Reform and Practice of the Curriculum System of "Integration of Specialization and Innovation and Entrepreneurship" Based on the Virtual Reality Technology

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Abstract. Amidst a rapidly evolving educational landscape, this thesis delves into the integration of specialization, innovation, and entrepreneurship in curricula, enhanced by virtual reality (VR) technology. This integration is crucial in aligning educational practices with the demands of modern society, which calls for a workforce equipped with both specialized knowledge and entrepreneurial acumen. The study examines the curriculum's reform and practice, highlighting the pivotal role of VR technology in enriching the learning experience through immersive, interactive environments. By restructuring course content, employing inquiry-based teaching methods, and revising assessment approaches, the research aims to foster a dynamic educational setting that not only cultivates students' technical skills but also encourages innovation and entrepreneurial thinking. The findings suggest that the incorporation of VR technology not only revitalizes the educational process but also significantly enhances students' engagement, creativity, and practical skills, offering valuable insights for future educational reforms.

Keywords: Integration of specialization, innovation and entrepreneurship, Virtual Reality Technology, Teaching Reform, Practice

1 Introduction

In today's society, the field of education is undergoing unprecedented changes. With the rapid development of science and technology and the urgent demand for innovative talents in the market, the traditional teaching mode is no longer fully adapted to the educational requirements of the new era. Especially in the field of higher education and vocational education, the in-depth integration of professional education and innovation and entrepreneurship education has become an important trend of education reform. This thesis focuses on this emerging trend, with special attention to the role and impact of virtual reality technology in promoting the reform and practice of "Integration of specialization and innovation and entrepreneurship" curriculum.

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As a cutting-edge technology, Virtual Reality (VR) has demonstrated its unique value in many fields, including education, by providing an immersive learning experience that enables students to practice and explore in a simulated environment, thus enabling them to gain a deeper understanding and mastery of knowledge. In the curriculum reform of "Integration of specialization and innovation and entrepreneurship", the application of VR technology opens up a brand-new teaching mode, which can not only increase students' learning interest, but also effectively promote their learning. It can not only increase students' interest in learning, but also effectively promote their innovative thinking and practical ability.

Integrating VR technology into the education system is not simple, and it needs to consider the reconstruction of curriculum content, updating of teaching methods, and adaptation of assessment mechanisms. Therefore, this thesis aims to explore the method of effectively integrating VR technology into the course of "Integration of specialization and innovation and entrepreneurship", analyse the challenges of the current curriculum reform, and put forward specific implementation measures and suggestions. It analyses the challenges of the current curriculum reform and puts forward specific implementation measures and suggestions. Through in-depth research, we will provide guidance to educators and new ideas for future educational reform.

2 Virtual Reality-driven Teaching and Learning in the Context of the "Integration of Specialization and Innovation and Entrepreneurship"

2.1 Background Analysis of "Integration of Specialization and Innovation and Entrepreneurship"

In September 2021, the General Office of the State Council issued the Guiding Opinions on Further Supporting Innovation and Entrepreneurship of College Students, which explicitly integrates innovation and entrepreneurship education into the whole talent cultivation system. However, the core problem facing China's current innovation and entrepreneurship education is that it overemphasizes utilitarian goals and neglects the importance of cultivating innovative and professional abilities [1]. Facing the new challenges of improving education quality and cultivating innovative talents, academics call for emphasizing the value rationality of education, i.e., focusing on cultivating talents with innovative thinking and professional skills to help economic transformation. In addition, teachers and students have low recognition of innovation and entrepreneurship education in actual teaching practice, which leads to insufficient endogenous motivation.

The main challenge of innovation and entrepreneurship education is that innovation and entrepreneurship education and professional education in colleges and universities are segregated from each other, forming two separate fields [2]. In order to cultivate comprehensive talents with innovative spirit as well as professional knowledge and entrepreneurial literacy, to realize the effective integration of disciplinary, professional and applied, and to support the national innovation-driven development strategy,

promoting specialized and entrepreneurial fusion education has become a key path for the return of the value of innovation and entrepreneurship education and the enhancement of endogenous momentum. Existing research mainly focuses on the construction of curriculum system, classroom teaching design, optimization of teaching methods and exploration of innovation and entrepreneurship practice. However, the attention to the internal mechanism of specialization and innovation and entrepreneurship education and the separation of the main body of innovation and entrepreneurship education is still insufficient [3].

2.2 Virtual Reality Technology Overview

Virtual Reality (VR) technology originated from the head-mounted display system designed by Ivan Sutherland and his team in 1968, and now it has developed into a mature interactive technology.VR utilizes interactive image display and sensory recognition and feedback technology to provide realistic visual, auditory and even tactile experiences [4]. The core characteristics of this technology can be summarized as Immersion, Imagination and Interaction, referred to as the "3I" characteristics [5].

VR is categorized into two types: immersive and cyberspace. Immersive VR utilizes Head Mount Display (HMD) to create an all-encompassing virtual environment, which is widely used in the fields of education, entertainment and professional training. Cyberspace-based VR, on the other hand, is suitable for distance and online learning environments, allowing users to interact and learn in a virtual space. The entire VR hardware system consists of four main components, including the head-mounted display device, host system, tracking system and controller.

With the continuous advancement in technology, the VR market has expanded to include multiple areas such as hardware devices, software resources, and integrated solution services. In the field of education and training, the application of VR technology continues to increase, bringing an innovative shift to traditional teaching methods and creating new educational models and experiences.

2.3 "Integration of Specialization and Innovation and Entrepreneurship" With Virtual Reality (VR) Technology

Combining VR technology with "Integration of specialization and innovation and entrepreneurship" can provide a richer and more realistic learning experience. At the theoretical level, VR technology can simulate real-world business environments, enabling students to better understand how theoretical knowledge can be applied to real-world situations. For example, testing different business strategies in a virtual market environment can help students understand market dynamics. At the practical level, VR technology enables students to perform real-world operations in simulated business environments, such as running a virtual business, which not only deepens their understanding of professional knowledge but also develops their entrepreneurial skills. In addition, the application of VR technology can promote students' innovative thinking because in the virtual environment, they are free to experiment and explore without the limitations of the real world.

3 Characteristics and Challenges of the "Integration of Specialization and Innovation and Entrepreneurship" Programme System

3.1 Basic Characteristics of the "Integration of Specialization and Innovation and Entrepreneurship" Programme

The "Integration of specialization and innovation and entrepreneurship" programme is a new teaching model that integrates professional education and entrepreneurship education in higher education. Professional education focuses on the mastery of technology or skills, aiming at enabling students to learn how to develop products or services, while entrepreneurship education focuses on the cultivation of entrepreneurial spirit and awareness, and teaches the knowledge of transforming technology into commercialized products. Under this model, through the integration of "professional + entrepreneurship" teaching content, we can cultivate composite talents with both professional skills and entrepreneurial ability.

This kind of integrated education has significant effects in enhancing the quality of teaching, strengthening the comprehensive quality of students and broadening employment channels. For example, in the field of engineering, through the combination of engineering courses and entrepreneurship projects, students not only learn how to design and manufacture engineering products, but also learn how to commercialize these products to enhance their market value. This educational model is based on four key aspects: holistic, coupled, hierarchical and cohesive [6]. The holistic connection lies in the integration of innovation and entrepreneurship education into professional learning; the coupling connection is reflected in the interaction and integration of innovation and entrepreneurship education and professional courses; the hierarchical connection gradually penetrates into the concept of entrepreneurship through the design of education in stages; and the cohesive connection is committed to transforming the graduates' concepts of employment and encouraging the spirit of entrepreneurship.

The "Integration of specialization and innovation and entrepreneurship" curriculum model not only strengthens the depth and breadth of professional knowledge, but also provides students with a platform to transform theoretical knowledge into practical innovation. It also provides a platform for students to transform theoretical knowledge into practice and innovation, and cultivates compound talents who are more adaptable to the needs of the society and the market.

3.2 Difficulty in Reconstructing the "Integration of Specialization and Innovation and Entrepreneurship" Curriculum System

Reconstructing the "Integration of specialization and innovation and entrepreneurship" curriculum faces many challenges in the higher education environment. This involves not only in-depth analyses of existing curriculum content, but also requires teachers to have interdisciplinary teaching skills and a deep understanding of innovation and entrepreneurship education. At the same time, the challenges include ensuring the

effective integration of innovative and practical elements while maintaining the depth and rigour of the curriculum.

In the case of "Integration of specialization and innovation and entrepreneurship" in the context of New Engineering, this process is particularly complex. New engineering + entrepreneurship courses need to be closely related to the development of new economy and new industries, and comprehensively integrate multidisciplinary knowledge to improve the practicality of the courses. Teachers need to constantly update their understanding of industry technology, combine cutting-edge research results with theoretical core knowledge points, such as mass-function unfolding, digital twins and other theories, and combine them with practical engineering cases to promote students' combination of theoretical knowledge and real-world problem solving [7].

Whether in the context of new engineering or other professions, the content reconstruction of the curriculum system of "Integration of specialization and innovation and entrepreneurship" is a challenging task, which requires a lot of efforts in curriculum design, teacher training and teaching resources. It requires innovation and reform in curriculum design, teacher training and teaching resources development.

3.3 Limitations in the Means and Methods of Teaching "Integration of Specialization and Innovation and Entrepreneurship" Courses

There are certain limitations in the teaching methods and approaches of the "Integration of specialization and innovation and entrepreneurship" programme, and the traditional teaching methods are difficult to meet the needs for the cultivation of innovative thinking and practical ability. For example, simple lectures and book learning cannot stimulate students' entrepreneurial spirit and innovation ability. Therefore, it becomes crucial to find more effective teaching methods, such as case studies, project-oriented learning and simulation practice.

With the development of new modern teaching technologies, the programme of "Integration of specialization and innovation and entrepreneurship" needs more teaching methods to stimulate students' interest and initiative in learning. In the context of new media technology and virtual reality technology, teachers' teaching methods are also facing higher requirements.

3.4 The Assessment Mechanism and Evaluation System of the "Integration of Specialization and Innovation and Entrepreneurship" Curriculum System is Complicated

It is a challenging task to construct an assessment mechanism and evaluation system that is adapted to "Integration of specialization and innovation and entrepreneurship" courses. The "Integration of specialization and innovation and entrepreneurship" course needs to cross multiple disciplines such as science, engineering, agriculture, medicine, economics and management, etc., so it has a wide range of professional backgrounds. However, as the courses have many knowledge points and involve a wide range of fields, traditional assessment methods such as paper-based final exams and classroom performance evaluation are difficult to be implemented comprehensively

and accurately, and cannot fully reflect the quality of teachers' lectures and students' learning effectiveness, and a sound assessment system and evaluation mechanism have not yet been formed.

In terms of teachers' assessment, the existing teaching assessment mainly focuses on traditional course teaching and graduation thesis, while innovation and entrepreneurship courses only account for a small portion of it, which leads to the possibility that teachers may pay more attention to the assessment requirements in other aspects and neglect the importance of "Integration of specialization and innovation and entrepreneurship". As for students' assessment, schools only set the assessment of innovation and entrepreneurship ability in entrepreneurship courses and entrepreneurship competitions, without integrating it with professional knowledge, resulting in the lack of mutual support between students' professional ability and entrepreneurship ability. In addition, the assessment indexes of entrepreneurship competitions are often result-oriented, and teachers pay more attention to the process of the competitions and neglect the cultivation of Integration of specialization and innovation and entrepreneurship" ability, which exacerbates the problem of fragmentation between professional education and entrepreneurship education [8].

Therefore, the construction of the assessment mechanism and evaluation system adapted to the "Integration of specialization and innovation and entrepreneurship" programme requires more in-depth thinking and exploration to ensure that students' learning outcomes and innovation ability can be comprehensively, accurately, fairly and objectively evaluated.

4 Specific Implementation Path of "Integration of Specialization and Innovation and Entrepreneurship" Teaching Reforms

4.1 Reconstruction of the Curriculum Content System Based on "Integration of Specialization and Innovation and Entrepreneurship"

It is crucial to reconstruct a curriculum system based on "Integration of specialization and innovation and entrepreneurship" in colleges and universities. First of all, we need to incorporate the concept of "Integration of specialization and innovation and entrepreneurship" into the design of traditional professional courses and brand-new courses, with a focus on cultivating students' innovation and entrepreneurial ability. This requires comprehensive consideration of the needs of the industry and future employment trends, and ensures that the content of the courses not only has theoretical depth, but also meets the needs of practical application. Secondly, the "Integration of specialization and innovation and entrepreneurship" type of curriculum system should cross different disciplines and organically integrate elements of entrepreneurship education into a wide range of disciplines, such as science, engineering, agronomy, medicine, military science, management science, etc., so as to promote students' comprehensive interdisciplinary ability. Through such integration, students can be provided with a broader perspective of knowledge and problem-solving abilities.

In addition, advanced technological means such as new media technology, virtual reality technology and Internet of Things (IoT) technology are utilized to enhance the interactivity and participation of the courses and to stimulate students' interest in learning and potential for innovation. Emphasizing the importance of practical content, students are actively involved in the process of solving practical problems through projects, seminars and teamwork to develop their innovative thinking and practical skills. Finally, a comprehensive, accurate, fair and objective evaluation system is established to assess not only students' mastery of theoretical knowledge, but also their innovative ability and practical level. Adopt methods such as project-based assessment, peer evaluation and continuous assessment to better reflect students' learning outcomes. Through the above measures, the reconstruction of the curriculum system of "Integration of specialization and innovation and entrepreneurship" can be achieved, the innovation ability and entrepreneurial awareness of students can be effectively enhanced, and high-quality talents adapted to the needs of future social development can be cultivated.

4.2 Reconstruction of Inquiry-based Teaching Methods Based on Virtual Reality Technology

Virtual reality technology brings brand new possibilities for teaching, especially in the inquiry-based teaching of the "Integration of specialization and innovation and entrepreneurship" programme, which plays an important role. Using VR technology, an immersive learning environment can be created, allowing students to explore and practice in the virtual scene, thus enhancing their active learning ability and problem-solving ability.

In the "Integration of specialization and innovation and entrepreneurship" course, virtual reality technology can be applied to simulate business scenarios, such as simulated entrepreneurial projects. Students can carry out market analysis, product design, team management and other activities in the virtual environment to deepen their understanding of the complexity of business operations. This inquiry-based teaching method can stimulate students' interest in learning and enhance their understanding of real business problems and their ability to solve them.

The implementation of inquiry-based teaching method needs to be combined with virtual reality technology and smart classrooms to form a full-time inquiry-based teaching mode with VR as the core. Students can carry out independent learning before class through the VR cloud platform, use VR resources and the smart classroom to carry out collaborative classroom learning, and then complete inquiry learning through the VR practical training platform, realizing full-cycle inquiry learning before, during and after class. Taking the "New Liberal Arts + Entrepreneurship" course as an example, teachers use relevant texts or technologies to build experimental situations, so that students can immerse themselves in the situation, and enhance their knowledge, technical level and operation ability through situational in-depth experience. VR/AR technology is used to enhance the effectiveness of experimentation through inquiry + contextual teaching method. Even with the continuous integration of extended reality technology (XR), human-computer interaction technology and contextual experimental

teaching, the traditional inquiry learning + contextual experience will say goodbye to the illusory and empty "brainstorming" mode, to achieve a real, perceptible immersive experience, to achieve the "scene, melting the mood in the scene, Scenario integration" experience effect [9]. About flowchart of VR inquiry-based teaching under the "Integration of specialization and innovation and entrepreneurship" teaching model specifically see Fig. 1.

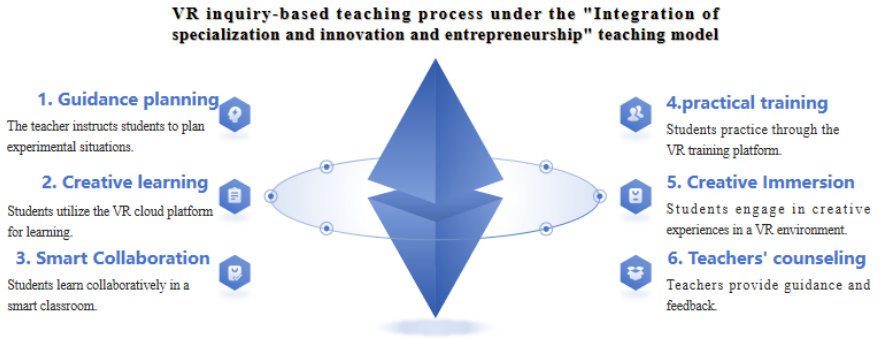

Fig. 1. Flowchart of VR inquiry-based teaching under the "Integration of specialization and innovation and entrepreneurship" teaching model

4.3 Reconstructing the Assessment Method of "Integration of Specialization and Innovation and Entrepreneurship" Courses

The traditional assessment methods are no longer appropriate in an "Integration of specialization and innovation and entrepreneurship" programme and need to be restructured to focus more on the learning process of the students. Methods for comprehensively assessing student performance include project-based assessment, continuous assessment and peer evaluation. The assessment should cover knowledge acquisition and look at innovative thinking, teamwork and problem-solving skills to encourage students to progress in their learning.

The new evaluation system of "integration of expertise and creativity" can be modeled on the CIPP model, including background evaluation, input evaluation, process evaluation and outcome evaluation [10]. Evaluation indicators should be refined according to the characteristics and objectives of different subjects, and quantitative analysis methods should be used to assign weights to the indicators to form a quantifiable evaluation index system. The evaluation results should be graded according to the education mode of "Integration of specialization and innovation and entrepreneurship", and different classification and grading management should be adopted.

The assessment method of the whole process management of innovative method courses consists of the quality of classroom input, the quality of inquiry-based learning, the quality of classroom output and the degree of team participation. Students' final assessment results are weighted by multiple links, which overcomes the multidimen-

sional of traditional assessment methods and more effectively ensures students' participation and teaching quality. The components of the specific assessment methods and the weighted calculation method are shown in Table 1.

Table 1. Comprehensive Evaluation Form for the "Integration of specialization and innovation and entrepreneurship" Courses Based on the CIPP Model

Evaluation Items	Evaluation Content	Evaluation Methods/Criteria
Background Evaluation (B)	Background and Motivation for Student Participation in the Program (B & M)	- Student Self-Evaluation Sheet - Program Planner
Input Evaluation (I)	Quality of Classroom Input (TI)	- T1: Student Classroom Performance - T2: Listening Quality
	Listening Quality (TQ)	- Q1: Quality of Learning - Q2: Written report
Process Evaluation (P)	Quality of inquiry-based learning (Q)	- Q1: Quality of Learning - Q2: Written report
	Classroom Output Quality (S)	- S1: Classroom report - S2: Class discussion
	Team Participation (P)	- P1: 3-person group base score - P2: Base Score for 2-Person Groups - P3: In-group scoring rules - P4: Individual Student Base Score
Outcome Evaluation (O)	Project Report	- Quality of written report - Quality of defense
	Presentation	- Quality of project presentation
Note: Total Evaluation Score (G) = B + I + P + O		

5 Conclusion

This thesis discusses in depth the reform and practice of the curriculum of "Integration of specialization and innovation and entrepreneurship" based on virtual reality technology, aiming at solving the current challenges in the field of education, especially in the cultivation of students' professional knowledge, innovative thinking and entrepreneurial ability. By analyzing the characteristics and challenges of the curriculum, and proposing specific measures for the implementation of teaching reform, this thesis provides a practical solution for education reform.

From the systematic reconstruction of the course content, the development of inquiry-based teaching methods based on virtual reality technology, to the reform of assessment methods based on the CIPP model, these measures constitute a comprehensive reform framework. This framework not only emphasizes the combination of theory and practice, but also focuses on the cultivation of students' innovative ability and entrepreneurial skills. The application of virtual reality technology plays a key role in this process, providing a powerful complement to traditional teaching methods and making the teaching process more vivid, interactive and efficient.

The conclusions of this study show that innovative technologies and teaching methods can effectively promote the development of the "Integration of specialization and innovation and entrepreneurship" course, increase students' motivation and participation in learning, and significantly improve their comprehensive quality and vocational ability. In the future, with the continuous progress of technology and further updating of educational concepts, technology-driven teaching reform will continue to play an important role in bringing more innovation and change to the field of education.

In summary, this thesis not only provides new perspectives for theoretical research, but also practical guidance for educational practice. Future research can build on this foundation to further explore the application of virtual reality technology in different educational fields, and how to more effectively integrate different advanced technologies with educational innovation based on the CIPP model.

Future research should focus on the long-term impacts of this integrative approach on students' career success and on identifying optimal strategies for incorporating VR across different disciplines and educational levels. Further exploration is also needed to understand how these innovations can be scaled and adapted to diverse educational settings, ensuring that the benefits of VR-enhanced education are accessible to a broader student population. By continuing to investigate these areas, future studies can build on this work to advance the field of educational technology and contribute to the development of more effective, engaging, and relevant educational practices.

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