



Construction of A Virtual Simulation Experimental Platform for Children's Drama Creation

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Abstract

In the era of informatization, in order to make up for the defect of repeated rehearsals, long learning cycles, and insufficient environmental resources in the current children's drama education, a virtual simulation experiment platform for children's drama creation has been designed. With the help of high-tech media technologies such as VR and 3D modeling, and based on the classic performance *The Abandoned Little Egg Yolk*, this virtual simulation experimental platform allows preschool education major students to be immersed in the real scene. Through this innovative operation, their comprehensive children's drama creation ability will be highly improved.

Keywords: Children's drama creation; virtual simulation experimental platform; VR technology

1 INTRODUCTION

Drama is a highly mature art, and it is a ritual of human life. Children's drama is centered on stage performance, which integrates various artistic elements such as literature, music, art, dance, architecture, etc., and is suitable for children's appreciation of interesting drama [1]. Peter Schleichnet once said: "Wherever there is a children's game, there is a drama." Dewey, an American progressive educator, proposed that drama activity is a kind of "learning by doing", and children can gain new experiences through role-playing, in order to continuously promote self-growth. For young children, drama is an advanced "game" and has a natural attraction to children.[2]. As a comprehensive art style, children's drama is of great significance to children's overall physical and mental development.

Huang believes that children's drama can provide children with a variety of life experiences [3]. Children's drama activities can effectively enable children to understand different virtual environments through role-playing, and can effectively help children form the cognition of "belief affects behavior" [3]. Wang mentions that children's drama activities are conducive to the development of peer relationships among young children [4]. Children can experience the joy of success in the process of performing, and they will be more active in interacting and communicating with their peers [4].

When talking about aesthetic ability, British drama educator Barbara Sharisberry said that: "The audience are also the participants of children's drama. The feeling of appreciating drama performance is different from the feeling of sitting at home watching drama. Audience aesthetics are enhanced" [5]. Children's drama also have other positive effects. The scholar Suo point out in the research: the choice of children's drama scripts is usually characterized by contradictions and conflicts, and children can use the story to experience different lives. This is a reasonable and healthy channel for children to express their emotions [6]. Zhang propose that children's drama activities could create an environment for language exchange between children [7]. The role-playing has effectively improved the ability to use language [7]. Based on this, drama education has gradually become the focus of early childhood education. Many domestic colleges and universities have set up courses on Children's Drama, and are dedicated to promote the development of drama education.

With the further development of science and technology, it has become the consensus of scholars and educators to apply cutting-edge technology to academic research and teaching practice activities. Ministry of Education of the People's Republic of China clearly states in *Key Points of Education Informatization and Network Security Work in 2019*: "It is necessary to promote the in-depth application of new technologies

such as big data, virtual reality, and artificial intelligence in education [8]. The integration of high-tech and children's drama teaching provides preschool education major students a new learning experience. This study will focus on the construction of a virtual simulation experimental platform for children's drama creation, which can enhance children's drama teaching efficiency in universities.

2 THE NECESSITY OF CONSTRUCTING A VIRTUAL SIMULATION EXPERIMENTAL PLATFORM FOR CHILDREN'S DRAMA CREATION

The course "Children's Drama Teaching" to which this experiment belongs is the main core course for preschool education major students, and is an important vehicle for their aesthetic education. In macro level, this course is conducive to the implement of the strategy of rejuvenating the country through science and education, and the strategy of strengthening the country through talents, furthermore, the promotion of cultural inheritance. In micro level, it helps to cultivate children's sentiments, creativity, and expressiveness. This study takes Chinese original children's play *The Abandoned Little Egg Yolk* as the carrier, highlights the respect for the original culture, and leads preschool education major students to be the most staunch promoters, practitioners and disseminators of Chinese excellent children's plays. The necessity of constructing this experimental platform is as follows:

2.1 Scientific research back-feeding teaching

"Firmly implement the strategy of rejuvenating the country through science and education, and the strategy of strengthening the country through talents" is an important instruction given by Chinese General Secretary Xi Jinping in *Report to the 19th National Congress of the Communist Party of China*. Scientific research back-feeding teaching is to apply advanced science and technology and its achievements to teaching practice to cultivate students' innovative ability and cutting-edge knowledge mastery ability. It is a realistic path to implement the above national strategies. This study has established a technologically innovative children's drama experimental platform with the help of virtual reality technology. It aims to effectively use scientific research back-feeding teaching to promote children's drama teaching in universities.

2.2 Repeated rehearsal

Theatrical performances require many high-intensity rehearsals, which is not conducive to the physical and mental development of preschool children. Once the rehearsal intensity is too large, it will cause irreversible damage to them. Therefore, *The Abandoned Little Egg*

Yolk can be pre-rehearsed in a virtual environment by preschool education major students in this experiment platform, and after it is relatively mature, it can then be implemented among children, which effectively protects the physical and mental health of preschool children.

2.3 Long learning cycle

Preschool drama courses teachers who have several jobs, not only to complete the work of screenwriter and director, but also to complete the work of costume design, stage set, sound design and etc. Due to this, preschool education major students need to go through a long learning cycle in traditional drama creation teaching, which contradicts the limited class hours. This experiment adopts the virtual reality technology of human-computer interaction, combined with the real original stage play, and condenses the learning cycle into 2 hours, which greatly improves learning effect.

2.4 Insufficient environmental resources

Ministry of Education of the People's Republic of China highly advocates aesthetic education for preschool children through the implementation of drama education. However, the lack of children's drama teachers has become an important reason for the implementation of this policy. This phenomenon is more prominent in remote rural areas, where it is difficult for rural preschool teachers to receive systematic children's drama training due to the constraints of the actual environment. This project uses virtual simulation technology to control technical parameters, which can also provide preschool education teachers in the vast rural areas with the opportunity to easily use and learn children's drama. This virtual simulation technology has greatly expanded the function of children's drama resources to serve the society.

3 CONSTRUCTION OF A VIRTUAL SIMULATION EXPERIMENTAL PLATFORM FOR CHILDREN'S DRAMA CREATION

3.1 The overall architecture of the experimental platform

The virtual simulation experiment platform for children's drama creation is developed with a service-oriented software architecture. It integrates physical simulation, innovative design, intelligent guidance, virtual experiment and teaching management, and has good autonomy, interactivity and scalability. The overall architecture of this experimental platform is shown in Figure 1, which is divided into five layers: data layer, support layer, general service layer, simulation layer and application layer.

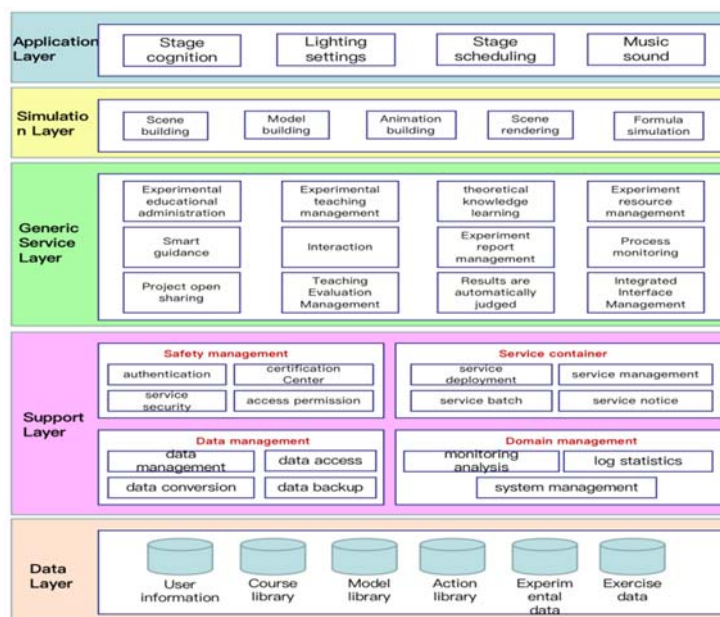


Figure 1: Overall architecture of the experimental platform

The data layer is responsible for data storage and access, including user information, course library, model library, action library, experimental data, and exercise data. The virtual simulation model of children's drama creation contains various types of virtual experimental data, and the corresponding database is designed according to the function to realize the storage and management of the corresponding data.

The support layer is the basis for the normal and open operation of virtual simulation experiments. It provides various services for the experimental platform generally including security management, service container, data management, and domain management.

The generic service layer is the teaching management platform. This layer provides integrated interface tools, supports the access of third-party virtual experiment software, and conducts unified management. The service layer contains experimental education administration, smart guidance, project open sharing, etc., to provide support for the implementation of virtual simulation experimental teaching of children's drama creation.

The simulation layer provides visual simulation functions. It develops virtual scenes, characters, props and other elements, collects the experimental data and formats the output to support the upper application.

The application layer is about open sharing virtual drama learning resources. Users can use various tools provided by the service and stimulation layer to create the experimental examples of children's drama creation.

3.2 Technical support of the experimental platform

In this project, the motion capture system is used to capture the movements of the actors, which is the most advanced means of motion capture at present. After being processed by the computer, the data of the three-dimensional space coordinates are obtained. When the data is recognized by the computer, it is fed back to the experimental platform. At the same time, the hyper-realistic software Unity3D is used to simulate the stage. Unity3D is the most advanced development engine, with a real physics engine, lighting system, and skeletal action system. It fully conforms to the effects of real stage lighting scene, stage choreographer, stage setting, etc., and can truly restore the stage effect.

The experimental project includes a complete experimental scene, character animation, etc., which requires relatively high hardware. In terms of experimental optimization, ZBrush is used for basic modeling, which meets the requirements for network speed and hardware. After the basic model is made, it is imported into 3Ds MAX for trimming, merging and optimization. Make textures in PhotoShop software, and paste the real pictures into virtual experiment. Then, the previous content is integrated through Unity3D software. The audio and video materials used in the virtual experiment are edited with AE software, and are also imported into Unity3D for integration. Finally, the 3D interaction step is realized by programming the C# language.

4 THE TEACHING PROCESS OF THE EXPERIMENTAL PLATFORM

This teaching process of the experimental platform is divided into four parts: experiment preparation stage, experiment process stage, comprehensive experiment stage, and experiment summary. Through the combination of online virtual interaction and offline

simulation training, preschool education major students can complete the pre-experiment preview, the actual operation during the experiment and the analysis and summary of experimental results (Figure 2). This experiment adopts the method of multiple evaluation, based on the scientific nature and expressiveness of art, it combines the standardized evaluation and the performance evaluation.

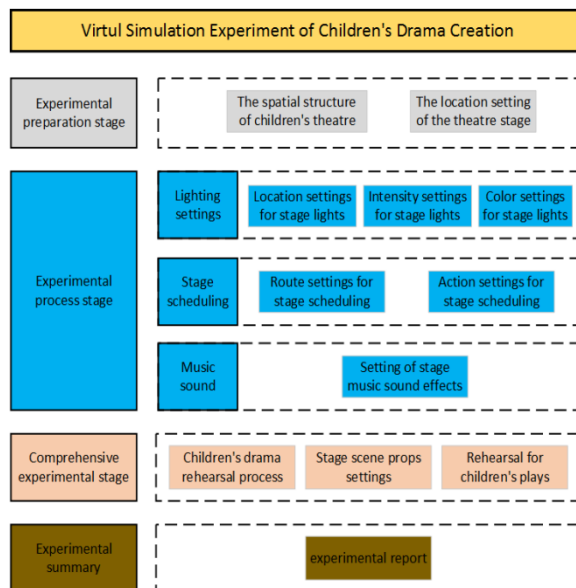


Figure 2: The teaching process of the virtual simulation experiment of children’s drama creation

4.1 Experiment preparation stage

In the experimental preparation stage, students first need to know the theater’ space structure and stage

location. Children’s theater includes auditorium, control room, stage, etc (Figure 3).



Figure 3 Spatial structure of children's theater stage

The stage of children's drama has a total of nine locations (Table 1). Different locations have different effects on attracting audiences. The order from strong to weak is lower middle area - central area - upper middle

area - lower right area - lower left area - Center right area - middle left area - upper right area - upper left area (left and right are subject to the actors) [9].

Table 1 The relationship between the location and strength of children's drama stage

upper right area	Upper Central	upper left area
center right	central area	center left
Lower right area	Lower Central District	Lower left area

4.2 The experimental process stage

In the experimental process stage, based on the task drive, students can carry out single-element design of stage lighting, stage scheduling, and music sound to complete the experimental output. Students can

understand the name, characteristics and functions of stage lighting with the experimental prompts, including top light, side light, surface light, etc., and can use the joystick in the stage lighting control panel to set the stage lighting position. According to the needs of the development of the plot, students can also adjust the intensity and color of the light (Figure 4).



Figure 4: Lighting adjustment for children's drama creation

At the same time, the experiment also helps students to understand the setting of the stage route, the relationship between the stage action design and the plot, atmosphere, and psychological motivation (Figure 5). In addition, students need to learn and understand the role

of stage music in experiments, design musical sound effects that could externalize the character’s heart, set off the atmosphere, and express the character’s relationships (Figure 6).



Figure 5: Stage Scheduling of Children's Drama



Figure 6: Musical sound effects created by children's plays

4.3 Comprehensive experimental stage

In this comprehensive experiment stage, students independently integrate elements such as stage lighting,

character movements, stage paths, and music to complete the comprehensive experiment of translating from “text” to “stage play”, and output their own dramatic works in the form of video (Figure 7).



Figure 7: Output of works created by children's plays

4.4 Experiment summary stage

In this experiment, students need to write and submit experimental reports, and compare and analyze their works. Through self-evaluation, peer evaluation, teacher evaluation, intelligent auxiliary evaluation and other diversified evaluation methods, students could know their works' merits and demerits. Preschool education major students will also master the elements of creativity and personalized artistic expression, thus developing the ability to the creation of children's drama.

5 FEATURES OF THE VIRTUAL SIMULATION EXPERIMENT PLATFORM FOR CHILDREN'S DRAMA CREATION

5.1 Collaboration between production and education

This project cooperates with the children's drama to transform excellent original play *The Abandoned Little Egg Yolk* into experimental content. The characters, stage background, and lighting settings in the experiment are all displayed in accordance with the performance repertoire, with a high degree of simulation. In the design of experimental content, this experiment not only considers the high-order nature of the experimental module, but also pays attention to the degree of challenge of each link. Taking lighting design as an example, in terms of the number of characters, the lighting for 1 character, 2 characters and multiple characters are designed. In the functional design of lighting, the experiment considers brightness and the location of the light.

5.2 Multiple evaluation

Scientific experiments emphasize the objectivity and accuracy of evaluation criteria, and art disciplines need to use performance evaluation methods. This project actively explores the evaluation methods, and organically integrates standardized evaluation and performance

evaluation. The project is divided into two modules. In the single-element practice stage, a standardized evaluation method is adopted to evaluate the students' mastery of basic knowledge. In the comprehensive application stage, students are asked to output their personalized artistic expressions in the form of videos and are judged by performance evaluation. For the evaluation subjects, there are students' mutual evaluation, teacher evaluation, and machine-assisted evaluation.

5.3 Use the virtual to promote the real

This experiment has designed a quantitative combination mode of lighting, scheduling, movement, and music. Students can use the software to continuously conduct multiple trials and combine the best art with technology to achieve the purpose of promoting the real with the virtual.

6 CONCLUSION

This experiment is a teaching application software of the virtual simulation experiment system of children's drama creation based on VR technology. It adopts online and offline mixed teaching, which not only expands the breadth and depth of children's drama teaching content, but also makes the time and space of teaching become flexible. At the same time, it also meets the needs of students for independent learning, innovative learning and personalized learning, and improves students' enthusiasm for children's drama education. However, there are also some defects in application. For example, the experimental system currently supports a single-person learning mode and cannot be performed by multiple people synchronously and collaboratively. Learning and operation, etc., need to be further optimized in the later stage, to promote the integration of information technology and children's drama education, so as to achieve the optimal teaching effect.

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AUTHORS' CONTRIBUTIONS

Shan Cuiping conducted the program design and wrote this article. Teacher Shi Xiaoqian, a member of the research group, participated in the experimental design and provided detailed insights. Associate Professor Wu Weiyong is the chief planner of the experimental program, and has conducted in-depth guidance on the experimental program planning, online teaching, technology development and other aspects.

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