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TRANSFORMING EDUCATION WITH VR/AR TECHNOLOGIES IN CHINA

Abstract. Based on the research findings, this paper proposes the following recommendations: to strengthen top-level design and policy support; to promote technological innovation and cost reduction; to build an ecosystem for content development and sharing; to strengthen teacher training and capacity building; to focus on educational equity and inclusive development; to improve standards and evaluation systems.
Keywords: VR/AR technologies; technological innovations; ecosystem; cost reduction; education.

VR/AR technology primarily demonstrates its value by transforming abstract knowledge into perceptible concrete experiences, lowering cognitive barriers, stimulating students' learning interest, and cultivating inquiry skills.

In scientific research, VR/AR technology provides new research methods and platforms for researchers. In archaeology, researchers can use VR technology to digitally reconstruct archaeological sites and conduct virtual excavations; in medicine, researchers can use AR technology to overlay medical images onto real patients for surgical planning; in psychology, researchers can use VR technology to create controlled experimental environments for psychological and behavioral studies. These applications greatly expand the possibilities of scientific research.

In interdisciplinary integration, VR/AR technology promotes collaboration between different disciplines. For example, in digital heritage protection, collaboration among computer science, archaeology, and art disciplines has achieved digital preservation and display of cultural heritage; in medical education, collaboration among clinical medicine, biology, and engineering disciplines has developed various virtual surgery training systems [1].

In rural education and special education, VR/AR technology demonstrates unique value in promoting educational equity.

In rural education, VR/AR technology can compensate for the shortage of high-quality educational resources in rural areas. Through remote VR teaching, rural students can enter the classrooms of famous teachers in the city; through AR technology, they can access high-quality educational resources equivalent to those of urban students. Survey data shows that after the project's implementation, rural

students' interest in learning science increased by 52.3%, and their understanding of abstract scientific concepts improved by 38.7% [2].

In special education, VR/AR technology provides new learning methods for students with special needs. For students with hearing impairments, AR technology can provide real-time speech-to-text conversion services; for students with visual impairments, VR technology can create auditory and tactile learning environments; for students with autism, VR technology can create controllable social scenarios for social skills training. These applications provide new possibilities for special education.

However, promoting VR/AR technology in rural and special education still faces challenges such as funding, technical support, and teacher training. These issues require ongoing attention and resolution from the government and all sectors of society.

In terms of content management platforms, many enterprises and institutions in China have developed VR/AR education resource platforms, such as Baidu's VR education platform and Net Dragon's VR education ecosystem. These platforms integrate hardware, software, and content to provide one-stop solutions for schools. Data shows that as of 2024, over 30% of primary and secondary schools in China have introduced such platforms [3].

In terms of data analysis platforms, with the development of educational big data technology, more and more VR/AR education platforms have begun to integrate learning analytics functionality, recording and analyzing students' learning behaviors and outcomes in virtual environments to provide data support for teaching optimization.

The development of VR/AR educational content typically includes stages such as demand analysis, instructional design, content production, technical implementation, and effectiveness evaluation. A high-quality VR/AR educational content development team needs to include instructional designers, subject experts, 3D modelers, program developers, and user experience designers.

In terms of instructional design, VR/AR educational content needs to be designed based on learning theories and teaching objectives to ensure its educational effectiveness. For example, in VR situational teaching design, considerations need to include situational authenticity, task challenge, and feedback mechanisms.

In terms of content production, it includes 3D modeling, animation production, interactive design, and other tasks. With the development of technology, some new content production methods have emerged, such as generating 3D models through photogrammetry and creating virtual scenes through real-world scanning.

Establishing a scientific effectiveness evaluation system is crucial for promoting the healthy development of VR/AR education. A comprehensive VR/AR education effectiveness evaluation system should include dimensions such as learning outcomes, skill development, emotional attitudes, and user experience.

In terms of learning outcomes evaluation, besides traditional test scores, it should also include evaluations of knowledge understanding depth, knowledge transfer ability, and problem-solving skills. Research shows that learning in VR

environments can improve long-term memory by 25-35% compared to traditional learning methods [4].

In terms of skill development evaluation, it primarily assesses the improvement of operational skills and practical abilities. Data shows that using VR technology for skills training can improve operational accuracy by 30-40% and reduce error rates by 25-35%.

In terms of emotional attitude evaluation, it mainly assesses changes in learning interest, motivation, and self-confidence. Survey data indicates that over 80% of students express a preference for learning in VR/AR environments, believing it makes learning more interesting and efficient.

In terms of user experience evaluation, it includes assessments of device comfort, interface friendliness, and interaction smoothness. Research shows that user experience directly impacts learning effectiveness, with good user experience potentially increasing learning engagement by 20-30% (Table 1) [5].

Table 1. Multi-dimensional Evaluation System for VR/AR Education Effectiveness

Evaluation Dimension	Evaluation Indicators	Evaluation Methods	Empirical Data Performance
Learning Outcomes	Knowledge mastery, understanding depth, transfer application ability	Tests, operational assessments, case analyses	Test scores improved by 25-35%, knowledge transfer ability enhanced by 30-40%
Skill Development	Operational accuracy, proficiency, problem-solving ability	Operational assessments, simulated scenarios, project evaluations	Operational accuracy improved by 30-40% problem-solving ability enhanced by 25-35%
Emotional Attitudes	Learning interest, motivation, self-confidence, learning engagement	Questionnaires, interviews, observational records	Learning interest improved by 40-50%, learning engagement increased by 25-35%
User Experience	Device comfort, interface friendliness, interaction smoothness	Usability testing, user interviews, behavioral data analysis	

In conclusion, the integration of VR/AR technology and education is an ongoing process of exploration and practice. It requires the joint efforts of the government, schools, enterprises, and all sectors of society to promote the healthy development of VR/AR education, ultimately realizing its potential value in promoting educational equity and improving education quality.

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DIGITAL ANALYTICS FOR INSTITUTIONAL PERFORMANCE IMPROVEMENT IN CHINESE UNIVERSITIES

Abstract. This article examines the development of digital analytics infrastructure in Chinese universities, revealing a hierarchical model driven by differences in funding, technological capabilities, and government support. Analytics are successfully applied to improve educational quality, reduce student dropout rates, and optimize management, thereby enhancing students' academic and employment prospects.

Keywords. education; digital model; hierarchical model; technological base; analytics: management optimization.

Most existing studies focus on European and American universities, while there is a lack of systematic research on the application of digital analytics in the context of China’s higher education system, which has distinctive institutional