

# *Virtual Simulation Based Experimental Sports Teaching Reform and Exploration*

Lin Xiao\*

*Department of Sports and Health, Zhaoqing University, Zhaoqing, Guangdong, 526061, China*

*\*Corresponding author*

**Keywords:** Virtual simulation experimental teaching platform; sports major; experimental teaching

**Abstract:** Virtual simulation experimental platform, utilized as an innovative sports major teaching mode in collegiate setting to break the spatial, environmental limitation, creates favorable conditions for sports teaching expansion, and helps sports major students further grasp the technical essentials of complex sports. However, insufficient funding and lacking independent R&D (research and development) capacity hinder the implementation of experimental teaching in colleges and universities, and hence create obstacles to promote deeper reform in sports teaching. Starting from status quo analysis concerning the application of virtual simulation experimental teaching platform, this study puts forward strategies and methods based on virtual simulation teaching to innovate and bring sports major teaching into a new level.

## 1. Introduction

With the goal of "Sports Strengthen Nations" in mind, colleges and universities faces higher requirements in terms of teaching methods for sports and physical education majors. Experimental teaching plays an important role in the physical education teaching system, and due to its functionality in examining students' theoretical knowledge and practical skills mastery and improving students' professionalism in multiple dimensions, experimental teaching innovation is a key element in deepening reform for physical education and sports teaching. Naturally, the virtual simulation teaching platform is applied in college and university setting to innovate the experimental teaching mode, content and methodology, and facilitate teachers to effectively cultivate high-caliber sports professionals, so as to ensure the output of university talents meets the needs of social development. Since a major direction for higher education institutions to achieve breakthrough in high-caliber talent cultivation is to take advantage of virtual simulation experimental teaching platform to improve sports major curriculum design and optimize teaching outcome, this study explores multiple ways to promote the virtual simulation based experimental teaching reform.

## **2. The status quo of virtual simulation platform application in sports major experimental teaching**

At the present stage, the application of virtual simulation experimental teaching in sports setting can be categorized into two parts: sports training and general teaching. In sports training, virtual simulation experimental teaching platform helps break external environment limits, create complex scenes for professional training without time and location restrictions, and can effectively control complex technical movement practices of difficult sports, reducing the potential risk of injury during athletes' training process. It also provides more detailed professional action recommendations based on multi-dimensional analysis and 3D demonstration and hence improved scientificity in sports training. In addition, for team sports, the virtual simulation experimental teaching platform facilitates tactics design and development, further enabling the cooperation and coordination among athletes. In the aspect of general teaching, the virtual simulation experimental teaching platforms receive quite positive feedback from higher education institutions such as Beijing University of Sports, Hangzhou Normal University, Shanghai Institute of Physical Education, with the good teaching outcome from the virtual simulation fully revealing its application value. Some universities utilize virtual simulation teaching platforms to carry out independent researches, incorporating courses like golf, sports physiology and biochemistry, human kinetics, sports injury emergency treatment into the platform to further innovate sports experimental teaching<sup>[1]</sup>.

## **3. Obstacles encountered when using virtual simulation experimental teaching platform**

### **3.1 Higher education institutions' limited independent virtual simulation R&D capacity**

At present, most of the virtual simulation experimental teaching platforms applied in colleges and universities involve 3D Studio Max modeling and Kinetic system, which are developed mainly by enterprise entities due to the insufficient capacity for universities and colleges in question to conduct independent R&D based on their diverse teaching needs. The colleges and universities cannot compare with professional enterprises in terms of funding, technology, or R&D personnel. This leads to sports related teaching fails to fully benefit from the platforms, since the 3D virtual simulation experimental teaching platform is highly rigid in terms of the system's algorithms, templates, procedures and background operation and maintenance management, so as to create an unwelcome environment for extra inputs. Some content refinements and changes cannot be integrated into the platform and have to be taught outside the platform as supplements by teachers. The virtual simulation experimental teaching platform currently has four main themes: technical movements' biomechanical testing and evaluation; virtual simulation of basic offensive and defensive tactics in soccer games; virtual simulation of ice and snow sports protection; and virtual simulation of table tennis refereeing<sup>[2]</sup>. Other sports items are still in developing stage, with currently only a few full functional virtual simulation applications available.

### **3.2 Insufficient investment and funding in virtual simulation experimental teaching**

The cost of virtual simulation experimental teaching platform is still relatively high for colleges and universities. With the main funding allocated by government agencies for teaching institutions' operation, colleges and universities need to coordinate budget to ensure the soundness of fund usage, which means that they cannot guarantee enough financial resource to support virtual simulation experimental teaching platform especially when facing other competing teaching infrastructure endeavors. Therefore, colleges and universities cannot provide students full range virtual simulation

teaching training, and as a result there are fewer chance for sports major students to train, evaluate and improve their sports ability through virtual simulation experimental teaching platform.

### **3.3 The platforms' inadequate teaching functionality**

Currently, sports related virtual simulation experimental teaching platforms have four major teaching modules: human kinetics' digital analysis, mechanical modeling, mathematical modeling, and virtual simulation technology. The functions of the virtual simulation experimental teaching platform mainly revolve around "sports anatomy and 3D display", "movement design under mechanical conditions", "internal structure and function of simple human body movements", and for slightly more complex sports and movement design, there is no complete virtual simulation teaching plan available yet <sup>[3]</sup>. The existing virtual simulation teaching modules cannot meet the actual needs from both teachers and students' perspectives, and if universities and colleges want to achieve ideal results from the sports majors experimental teaching mode reform, they must do a good job to upgrade platforms' software as well as hardware, and input students' learning needs to create multi-functional modules to the proposed virtual simulation experimental teaching platform.

## **4. Virtual simulation based experimental sports teaching reform strategies**

### **4.1 Universities to improve independent research and development ability through "industry-university-research" collaboration**

Higher education institutions can broaden the research and development channels through "industry-university-research" collaboration, seek help from outside parties such as corporations and research entities to jointly carry out the proposed simulation experimental teaching platform development, improve their own independent R&D ability during the process of collaboration, and lay the foundation for the simulation platform's continuous evolution to meet the changing needs of sports majors teaching. The university or college can set up a dedicated team, composed of head teachers of each discipline, technical personnel from professional institutions and external experts from corporations, to lead the R&D for the simulation teaching platform with inputs and feedback from student representatives, teaching assistants to better the process. Colleges and universities can also train internal R&D personnel based on "industry-education integration" by inviting all students to participate "innovation and entrepreneurship" initiatives to conduct spontaneous virtual simulation R&D through either cooperation with external enterprises or individual activities to develop new projects, so as to enhance schools' internal R&D force.

### **4.2 Cost control through AR experiment courses based on online learning applications**

In order to reduce the cost of virtual simulation experimental teaching platform while ensuring students receive systematic experimental training to improve the learning quality, higher education institutions can combine different forms of teaching activities to achieve coherence upon sports related experimental teaching and result in the effect of "1+1>2". Colleges and universities can team up with research institutions and business entities to develop online AR learning applications that can be operated by students individually on daily basis as sports teaching supplement curriculum. Because of the help from AR learning applications, the virtual simulation experimental teaching platform can be used in more important tasks such as unit summary teaching, focusing on assessing and improving students' complex skill control and overall knowledge comprehension. This way, not only can colleges and universities maintain the ideal frequency of the virtual simulation experimental teaching platform's usage, reducing the platform overall operation cost, but

also ensure that students' personalized learning needs are met, and effectiveness and quality of sports experimental teaching can be augmented during the whole semester.

### 4.3 Improving the platform teaching module design with imbedded students' learning needs

To further improve the design of the virtual simulation experiment teaching platform and add multi-functional modules incorporating students' specific learning needs, the following measures can be taken. First, questionnaires can be used to collect information and feedback from teachers and students and then the problems found in the current use of the virtual simulation experiment teaching platform should be used to guide the platform's improvement plan, so the teaching modules can be optimized with input from faculty and students to meet the deepening reform requirements and the phased education goals. For example, pursuing the "integration of medical and sports sciences" goal, a human anatomy 3D modeling from medical major can be added to the teaching of "sports anatomy" for deeper theoretical comprehension. Secondly, diverse teaching modules based on students' interests and extra curriculum requirement should be incorporated into the platform for students' spontaneous exploration. Universities and colleges can develop open learning modules catering for sports popular among students such as basketball, tennis, badminton so as to drive students to learn by their interests, and also collect valuable data to lay a good foundation for systematic development of new modules.

## 5. Conclusion

The virtual simulation experimental teaching platform is of great value for sports related teaching in colleges and universities, and can provide students with intuitive and detailed contents to ensure their comprehension and application of professional knowledge, which is otherwise hard or costly to achieve through traditional teaching methods. Equipped with the virtual simulation teaching platform, the sports major experimental teaching can realize its potential for high-caliber talent cultivation, but only after the construction of virtual simulation experimental teaching platform is optimized, innovative teaching modules developed on regular basis.

## Acknowledgement

Ministry of Education Industry-University Educational Collaborative Project (220605862134038).

## References

- [1] Yang Wenyi, Tian Chunlan. *Research on the importance of teaching with the aid of virtual simulation technology and its countermeasures in physical education majors in colleges and universities [J]. Sports Science and Technology Literature Bulletin, 2022, 30(01):127-130.*
- [2] Zhu Jianqiao, Xiong Jingmei. *Research on the use of virtual simulation technology in the classroom teaching of table tennis for physical education majors in general colleges and universities [J]. Martial Arts Research, 2021, 6(11): 154-156.*
- [3] Wu Juhua. *Discussion on the application of virtual simulation technology in teaching sports anatomy course in physical education [J]. Sports Science and Technology, 2020, 41(05):159-160.*