# Exploration of the "VR+STEAM" Teaching Model

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**Abstract.** With the rapid development of technology, VR technology is gradually integrating into the field of education, driving educational transformation. This article conducts research on the "VR+STEAM" teaching mode, analyzes the theoretical basis of this mode, explores the implementation methods and advantages of the "VR+STEAM" teaching mode in extracurricular teaching, and finally proposes the key points and teaching reform suggestions of this teaching mode. Research has shown that the "VR+STEAM" teaching model plays an important role in stimulating students' interest in learning, improving innovation ability, and cultivating comprehensive qualities.

**Keywords:** VR; STEAM; Teaching mode; innovation ability.

## 1 Introduction

With the advancement of technology, educational methods are also constantly being updated. The STEAM educational philosophy emphasizes interdisciplinary learning, cultivating students' comprehensive abilities and innovative thinking. The emergence of VR technology has brought new possibilities to education, and the integration of the two has practical significance. Author Ge Yan proposes a specific implementation path for the construction of VR laboratories based on STEAM education theory [1]. Author Qiu Tian discussed the workshop operation and management methods that combine STEAM education philosophy with VR technology [2]. The author Li Yan has built a new VR development and training platform based on the STEAM concept [3]. Author Pi Jian constructed and applied the STEAM curriculum system for vocational schools based on VR/AR technology [4]. Author Peng Wei Hsiao believes that combining STEAM education with VR assisted experiential courses can help improve student satisfaction and learning outcomes, and stimulate their learning motivation. Cultivating high-level professional and innovative talents is the key to improving international competitiveness and even building an innovative country [5]. As a comprehensive theory that integrates multiple disciplines, STEAM theory opens up new paths and perspectives for cultivating students' innovative abilities [6]. Integrating VR technology with STEAM education philosophy to carry out teaching reform is a new teaching model, especially in the implementation of VR+STEAM teaching mode, which is worthy of our in-depth research.


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## 2 The Theoretical Basis of VR+STEAM Teaching Mode

The theoretical foundation of the VR+STEAM teaching model not only covers the relevant theories of psychology and education, but also closely integrates with various fields such as technology, engineering, and art, forming its unique educational practice system. This mode integrates the core idea of modern education, and aims to cultivate all-round talents with innovative spirit and practical ability by means of advanced technology.

The combination of experiential learning theory and virtual reality technology. The experiential learning theory emphasizes that learners acquire knowledge and skills through firsthand experience. Experiential learning is located within bi-directional (or multi-dimensional) interactions [7]. VR technology provides learners with an immersive virtual environment, allowing them to experience learning content firsthand, enhancing understanding and memory. VR technologies can positively influence learning outcomes in education [8] This combination enables learners to shift from passively receiving knowledge to actively exploring knowledge, improving their initiative and engagement in learning. In the VR+STEAM teaching mode, the application of experiential learning theory is not only limited to knowledge acquisition, but also extends to the cultivation of students' emotions and values.

The integration of multiple intelligence theory and interdisciplinary education. The theory of Multiple Intelligences (MI) states that human intelligence is composed of different types of intelligences and that each individual possesses all of them but to a different degree [9]. The application and transfer of interdisciplinary knowledge in practical activities is the structure of STEAM education [10]. The VR+STEAM teaching model integrates multiple disciplines such as science, technology, engineering, art, and mathematics, providing diverse learning content and methods to help students discover and tap into their potential. The model emphasizes individual differences and personalized education, allowing students to choose learning content and methods based on their interests and strengths, and fully develop their potential. For example, in the "Challenge Cup" or "Internet plus" discipline competition, students with different specialties such as electronic information, computer, art, etc. can form a team and use scientific and technological means to create unique works and cultivate scientific and technological innovation ability.

## 3 The Implementation of VR+STEAM Teaching Mode

The author has successfully applied the "VR+STEAM" teaching model in course design, subject competitions, and extracurricular interest groups based on actual teaching, achieving good teaching results. Under the cultivation of this teaching model, the learning interest of many students has greatly increased, actively consulting literature and seeking help from teachers to solve some engineering problems. Some students won national or provincial awards in the China International College Students’ “Internet+” Innovation and Entrepreneurship Competition, the National Undergraduate Electronic

Design Contest, the National University students' social practice and technological energy saving competition, etc. Some students received funding from the National Undergraduate Innovation and Entrepreneurship Training Program, and some students joined the teacher's research team to participate in scientific research.

### 3.1 Course Design

Sensors and Detection Technology is a discipline that combines theory and practice, involving multiple disciplinary fields and has a wide range of applications. Traditional teaching methods often focus on imparting theoretical knowledge, leading to a lack of practical opportunities for students to truly master the application of sensors in various industries. To address this issue, we attempted to redesign the course "Sensors and Detection Technology" by combining VR technology and STEAM education philosophy. In terms of curriculum design, teachers need to combine VR technology and STEAM education concepts to develop innovative and practical teaching plans. The author chose the course design of "Sensors and Detection Technology" to design and practice teaching cases. Firstly, determine the teaching objectives. Clarify the teaching objectives of the course, including knowledge objectives, ability objectives, and emotional objectives, to ensure that students can achieve comprehensive development through learning. Secondly, select suitable VR technology and teaching resources based on teaching objectives and course content. Ensure the practicality and reliability of technology, while also considering the age and cognitive level of students. Thirdly, utilizing the interactivity of VR technology, design interesting interactive activities to stimulate students' interest and initiative in learning. For example, conducting experimental simulations, interactive operations, and immersive experiences through VR technology. Fourthly, integrate STEAM education concepts into the curriculum, emphasizing the integration of interdisciplinary knowledge. Guide students to comprehensively apply knowledge from different disciplines to solve problems, cultivate their innovative thinking and comprehensive abilities. Finally, establish effective evaluation criteria to evaluate the learning outcomes of students. At the same time, encourage students to provide feedback so that teachers can adjust teaching methods and content in a timely manner.

### 3.2 Subject Competitions

Subject competitions are an important means of cultivating students' comprehensive application and innovation abilities. Integrating VR technology and STEAM education into teaching, and forming interdisciplinary students with expertise in electronics, computer science, art, environment, and other fields into a team to participate in subject competitions, can further stimulate students' learning interest and innovation ability. Firstly, determine the competition theme. Generally, it is advisable to avoid single professional subject competitions and instead choose subject competitions that are highly comprehensive, integrate technology into industry applications, closely related to real life and technological development trends, and enable cross disciplinary students to

leverage their strengths to form STEAM teams, ensuring that the content of the competition is innovative, adaptable, and practical. For example, "Challenge Cup National Undergraduate Extracurricular Academic Science and Technology Works Competition", "China International Internet plus Undergraduate Innovation and Entrepreneurship Competition", "National Undergraduate Energy Conservation and Emission Reduction Social Practice and Science and Technology Competition", etc. Secondly, provide necessary VR technology and resource support for participating students, invite teachers or industry experts from different majors to provide guidance, and help them successfully complete their works and improve their quality. Thirdly, clarify the division of labor based on the professional characteristics of students. For example, having students with three different professional backgrounds in electronics, computer science, and art form three small teams: a basic team, a modeling team, and a programming team. They work together and utilize their respective professional strengths to organically integrate science, technology, engineering, art, and mathematics, achieving the same goal. Finally, summarize and provide feedback on the competition, providing reference for future competitions, and encouraging students to apply the experiences and skills gained in the competition to their daily learning and life.

### 3.3 Extracurricular Interest Groups

By establishing VR+STEAM extracurricular interest groups, students can be provided with a more flexible learning platform to meet their personalized needs. The following are the implementation steps: (1) Determine the theme: Based on the interests and actual needs of students, choose a practical case related to VR+STEAM, such as VR design of thyristor circuit principles. (2) Team building: Reasonably divide tasks based on the interests and strengths of students, ensuring that each person has clear responsibilities and tasks. For example, some students are skilled in programming and mainly responsible for program development; Some students excel in electronic technology and are mainly responsible for circuit module design; Some students are creative and mainly responsible for art and design; Some students are good at mathematics and are mainly responsible for data analysis and modeling. (3) Organizational activities: Develop a group activity plan, regularly organize students for discussions, research, and presentations, and ensure the continuity and effectiveness of the activities. Encourage students to cooperate and share in group activities, jointly explore problems, exchange experiences and skills, create a good learning atmosphere, and promote the common growth of students. (4) Training and tutoring: Provide students with basic training in related technologies, helping them master skills such as VR development, circuit simulation, and program design. Help students solve problems and difficulties they encounter. At the same time, invite experts to give lectures or provide guidance to improve the overall level of the group. (5) Evaluation and presentation of achievements: Evaluate and showcase the activities of interest groups, organize exhibitions, demonstrations, and other activities in a timely manner, and allow students to fully showcase their achievements and creativity. At the same time, the results can also be shared and disseminated to enhance students' interest and influence in learning.

## 4 The Advantages of VR+STEAM Teaching Mode

The VR+STEAM teaching mode can enhance students' interest in learning, enhance their practical abilities, cultivate their innovative thinking, effectively improve teaching effectiveness, and promote the comprehensive development of their overall quality. (1) VR technology provides students with an immersive experience, making the learning process more interesting. For example, three VR teaching cases developed by our student team were applied in course teaching. Students can personally operate virtual electronic instruments and observe changes in the entire circuit state, which greatly enhances their interest in learning through this interactive learning method. (2) Enhance students' practical abilities. Due to the ability of VR technology to simulate real environments, students can engage in practical operations in virtual environments, thereby enhancing their practical abilities. In the process of our STEAM student team preparing to design VR cases, students need to search for a lot of information, master a lot of relevant professional knowledge, and repeatedly simulate operations and tests in order to achieve an excellent work. (3) Cultivate students' innovative thinking. VR technology provides students with an open and free learning space, allowing them to explore various possibilities in a virtual environment and cultivate their innovative thinking. In the VR teaching case of the course "Sensors and Detection Technology", students can change experimental conditions, explore new experimental results, analyze internal principles, and cultivate their innovative thinking and practical abilities. (4) Improve teaching effectiveness. VR technology can simulate real environments, allowing students to experience learning content firsthand, enhancing understanding and memory. This teaching method is more intuitive and vivid than traditional lecture based teaching, which helps to improve teaching effectiveness. (5) Promote the development of students' comprehensive qualities. Through the VR+STEAM teaching mode, students not only learn knowledge, but also cultivate interdisciplinary thinking, teamwork ability, problem-solving ability, and so on. This model helps to promote the development of students' comprehensive qualities and prepare them for future learning and career.

## 5 Conclusions

VR technology has brought a new teaching method to education, breaking the limitations of traditional lecture based teaching and making the learning process more vivid and intuitive. The STEAM educational philosophy emphasizes interdisciplinary integration and cultivates students' comprehensive qualities. The combination of the two has obvious advantages in enhancing students' interest in learning, enhancing their practical abilities, cultivating their innovative thinking, improving teaching effectiveness, and promoting the development of their comprehensive qualities. It can be said that the VR+STEAM teaching model provides new directions and impetus for educational reform, helping to cultivate talents who can meet the needs of future society. With the continuous progress of technology and the constant updating of educational concepts, we have reason to believe that the VR+STEAM teaching model will play an increasingly important role in the future education field.

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