

Digital Transformation of Environmental Design Education and Application of Virtual Reality

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Abstract: The digital transformation of EDE (Environmental Design Education) and the application of VR (Virtual Reality) is a field that attracts much attention, and it is bringing new opportunities and challenges to learners and educators. First of all, VR technology improves the learning experience and enables students to explore different environments and design concepts in a personal way, so as to understand concepts more deeply. Secondly, VR tools provide students with an innovative platform, which can test and modify the design in real time in a virtual environment, and promote the cultivation of creativity and problem-solving skills. EDE's digital transformation and VR application provide learners with more attractive and effective learning methods, which are helpful to cultivate innovative and problem-solving skills. However, the sustainable development of this field needs continuous cooperation and investment to overcome the technical and educational challenges and push EDE further into the future.

Keywords: Virtual Reality; Digital Transformation; Environmental Design Education.

1. Introduction

EDE (Environmental Design Education) has always been an important field to cultivate innovative thinking and sustainable development concept. With the rapid development of digital technology and the wide application of digital tools such as VR (Virtual Reality), the field of EDE is also facing challenges and opportunities of digital transformation. This digital transformation has brought unprecedented flexibility and innovation to education, enabling students to participate in learning in an unprecedented way and deeply understand the complexity of the field of environmental design [1].

With the progress of science and technology, VR technology has gone out of the laboratory and entered the field of education. This technology not only provides a highly immersive learning experience, but also simulates various real-world environments, enabling students to explore, experiment and design in a virtual environment [2-3]. In EDE, VR technology provides students with an unparalleled opportunity to experiment in different design schemes and understand the influence of environmental factors without actually building a prototype or conducting field trips. This not only improves students' learning efficiency, but also helps to reduce the cost of resources and time, thus promoting the concept of sustainable development.

The purpose of this study is to explore the influence of digital transformation on EDE, especially the application of VR technology in education. Through in-depth study of the potential and limitations of VR in EDE, we can better understand the impact of this technology on students' academic achievements and career development. In addition, we will also discuss the changes of digital transformation on education and teaching methods and resources, and how to better integrate digital tools to improve the quality and efficiency of EDE.

2. The Importance of EDE

EDE is a vital field of education, which covers various disciplines related to environment and design, such as architecture, urban planning, landscape design, interior design and so on. EDE can help people better understand and cope with environmental challenges and promote sustainable development. Students learn how to design and build sustainable buildings and cities to reduce resource waste, energy consumption and environmental pollution. EDE encourages innovation and creative thinking. By solving practical problems, such as urban congestion, climate change and air pollution, students cultivate their ability to solve problems and propose innovative solutions. EDE has a far-reaching impact on urban planning and social development. Reasonable urban planning can improve people's quality of life and improve the accessibility and habitability of the city.

EDE helps to inherit and protect cultural heritage. Students learn how to preserve and restore historical buildings and landscapes to maintain social and cultural continuity [4]. To improve people's quality of life. By designing more livable space, creating more beautiful environment and improving indoor and outdoor design, people's physical and mental health and happiness can be improved. EDE covers many disciplines and promotes interdisciplinary cooperation. This helps students acquire comprehensive knowledge and skills to solve complex environmental and social problems. It provides a wide range of employment opportunities for students. They can become architects, urban planners, landscape designers, interior designers, etc., and make contributions to the sustainable development of society and beautifying the environment.

In a word, EDE is the key factor to cultivate future social construction and sustainable development. It not only helps to create a better environment, but also cultivates professionals with the ability to innovate and solve problems, contributing to the prosperity of society and the improvement of human life quality.

3. Digital Transformation of EDE

3.1. Problems Faced by EDE at Present

At present, EDE faces some important problems and challenges, which may prevent students and industry professionals from getting the best education and training. Although sustainability is very important in environmental design, many EDE plans have not fully integrated the principle of sustainability. Students may not have enough opportunities to learn how to design and plan sustainable buildings and cities. The technical and digital transformation in the field of environmental design has developed rapidly, but many educational institutions face difficulties in keeping up with these changes [5-6]. It is becoming more and more important to ensure that students master new technologies and tools to meet the needs of modern design and planning. The problems of diversity and inclusiveness in the field of EDE still exist. Limited pluralistic representation may limit the participation of students with different backgrounds and experiences, and may affect innovation and the introduction of different perspectives.

Some EDE plans may be too theoretical and lack practical opportunities. Students may need more practical projects and laboratory experience to meet real-world challenges. Teachers and educators need to constantly update their knowledge and skills to keep up with industry development and new technologies. This requires investment in teacher training and development to ensure that they can provide the best education. EDE usually needs to visit specific studios, laboratories and materials, which may lead to higher tuition fees and costs [7]. This may limit the participation of some students and increase their burden. EDE needs to put more emphasis on ethics and social responsibility. Students need to learn how to design to promote social equity, inclusiveness and sustainability, not just to meet market demand.

Solving these problems requires cooperation, innovation and continuous improvement. Educational institutions, industry professionals and the government should all be involved to ensure that EDE can meet the future needs and promote the sustainable development of society, environment and economy.

3.2. Digital Transformation Method of EDE

The digital transformation of EDE is the key, because digital technology can provide students with a better learning experience, improve the educational effect and make education more innovative and adaptable. The following are the key steps and methods to implement the digital transformation of EDE:

Online courses and distance learning platforms: Establish online courses and distance learning platforms so that students can access teaching materials and resources anytime and anywhere. This helps to improve the accessibility of education, especially for those students who can't attend traditional face-to-face courses.

VR and AR (Augmented Reality) technology: Using VR and AR technology to create a virtual laboratory and simulation environment, so that students can carry out actual design and planning practice without actual physical resources. This technology can also help students learn complex design concepts visually and interactively.

Online collaboration tools: Use online collaboration tools and platforms to enable students to collaborate remotely and complete projects and tasks together. This reflects the practice

of teamwork and project management in the field of actual environmental design.

Digital model and data analysis: teach students how to use digital tools to create architectural and urban models and how to analyze environmental data. This can cover topics ranging from the sustainability of building materials to traffic flow analysis.

Online assessment and feedback: Digital tools can be used for online assessment and feedback, as well as automated tests and quizzes. This helps teachers to evaluate students' performance more effectively and provide feedback in time.

Digital resource library: establish a digital resource library, including e-books, video tutorials, case studies and open source design tools, so that students can conduct in-depth research and autonomous learning.

Training teachers and educators: Digital transformation needs to train teachers and educators so that they can skillfully use new technologies and integrate them into the education process.

Data security and privacy: ensure the data security and privacy of students and teachers, while complying with applicable laws and regulations.

Feedback and improvement: collect feedback from students and teachers, and constantly improve the content and methods of digital education to ensure that educational needs are met.

The digital transformation of EDE requires comprehensive utilization of various digital technologies and tools to improve the quality of education, expand students' learning opportunities, promote innovation and provide better education for future environmental design professionals.

4. VR Application of EDE

4.1. VR Technology

VR technology is a virtual environment generated by computer, which makes users feel as if they are in it. It usually involves the use of special head-mounted devices or glasses and a controller to interact in a three-dimensional virtual world. VR usually requires a head-mounted display, such as a VR helmet, to present a virtual environment. These head-mounted devices include high-resolution screens that cover the user's field of vision and create a sense of immersion.

VR technology aims to provide a sense of immersion and make users feel as if they are really in a virtual world. This includes visual and auditory immersion, and sometimes simulation of touch and movement [8-9]. The continuous development and improvement of VR technology provides opportunities for innovation in various fields, including education and training. Through VR, users can experience various situations in an immersive way, thus improving communication, understanding and learning.

4.2. The VR Application Mode of EDE

4.2.1. Virtual Laboratory and Model

Virtual laboratory and model are one of the applications of VR technology in education, science and research. They provide a virtual environment for users to experiment, observe and interact without real actual equipment or laboratory. Virtual laboratory simulates the laboratory environment, so that students can carry out scientific experiments, observe the experimental results and learn scientific principles. This is very useful when schools or institutions may not have actual laboratory equipment. It

provides a safe learning environment, especially for those subjects that need to deal with dangerous chemicals or risky experiments. Students can study without actual danger. Virtual laboratories and models can be used for students' education and vocational training [10]. Students can practice skills, understand concepts and prepare for practical application in the virtual environment. Using VR technology, students can participate in the virtual laboratory and do design and planning exercises without actually building a physical model. This helps students to test design concepts in real time, iterate quickly and understand their influence.

4.2.2. Virtual Building Tour

Virtual building tour is an application mode that makes users explore and experience buildings and cities remotely by using VR technology. This technology allows users to appear in person, without actually going to buildings or cities. Virtual building tour enables users to explore buildings and cities around the world remotely through VR devices, such as VR helmets. This provides unlimited possibilities for education, tourism, urban planning and design. Virtual building tour is of great help to education. Students can better understand the principles of architecture and urban planning, history and culture through virtual tours, and even practice architectural design and planning.

Some virtual building tours allow users to interact with the virtual environment, such as changing architectural elements, exploring internal space, or observing buildings under

different time and weather conditions. Students can visit buildings and cities through VR, and learn more about various design styles, building materials and spatial planning. This can deepen their understanding of historical buildings and urban planning. Students can use VR tools to roam freely in the virtual environment to better understand the space design and layout. They can create and modify designs in a virtual environment and observe the effects of changes in real time.

4.2.3. Virtual Lectures and Education and Training

Virtual lectures and education and training are an important application of VR technology in the field of education, which provide students and professionals with a more interactive and immersive learning experience. Virtual lectures and education and training allow students to participate in courses and training in an online environment without having to go to the scene. This increases the flexibility of learning and enables learners to study according to their own schedule and place.

Through VR technology, students can enter the virtual classroom or training scene, as if they were in the real environment. Establish a virtual classroom (Figure 1). This immersive experience helps to improve the learning effect and enhance memory and understanding. Virtual lectures and education and training are usually interactive, allowing students to interact with virtual teaching environment, virtual objects and scenes, ask questions and interact with other students.



Figure 1. Virtual classroom

VR in education and training can simulate actual scenes, such as operating room in medical training, airplane cockpit in flight training, and architectural model in architectural design. This is helpful for students to carry out practical operation and practice. Virtual lectures and education and training can be used in various disciplines and fields,

including medicine, engineering, art and design, vocational training and so on. They provide opportunities for learners in different fields.

Virtual education usually supports personalized learning, and educators can adjust the course content according to students' needs and progress. Virtual lectures and education

and training contribute to distance teaching and training, and provide students and professionals with learning opportunities that transcend geographical and time constraints. Students can practice through virtual experiments and simulations without using actual equipment or resources. This is especially valuable in scientific experiments, medical training and other fields. Teachers can use VR for distance teaching and lectures. This will help to provide high-quality education, save time and cost, and enable students to participate in educational resources from all over the world.

Virtual lectures and education and training have been widely used in higher education, vocational training, medicine, military training and various industries. These technologies provide richer learning experience and help to improve students' participation, understanding and skills. VR technology will continue to develop in the future, bringing more innovation and improvement to the field of education.

5. Conclusion

VR technology provides students with an immersive learning experience, which can simulate various environments and scenes, so that students can better understand the principles and practical applications of environmental design. This helps to improve their learning motivation and participation. VR tools can be used for real-time simulation and feedback in the design process. Students can quickly iterate over their designs and try different ideas, thus improving their innovative ability and problem-solving skills. Digital EDE can also provide a large number of learning data for tracking students' progress and evaluating their performance. This is helpful for personalized learning and adjusting teaching content according to students' needs. The digital transformation of EDE and VR application provide students with richer learning experience and enhance their ability of innovation and problem solving. However, the successful implementation of this transformation requires adequate preparation and resource investment to overcome technical and educational challenges. The future of this field

will depend on the cooperation of educational institutions, educators and technology providers to promote the development of EDE.

References

- [1] Li Shangyong, Yuan Jimin, Yan Shi,&Li Chunfang. (2023). Smart Campus Planning and Design in Colleges and Universities under the Digital Transformation of Education. *Modern Information Technology*, 7(9), 56-59.
- [2] Sun Mingchun. (2015). Compass for opening up the road of digital design education in art colleges -- Comment on "In the name of experiment: parametric environmental design". *China Audio-visual Education* (8), 1.
- [3] Ying Chao. (2015). Concerto between Dream and Reality-Art Design Education in the Deconstruction Digital Age. *Art Garden* (6), 4.
- [4] Liu Sanxing. (2019). Design and implementation of "internet plus" Digital Campus in secondary vocational schools. *China Informatization* (5), 3.
- [5] Xiao Yang,&Li Wu. (2021). Digital transformation of book marketing model in new media environment. (2014-10), 37-39.
- [6] Grace Wai Wong. (2018). Research on the Application of VR Technology in the Teaching of Environmental Art and Design. *Popular Literature: Academic Edition* (23), 1.
- [7] Yao Jing, Liu Jinning, Cai Sifan. (2020). Research on the application of virtual reality technology in environmental design. *woman square (New Era Education)*, 000(005), P.1-1.
- [8] Jia Jinglin, Yang Yuhui, Xie Xili, & Xiong Caiping. (2009). Design and Application of Virtual Learning Environment in Humanities Education. *Modern Educational Technology*, 19(5), 3.
- [9] Yu Yi,&Wu Jianan. (2021). Application of Virtual Reality Technology in Practice Teaching of Environmental Design Specialty. *Art Education Research* (8), 4.
- [10] Jia Xuan,&Wu Chunlei. (2023). Application of Virtual Reality Technology in Environmental Design Teaching. *Art Market* (2), 2.