Packaging’s Visual Three-Dimensional Presentation and Experience with Virtual Simulation

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Abstract. **Objective** To create an immersive experience experimental teaching environment through the technical means of simulation experiment, focusing on solving the problem of the conversion from flat to three-dimensional, from static to dynamic visual effects in the teaching of publishing and packaging courses, and to achieve rapid verification of three-dimensional presentation and display of packaging design. **Methods** First, aiming at the objective problems in publishing and packaging teaching practice, use 3DMax three-dimensional modeling software to classify the common structural forms in packaging and [make] three-dimensional models, and then use Unity3D simulation technology for all three-dimensional models to set parameters and build packaging Design a visual three-dimensional presentation and experience system. **Results** Assist students to use virtual simulation technology to realize the three-dimensional presentation of packaging design after the completion of the graphic creativity, and at the same time to quickly and low-cost test the feasibility of the packaging design plan in the process of display and experience. **Conclusion** This teaching method can allow students to quickly form a three-dimensional and dynamic spatial thinking mode, improve the expression efficiency of students' creative thinking, and allow students to discover, analyze and solve problems intuitively.

Keywords: Virtual Simulation, Experimental Teaching, Immersive Experience

With the rapid development of science and technology, low-input, short-period, effective, and open virtual simulation technology is gradually being used by major universities. The "Notice of the Ministry of Education on Carrying out the Construction of National Virtual Simulation Experiment Teaching Project" (Jiao Gao Si Han [2018] No. 5) puts forward the idea and necessity of construction of virtual simulation experiment teaching [1]. "Notice of the Department of Higher Education of the Ministry of Education on Strengthening the Continuous Service and Management Related Work of the National Virtual Simulation Experimental Teaching Project" (Jiao Gao Si Han [2018] No. 56) emphasizes the in-depth integration of information technology and experimental education and teaching to promote the quality of higher education teaching [2]. At the 11th "Chinese University Teaching Forum", Wu Yan, the director of the Higher Education Department of the Ministry of Education, proposed a virtual simulation "Golden Lesson" in a report on "Building a Chinese Golden Lesson" to open up a new way of teaching in colleges and universities with "smart + education" The
idea of emphasizing the importance of the construction of virtual simulation experiments and training projects [3].

"Publishing and Packaging" is a comprehensive discipline that integrates art, technology, materials, and craftsmanship [4]. It has strong application and practicality. The current packaging design course teaching is mostly limited to digital proofing before printing. The actual packaging design is subject to production cost, production conditions (small batch jobs are not accepted by many printing plants), production materials (metal, ceramics, glass, etc.), and experimental consumption (Once the production fails, it will consume huge material costs and time and energy), post-shooting conditions and other problems, it is difficult to present the true effect of the selection of printing materials and printing process, and it is difficult for students to verify their creative ideas in time, which greatly reduces students. The enthusiasm for learning and the quality of course teaching are also affected [5].

1. Virtual Simulation Experimental Teaching Design System

![Architecture diagram of virtual simulation experiment system](image)

Figure 1. Architecture diagram of virtual simulation experiment system

The visual three-dimensional presentation and experience of packaging design. Virtual simulation experiment. For the core link of the visual three-dimensional presentation and experience in "Publishing and Packaging", a virtual simulation experiment platform is established, which avoids the constraints of objective conditions and creates by the technical means of simulation experiments. The immersive experience learning environment focuses on the conversion of packaging design from plane to three-dimensional, from static to dynamic visual effects, and intuitively feels the practicality and design beauty of packaging design [6]. At the same time, improve the classroom teaching effect, and strive to not only allow students to master theoretical knowledge, but also allow students to clearly understand the printing and crafting processes of publishing and packaging, so as to maximize the expression efficiency of students' creative thinking, so that students can quickly and quickly intuitively discovering problems can enhance students' ability to discover and analyze problems and finally solve
problems, so as to cultivate the ability of spatial thinking of design majors, and improve students' enthusiasm for learning publishing and packaging theory and practice.

The visual three-dimensional presentation and experience virtual simulation experiment project of packaging design mainly revolves around the core concepts of packaging "three-dimensional presentation" and "display experience". Through advanced 3D virtual engine technology, VR technology, animation technology, human-computer interaction and database technology, Construct the virtual experiment environment and operation objects required for this experiment [7]. The project is divided into three modules: experimental space, creative exhibition hall, and my design. In the "experimental space", the best presentation effect in line with the design is selected according to the design ideas, and the packaging design plan is determined to promote the rapid realization of design ideas by students and enhance the learning initiative. In the "exhibition space", virtual simulation technology is used to achieve 720° all-round experience and evaluation, so that the design plan can receive all-round, more professional and objective opinions; at the same time, excellent experimental cases are selected for long-term display, collection, and effective integration line On the virtual simulation teaching resources. In "My Design", you can quickly and frequently edit experiments according to the design ideas, and [Save] to "My Design" to compare different packaging three-dimensional presentation schemes and choose the best. From "verification" in design to "display and experience" after design, comprehensively test and verify the rationality, feasibility and creativity of packaging design, and complete the three-dimensional presentation of packaging design in virtual experiments-exhibition hall design-interactive experience- -Display of creative works, etc.

In addition, this project uses the experimental platform to publicly share the experimental results of the "Creative Exhibition Hall", accept social comments, and form a "teacher-audience" double evaluation system. In the project, in addition to establishing a “comprehensive, scientific, and objective” teacher evaluation system, audiences (including students) can learn from “package innovation”, “integration of packaging aesthetics and practicality”, “works display effect”, and “works display effect”. Comment on "artistic appeal" and save opinions. As an audience, students evaluate the works of others as a way to improve their professionalism. While ensuring that the experimental results are fair and objective, it also trains students to think about packaging works so as to improve their packaging design ability and comprehensive quality in an all-round way.

2. Visual Three-Dimensional Presentation of Packaging Design and Implementation Steps of Experience Virtual Simulation Experiment

Packaging design visual three-dimensional presentation and experience virtual simulation experiment belongs to the "Publishing and Packaging" course (64 class hours), which occupies 3 class hours.

The first class hour: get familiar with the visual three-dimensional presentation and experience virtual simulation experiment system of packaging design and upload the graphic design draft;

The second class hour: focus on avoiding the constraints of actual forms, materials, craftsmanship and other operating conditions, and conduct high-frequency exercises on packaging forms, materials, and opening methods to present the three-dimensional effect of packaging design;

The third class hour: focus on the design of the display effect, choose the appropriate light source, background, props, etc. to display and experience it in all directions and multiple angles, and submit the experiment report.

12 specific knowledge points, details are as follows:

(1) With the aid of the packaging design form database provided by the virtual simulation experiment, master the form types of packaging structure, be familiar with the attributes of different structure forms, and select the packaging form structure that matches the design;

(2) With the help of the main material database of packaging design provided by virtual simulation experiments, understand the type and content of material attributes, and quickly grasp the principles of packaging material design;
(3) With the aid of the packaging design auxiliary material database provided by the virtual simulation experiment, the materials are matched with the designed scheme and main materials, and the integrity of the design materials is comprehensively investigated.

(4) With the aid of the packaging design opening method database provided by the virtual simulation experiment, according to the different requirements of the design plan, master the method of packaging design opening method, and investigate and evaluate the applicability of the opening method plan.

(5) Determine the exhibition style that can reflect the connotation of the work based on the packaging design positioning and design content.

(6) According to the basic principles of exhibition hall selection, the exhibition space meets the requirements of the number and scale of the exhibited works, determine the main factors of the exhibition composition such as space size, color tone, and master the overall color tone of the color configuration, the color relationship between the product and the background color configuration Composition method.

(7) According to the display needs, with the help of virtual simulation technology light source database, determine the type of light source and the combination of different light source types and tones to ensure that the main body of the exhibition gets better lighting rendering.

(8) Able to use virtual simulation operation to provide different ways of display and display to fully display the creative effects of works.

(9) With the aid of the display props database provided by the virtual simulation experiment, according to the needs of the exhibition works, place the display props that play an embellishment role and set off the artistic atmosphere of the works to improve the overall artistic beauty of the exhibition hall.

(10) With the help of virtual simulation technology, a full range of display experience can be performed on the displayed display effect, and the rationality of the packaging design can be tested and corrected.

(11) Through the virtual exhibition hall display, master the operation of the overall design thinking of packaging design.

(12) Visit the works of others, comment on the works, think deeply about the design principles and evaluation criteria of packaging design, and further enhance the comprehensive design quality.

3. Visual Three-Dimensional Presentation of Packaging Design and the Innovation of Experience Virtual Simulation Experiment

3.1. Realize the Teaching Organization Method of "Combination of Virtuality and Reality, and Combination of Online and Offline"
Using virtual simulation experiments, compared with the traditional offline teaching methods, teachers no longer blindly explain knowledge, but give most of the time to students, who can conduct online experiment operation exercises or perform operation assessments. For the graphic creative design drafts submitted by students, the three-dimensional presentation is first realized through virtual simulation experiments, and then the layout is displayed in the virtual "creative exhibition hall" to comprehensively test the feasibility of the design. The teacher only gives necessary guidance and guidance. In response to the problems in the experiment, the teacher answers the questions in a timely manner, and statistically analyzes the opinions and suggestions of the students, to achieve an effective combination of online and offline, promote the efficient completion of teaching tasks, and provide effective teaching and research data [8].

3.2. Break through the Traditional Evaluation Methods and form a Comprehensive, Scientific and Objective Experimental Evaluation System
Different from traditional classroom evaluation, this virtual simulation experiment evaluation method is based on the principle of "comprehensive, scientific and objective", creating an evaluation system
for knowledge point evaluation, operation process evaluation, and work display evaluation, and pays more attention to the standardization of students' practical process Sexuality and performance [9]. At the same time, the visual three-dimensional presentation and experience project of packaging design based on virtual simulation technology aims at cultivating practical talents, builds an experimental platform of "creative exhibition hall", creates an immersive experience environment, and implements a "teacher-audience" two-layer evaluation system. While ensuring that the experimental results are fair and objective, they also train students to think about packaging works so as to improve their design capabilities.

3.3. Realize the "Open Sharing" of Teaching Process and Teaching Resources

The visual three-dimensional presentation and experience virtual simulation experiment of packaging design is open and shared through the network, and the experimental results are also released and saved on the experimental portal website at the same time to realize the reproduction of the exhibition hall scene. Visitors can log on to the website at any time to roam around the exhibition and give their own comments. These evaluations will become precious reference materials for students' learning and teachers' teaching.

4. Conclusion

Through the use of packaging design visual three-dimensional presentation and experience virtual experiment teaching methods, a new model of personalized and intelligent experimental teaching combining online and offline teaching is created, which makes up for the shortcomings of traditional experiments and effectively overcomes the limitations of traditional practical teaching. It breaks through the constraints of time and space, solves the problem of teacher-student time cycle, and expands the intensity and breadth of packaging design teaching exchanges. At the same time, it saves experimental costs, reduces the difficulty of packaging design and production, realizes design flexibility, and ensures the completion of high-quality packaging design. Through the display of the virtual "exhibition space", the limitations of traditional experiments are broken through, the long-term preservation and sharing of excellent works are realized, the limited connection between the school and the society is promoted, the development of disciplines is promoted, and the progress of art teaching and service to the society is promoted [10].

Acknowledgments

Fund Project: The 2020 Virtual Simulation Experimental Teaching Project of Xi'an FanYi University Institute (ZK2043). The virtual simulation experimental teaching project of visual three-dimensional presentation and experience of packaging design.

References

[1] Ministry of Education. Notice of the Ministry of Education on the Construction of National Virtual Simulation Experimental Teaching Project [Z].(2018-5-30). http://www.moe.gov.cn/srcsite/A08/s7945/s7946/201806/t20180607_338713.html.(in Chinese)

[2] Ministry of Education. Ministry of Education Department of Higher Education Notice on Strengthening the Continuous Service and Management of National Virtual Simulation Experimental Teaching Projects[Z].(2018-12-5).http://www.moe.gov.cn/s78/A08/tongzhi/201812/t20181205_362501.html. (in Chinese)

[3] Bo Rongrong, Leng Mingxiang. Basic cognition, realistic dilemma and practical path of the construction of "Golden Course" in colleges and universities[J]. Heilongjiang Higher Education Research, 2019 (08): 141-144. (in Chinese)

[4] Li Guang, Song Haiyan, Sun Binqing, Gao Wenhua, Liu Guangfa. Construction and Practice of National Virtual Simulation Experimental Teaching Center for Packaging Engineering [J]. Packaging Engineering, 2019, 40(12): 47-51. (in Chinese)
[5] Wang Weiguo, Hu Jinhong, Liu Hong. Current status and development of virtual simulation experiment teaching in foreign universities[J]. Laboratory Research and Exploration, 2015, 34(5): 214—219. (in Chinese)

[6] Meng Lingwei, Liu Wei, Hu Yaguang, Li Juan. Application and Practice of Virtual Simulation Technology in the Teaching of Packaging Engineering Specialty Courses——Taking "Logistics Transportation Packaging Design" as an example[J]. Agricultural Products Processing, 2015, (12): 76-78. (in Chinese)

[7] Mohamed Kilani, Korosh Torabi, Guangzhao Mao. Application of virtual laboratories and molecular simulations in teaching nanoengineering to undergraduate students[J]. Computer Applications in Engineering Education, 2018, 26(5), 1527-1538.

[8] Dygalo Vladislav; Keller Andrey; Shcherbin Aleksey. Principles of application of virtual and physical simulation technology in production of digital twin of active vehicle safety systems[J]. Transportation Research Procedia, 2020, 50, 121-129.

[9] Zhixuan Liu, Guoxian Jin. The Effects of Emotional Interaction with Virtual Student on the User’s Eye-fixation and Virtual Presence in the Teaching Simulation[J]. JOURNAL OF THE KOREA CONTENTS ASSOCIATION, 2020, 20(2), 581-593.

[10] Y. R. He, X. R. Wang, Q. J. Chen, P. Leng. DESIGN AND IMPLEMENTATION OF VIRTUAL SIMULATION TEACHING SYSTEM FOR UAV BASED ON WEBGL[J]. ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 2020, XLII-3/W10, 1239-1246.