

# Construction of New Mixed Teaching Mode of Physical Education in Colleges and Universities Assisted by Virtual Simulation Technology

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**Received:** December 4th, 2025 | **Accepted:** January 29th, 2026

## ABSTRACT

In response to the problems of single teaching methods and lagging feedback in current physical education teaching in universities, this study proposes a new hybrid physical education teaching mode that combines virtual simulation technology. This model is based on high-precision motion capture and biomechanical modeling and implements a three-stage intervention of “classroom demonstration-virtual correction-autonomous training”. Through experiments, it was found that the standardized motor skills of the experimental group improved by an average of  $\geq 10\%$ , and the accuracy of identifying and preventing sports injuries increased by  $\geq 15\%$ . The experimental group was significantly better than the control group in terms of maximum oxygen uptake, explosive power, and tactical application ability. The results indicate that virtual simulation technology can not only effectively improve teaching effectiveness and safety but also narrow the skill gap between students. This study provides a practical paradigm for the digital transformation of university sports.

## KEYWORDS

Virtual Simulation Technology, College Sports, Physical Education Courses, Teaching Mode

## INTRODUCTION

As an important component of various industries such as agriculture, industry, and medical care, computer simulation technology contributes to the development of national economic construction (Chen, 2021). With the rapid development of information technology, various cultural and professional courses have begun to introduce teaching contents related to computer simulation, and interactive visual multimedia teaching equipment is being widely used (Wu, 2024). The main traditional teaching method of physical education is to rely on the hands, the learning of students and the practice in class. However, the stereotyped teaching methods cannot be combined with the strong pursuit of new technology by college students today or with the requirements of students' physical quality (Deng et al., 2020; Xing & Zhang, 2025). At present, physical education courses in colleges and universities are facing some challenges. On the one hand, the number of theoretical courses is limited, so all theoretical

DOI: 10.4018/IJeC.401094

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knowledge related to sports cannot be completely covered. On the other hand, most courses still adopt the learning mode of teacher demonstration and student imitation, which lacks interest and interaction with students and cannot fully attract students' attention (Gonçalves et al., 2022). What is even more worrying is that without immediate feedback and personalized guidance, the rate of students' action mistakes is as high as over 50%, which greatly increases the risk of sports injuries. In addition, some sports activities that need specific environments, such as shooting and rock climbing, are difficult to implement due to the limitation of venues and equipment, which further affects the teaching quality and students' enthusiasm (Moustakas & Robrade, 2022; Shen et al., 2022).

However, the development of information technology provides technical support for some physical education. For example, some projects that do not meet the outdoor teaching conditions can be assisted by virtual simulation technology so that teaching activities can be carried out directly in the classroom (Siskind et al., 2022). Students can study and train independently through this technology, and teachers can also carry out teaching activities at any time. In this way, not only can students' theoretical knowledge be consolidated but also the teaching quality and effect can be enhanced (Zhu, 2020). Especially during the COVID-19 epidemic, school suspension accelerated the development of online teaching and educational informatization, but it also highlighted the limitations of traditional physical education courses in the face of unexpected situations (Du et al., 2021; Song & Wang, 2025). Although virtual simulation technology has shown revolutionary potential, its application in college physical education teaching is still in the feasibility exploration stage of single projects and small samples. At present, a systematic teaching model covering the evaluation of the actual simulation effect of theoretical cognitive skills acquisition and the empirical test of large-scale classroom environment has not been established. The existing research fails to determine whether virtual simulation can significantly narrow the skill gap between students and reduce the risk of sports injury caused by action mistakes, and whether it can significantly improve students' long-term willingness to participate in physical education courses.

To fill this research gap, this study puts forward and verifies a mixed teaching mode of physical education in colleges and universities that integrates reality and virtuality. In this paper, the following quantifiable goals are set:

- The scores of students in the experimental group in standardized motor skill evaluation are higher than those in the control group by  $\geq 10\%$ .
- The correct rate of sports injury identification and prevention knowledge test in the experimental group was improved by  $\geq 15\%$  in the control group.

This study is divided into three stages. First, based on high-precision motion capture and biomechanical modeling technology, a standardized motion database covering seven mainstream sports events is constructed. Second, the three-stage intervention scheme of "classroom demonstration-virtual correction-autonomous training" is embedded in the 14-week teaching cycle. Finally, through skill test, physiological index monitoring, and questionnaire survey, the teaching effect is evaluated from multiple dimensions. This study verifies the feasibility of virtual simulation technology as a core teaching tool rather than an auxiliary means, and also provides a replicable and extensible practice paradigm for the digital transformation of college sports in the new era.

The structure of this paper is as follows: First, in the introduction, the problems and challenges existing in traditional physical education teaching are analyzed, the virtual simulation technology is introduced, and the objectives, methods, and value contributions of this study are put forward. The literature review combs the shortcomings of college physical education courses and the related research of virtual simulation technology in physical education teaching. The third part, materials and methods, expounds the methods, principles, and model building process adopted in this study. The fourth part shows the experimental results and analyzes them. The discussion discusses the limitations of the research results and future solutions. The last part summarizes the research results.

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