment for students will greatly promote the reform of experimental and practical teaching, solve the shortcomings of the traditional teaching mode such as insufficient experimental equipment, shortage of funds and time and space constraints, and reduce the cost and risk of experimental and practical teaching (Nong et al., 2021).

Proteus software is an EDA tool released by Lab Center Electronics, which truly realizes the whole process of design from virtual to actual, from concept to product, and can satisfy students' needs from a concept (or idea) to the design of circuit schematic, writing of program code, simulation and debugging of system, PCB design, and finally product development. This allows students to complete innovative designs and system simulations with high efficiency without the constraints of time, space, and content (Feng, Liu, & Chen, 2021). More and more universities in China have taken Proteus as the best virtual simulation demonstration platform for electronic information majors, and it has been widely used in the experimental teaching and research development of circuit analysis, analog circuit, digital circuit, embedded system (microcontroller application system, ARM application system) and other courses. The laboratory includes microcontroller design and simulation laboratory, embedded system design and simulation laboratory, microcomputer principle simulation laboratory, Arduino visualization design innovation laboratory, Internet of Things simulation training platform and innovation training platform. It provides a good platform for teaching reform, innovative teaching and research development (Shi, Song, Chen, 2020).

3. Virtual Simulation Practice Teaching Path for Electronic Information Courses to Improve

In accordance with the spirit of the document "Notice on the Construction of National Virtual Simulation Experimental Teaching Center" issued by the Department of Higher Education [2013] No. 94, in order to realize the construction standards of "high order, innovation and challenge" of the first-class courses in higher education in China, relying on the technologies of virtual reality, multimedia, human-computer interaction, database and network communication, insisting on problem-oriented and demand-oriented, constructing a highly simulated virtual experimental environment and experimental objects, allowing students to conduct experiments in the virtual environment, realizing teaching functions that are not available or difficult to be completed in real experiments, and cultivating students' innovation ability and creative consciousness.

The application of Proteus visual simulation software to the teaching practice of electronic information courses, constantly improves the effect of experimental

and practical course teaching and innovation and entrepreneurship training, and explore the new mode of simulation and practical teaching of electronic information courses under the new situation, is of great significance to accelerate the cultivation of students' practical ability and comprehensively improve the innovation spirit and innovation ability of college students.

3.1. Strengthen the Construction of Teachers, Improve the Level of Virtual Simulation Teaching, and Promote the Development of Disciplines and Professions

Electronic information majors are highly practical and application-oriented disciplines, and in today's rapid development of science and technology, electronic technology is developing rapidly and new technologies are emerging. As the leading force to implement innovation education and cultivate innovative talents, how to keep up with the development of science and technology and continuously improve students' innovation spirit and entrepreneurial ability has become the primary problem faced by teachers of electronic information majors (Zhang, Yan, Wang, & Jia, 2021).

Schools or colleges should establish a long-term mechanism to promote the development of teaching teams and strive to build a professional teaching team with high quality and high level, which can contribute to the development of disciplines and the construction of new majors. In order to broaden new horizons, expand new knowledge, improve engineering practice ability and enhance hardware and software system development ability, in order to meet the characteristics and specific teaching needs of electronic information majors, take simulation experiment reform as the entry point and actively organize teachers of professional courses to participate in virtual simulation technology and Proteus visualization design training, PAEE certified teacher training, innovative teaching training, etc., so as to improve teachers' virtual simulation teaching, application research and software development. In order to improve the teachers' comprehensive ability of virtual simulation teaching, application research and software development, and continuously promote the construction of "dual-teacher" teachers.

Teachers of professional courses should actively promote the combination of virtual simulation technology and professional course teaching, explore the use of "intelligence + education" mode in the field of experimental teaching, clarify teaching reform ideas, design excellent experiments and practical cases according to the characteristics of the course, adopt advanced teaching methods, integrate information technology with experimental teaching, and carry out all-rounded experiments and practical training to deepen students' understanding of the course. Through the development of the Ministry of education's industry-university cooperation collaborative education project and university-enterprise cooperation project, establish a system of experimental and practical teaching that virtual reality combination, science and education integration, and industry-education integration, promote the construction of a "dual-teacher" quality teach-

ing team, train young and middle-aged teachers, and make the age structure, educational structure, knowledge structure and academic structure of the teaching team more reasonable.

3.2. Improving Teaching Methods, Integrating Proteus Simulation Software with Theoretical Teaching, and Improving Classroom Teaching Effects

The courses of electronic information are generally more theoretical, abstract and difficult, requiring students to have better logical and abstract thinking ability and stronger comprehension in order to truly understand and learn the relevant courses well. When teaching electronic information courses, teachers of professional courses generally feel that students lack perceptual understanding of the course content, which makes it difficult to understand and master the course content, and students also generally reflect that these courses are difficult to learn, and students will easily lose interest in the course after a long time.

In the teaching process, teachers of professional courses should not only innovate teaching contents, design course contents covering "Civic and Political Education, General Education, Professional Education, Creative and Entrepreneurial Practice, Enterprise Operation and Management", and pay attention to the application of "inspiring, discussion, participation and experience" teaching methods, but also pay attention to the use of new technology and teaching resources to meet the diversified and personalized learning needs of students, fully mobilize students' participation, help students understand the teaching contents more deeply, apply the knowledge learned flexibly, and improve students' ability to analyze and solve problems.

The use of Proteus virtual simulation software can truly realize the whole process from virtual to actual, from concept to product design, which can show the obscure theories, complex and profound control methods, and complicated and changing circuit systems to students in a more intuitive way, and promote students to better understand and master the course content by deepening their perceptual understanding.

In the teaching process, teachers of professional courses should pay attention to the use of virtual simulation technology and Proteus virtual simulation platform according to the course content and student characteristics, and make use of the advantages of its dynamic simulation, while explaining theoretical knowledge, simulation and demonstration, more intuitive to show students the hardware principles and software control methods, so that students can combine perceptual cognition and rational understanding, faster grasp the new content, deepen the understanding of the course content, and improve the effectiveness of classroom teaching.

3.3. Actively Carry Out Virtual Simulation Experimental Teaching, Combined with Hardware Experimental Resources, to Explore the "Virtual Reality" Experimental Teaching Mode

The traditional experimental teaching is limited by the experimental box, the

experimental field and the experimental time, and the experimental projects are mostly verification experiments, which are not conducive to the development of design and innovative experiments. Virtual simulation experiment teaching is an important direction of modern practical teaching reform, and has advantages that traditional practical teaching does not have. The application of Proteus virtual simulation technology to the teaching of electronic information-related courses and the construction of innovative practice conditions and environment for students will greatly promote the reform of experimental and practical teaching, solve the shortcomings of the traditional teaching mode such as insufficient experimental equipment, lack of funds and time and space constraints, and reduce the cost and risk of experimental and practical teaching.

In order to effectively improve the effect of experimental teaching, on the one hand, we can combine the relevant professional courses and build the corresponding Proteus teaching resources, and introduce Proteus teaching resources in the experimental sessions, redesign the experimental projects and experimental contents according to the Proteus simulation software, increase the design and innovative experiments, explore the experimental teaching methods and methods based on virtual simulation through the simulation training of experimental projects, and improve the experimental teaching effect. On the other hand, based on Proteus visual design software, combined with the existing hardware experimental resources, collect and produce suitable teaching cases, enrich and innovate experimental teaching content, gradually build a "software-based, hardware-supported, organic combination of virtual and real" experimental teaching system and resource environment, and realize the "real-based, virtual-supported, virtual-real integrated" practical teaching concept, expand experimental and practical contents and fields on the basis of effectively reducing experimental costs and risks, and cultivate students' comprehensive design and innovation abilities; In addition, we take simulation experiment teaching reform as the starting point, organize and establish virtual simulation laboratories for electronic information courses, provide students with simulation experimental equipment, visualization simulation software, experimental and practical tools, and build a teaching system and process from theory to simulation, and then to experiment and practical training, and finally to form corresponding physical works, so as to truly realize the organic combination of "teaching, learning and doing" (Fu & Zhu, 2021; Bai et al., 2021).

3.4. Exploring Innovative Practice Mode Oriented to Talents' Needs Based on Science and Technology Competition and Scientific Research Projects

Innovation and entrepreneurship education is a great undertaking to promote individual development, education and teaching reform, human knowledge accumulation and social and economic development in the context of "new engineering". The value of innovation and entrepreneurship education is a new concept and new mode of quality education that cultivates students' innovative

and entrepreneurial consciousness, thinking, spirit and professional ability by deeply developing the integration of industry and education, school-enterprise cooperation, and insisting on "promoting learning through competition, teaching through competition, and creating through competition" under the change of traditional education and teaching methods (Chen, 2021; Fan, Wang, Fan, 2020).

According to the actual working needs of enterprises, colleges and universities should build a multi-body collaborative education platform, realize the goal of collaborative education among industries, enterprises and schools, further promote Industry-University Cooperation and integration of industry and education, and realize personalized selection, practical training, cutting-edge leadership and quality training. As one of the core subjects in the implementation of innovation and entrepreneurship education, professional teachers should be guided to change their traditional teaching concepts through "passing on, helping and leading" work, encouraging teachers to undertake discipline competitions, science and innovation project guidance, and actively participate in professional construction and innovation and entrepreneurship education activities, taking into account professional characteristics and teachers' discipline background.

Optimize the allocation of teachers with different research directions, set up a stable innovation training teacher guidance team, integrate the needs of enterprises and the latest research results of the teacher team into experimental and practical teaching cases, take students as the main body and teachers as the leader, make full use of the virtual simulation platform, take advantage of the virtual simulation software, implement the practical process from theory → simulation → physical, and innovate the teaching mode. Relying on scientific research projects, we will enrich and innovate experimental and practical teaching contents, adopt targeted innovative training, stimulate students' independent thinking and innovative consciousness, fully mobilize and develop students' creativity, imagination and subjective initiative, and cultivate students' innovative ability and entrepreneurial consciousness.

Students from freshman to senior year are encouraged to actively declare various innovative projects at the college, university, city, autonomous region and even national levels individually or in teams, or participate in scientific research projects such as vertical projects, horizontal projects, university-enterprise cooperation and industry-university-research cooperation of their supervisors, and learn cutting-edge professional knowledge in related fields by relying on virtual simulation laboratories and innovation and entrepreneurship practice centers. Through project design, project declaration and scientific and technological innovation projects, students will experience the process of realizing innovative ideas, thus cultivating their innovative thinking, teamwork ability and academic research ability. Through practical project practice, students will gain a deep understanding of the concept of entrepreneurship and effectively cultivate their

enthusiasm and potential.

We actively organize students to participate in the Proteus Visualization Design Innovation Competition, the China Internet+ Student Innovation and Entrepreneurship Competition, the Challenge Cup, the National Student Robotics Competition, the Creative Youth National Student Robotics Competition, and the National Student Innovation Competition. Based on the principle of "promoting teaching and learning through competitions, promoting innovation and skill enhancement through competitions", we promote the development of teaching of new generation artificial intelligence, improve students' engineering literacy, engineering design ability, practical and hands-on ability, innovation and engineering research and development ability, and realize the goal of cultivating senior applied talents with innovative awareness and ability.

4. Conclusion

Under the background of "New Engineering", deepening innovation and entrepreneurship education reform has become an inevitable choice to promote talent cultivation in colleges and universities and an effective way to improve the quality of education and teaching. In the process of cultivating applied talents with innovation spirit and entrepreneurial consciousness, practical teaching is an important link to consolidating theoretical knowledge and transforming knowledge into ability, and it is the only way to cultivate students to master scientific methods and improve operational ability. Virtual simulation experimental teaching is an important direction of modern practical teaching reform and has many advantages that traditional practical teaching does not have. The application of virtual simulation experiment teaching in the teaching of electronic information professional courses, the construction of highly simulated virtual experimental environment and experimental objects, so that students can carry out experiments and practical training in the virtual environment, will greatly promote the reform of practical teaching, solve the shortcomings of the traditional teaching mode in the lack of experimental equipment, shortage of funds and time and space constraints, reduce the cost and risk of practical teaching, so as to improve the overall innovation spirit and practical ability of college students. This paper discusses the path and feasibility of combining the teaching of electronic information courses with Proteus virtual simulation platform to promote innovation and entrepreneurship education reform from the aspects of strengthening teachers' team building, improving teaching methods, constructing a new experimental teaching system and resource environment, and innovating practical teaching mode. Facing the continuous covid-19 epidemic of new crown pneumonia, to ensure that the relevant experiments of electronic information courses can be carried out smoothly on schedule, we need to explore more virtual simulation platforms in experimental teaching and practice training, make up for the shortcomings of teaching and training under line, and lay a solid foundation for students to consolidate theoretical knowledge, enhance their practical ability and innovative spirit.

Acknowledgements

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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