

Development Research on a Virtual Simulation Teaching and Training Platform for Preschool Education in the Convergence Publishing Era (Postprint)

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Abstract

The development of information technology is progressively driving the transformation of teaching philosophies and models in higher education, while the era of integrated publishing is imposing increasingly stringent requirements on educational publishing institutions. This article, taking the development of a virtual simulation teaching and training platform for preschool education by a publishing house as a case study, analyzes the necessity of integrating virtual simulation technology with teaching and training practices for preschool education majors in universities within the context of integrated publishing; examines the current application and development status of virtual simulation teaching and training platforms in preschool education, along with existing challenges; elaborates on the system design and development pathway through a practical exposition of the platform's development; and provides insights for innovating teaching and training models in preschool education majors and for fostering deep cross-boundary integration among universities, publishing institutions, technology companies, and kindergartens.

Full Text

Research on the Development of Virtual Simulation Teaching and Training Platforms for Preschool Education in the Era of Integrated Publishing

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Abstract: The advancement of information technology is gradually transforming higher education teaching philosophies and models, placing increasingly demanding requirements on educational publishing units in the era of integrated publishing. This article analyzes the necessity of integrating virtual simulation technology with teaching and training for preschool education majors in universities against the backdrop of integrated publishing, using the development of a preschool education virtual simulation teaching and training platform by a publishing house as a case study. It examines the current development status and existing problems of virtual simulation teaching and training platforms in preschool education, elaborates on the platform's system design and development pathway through practical development experience, and provides insights for innovating preschool education teaching and training models and enabling deep cross-sector collaboration among universities, publishing units, technology companies, and kindergartens.

Keywords: preschool education; virtual simulation; teaching and training platform; integrated publishing

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In the 21st century, a new wave of technological innovation based on emerging technologies such as the Internet of Things, artificial intelligence, big data, and blockchain has brought new opportunities and challenges to China's higher education. The "Education Informatization 2.0 Action Plan" issued by the Ministry of Education in 2018 proposed accelerating the construction of intelligent learning systems for universities oriented toward next-generation networks, "using demonstration virtual simulation experimental teaching projects as a vehicle to strengthen the construction of large-capacity intelligent teaching resources, form a ubiquitous and intelligent learning system, and promote the deep integration of information technology and intelligent technology into the entire educational teaching process" [1]. To thoroughly implement the "13th Five-Year Plan for Education Informatization," achieve the transformation and upgrading of education informatization, and fully leverage its supporting and leading role in educational modernization, the General Office of the Ministry of Education proposed "continuously promoting the construction of resources for vocational education and higher education, with specific measures including: deepening the integration of information technology and higher education teaching, accelerating the construction of demonstration virtual simulation experimental teaching projects, and forming an integrated online virtual simulation experimental teaching project learning environment." In June 2018, the Ministry of

Education issued the “Notice on Launching the Construction of National Virtual Simulation Experimental Teaching Projects” to further promote the integration of modern information technology into teaching practice.

In real teaching practice, virtual simulation technology and its virtual simulation teaching environments under artificial intelligence are gradually being widely used in science and engineering majors at various levels of institutions (Figure 1 shows a floor plan of an artificial intelligence classroom at a vocational college). Moreover, due to the significant teaching effects of virtual simulation teaching in science and engineering majors, it has also influenced teaching reforms in humanities majors such as culture and education. In recent years, the application of virtual simulation teaching and training methods in culture and education majors has begun to take root. Simultaneously, the evolution of educational publishing has consistently kept pace with teaching reforms, and virtual simulation teaching and training tools and their courses have become important components of educational resources. How to incorporate complex and extensive teaching resources into publishing and how to advance the upgrading of educational publishing itself have been put on the agenda, and the concept of integrated publishing has subsequently emerged.

1. Development of Virtual Simulation Teaching and Training Platforms for Preschool Education in the Era of Integrated Publishing

The construction of virtual simulation teaching projects is the necessary path to promote the development of educational informatization and modernization, and it represents the primary approach to cultivating high-level, high-quality applied talents.

1.1 Current Status of National Virtual Simulation Experimental Teaching Projects

In 2017, the General Office of the Ministry of Education issued the “Notice on Conducting the Construction of Demonstration Virtual Simulation Experimental Teaching Projects from 2017 to 2020” (hereinafter referred to as the “Notice”), proposing “to rely on modern information technology, focus on urgently needed experimental teaching informatization content in relevant majors, and based on complete experimental teaching projects, construct demonstration virtual simulation experimental teaching projects” [2]. The “Notice” made overall plans to identify approximately 1,000 demonstration virtual simulation experimental teaching projects by 2020.

In 2018, based on recommendations from provincial-level education administrative departments and after comprehensive review and public announcement, the Ministry of Education identified 296 virtual simulation experimental teaching projects as national-level projects, including 12 projects related to preschool education [3]. In 2019, the scope of national virtual simulation experimental teach-

ing project identification expanded to 26 academic categories, with the number expanding to 305 projects. By September 2020, among the online projects on the national virtual simulation experimental teaching project sharing platform (Experimental Space) hosted by the Ministry of Education, there were 34 projects in the education category, including 9 preschool education projects. For example, Shenyang Normal University designed the “Virtual Simulation Experimental Teaching Project for First Aid Treatment of Airway Foreign Body Obstruction in Kindergarten Children” based on curriculum, which uses virtual simulation technology to reproduce scenarios of children with airway obstruction. Through interactive methods such as observation, learning, and operational practice, students develop the safety awareness necessary for preschool teachers, understand essential first aid methods, and master emergency treatment procedures for preschool safety accidents. Another example is Shijiazhuang University, which plans to construct a preschool education virtual-reality integrated training platform in its preschool education training rooms, conducting virtual simulation training in modules such as sensory integration, environment creation, psychological and emotional education, cognitive ability training, health and childcare training, nutrition and dietary management, play and teaching aid development training, pre-job training, and in-service professional development.

1.2 Problems in the Development of Preschool Education Virtual Simulation Teaching and Training Platforms

Currently, the main developers of virtual simulation teaching platforms are technology companies, educational service institutions (such as educational publishers), and higher education institutions. However, due to vastly different professional teaching needs, different development stages, and different development purposes, and because the state has not issued relevant technical specifications and development policies, existing virtual simulation teaching platforms exhibit diverse characteristics. For example, technology companies often develop platforms based on their own technical advantages without conducting extensive and professional teaching needs research, resulting in platforms that are not user-friendly in teaching or even inefficient to use. Higher education institutions often develop platforms based on professional needs for funding applications or projects. Although these platforms are closely integrated with teaching and some are relatively practical, they technically depend on technology companies, leading to high input but low output.

Examining the currently developed preschool education virtual simulation teaching and training platforms, common problems include scattered teaching projects, single kindergarten scenarios, expensive supporting hardware, and overlapping content in training modules. These platforms have not yet formed an organically connected preschool education virtual teaching and training platform system based on preschool education talent cultivation goals.

2. Characteristics of Preschool Education Virtual Simulation Teaching and Training Platforms in the Era of Integrated Publishing

Previous preschool education talent cultivation primarily relied on deep cooperation between universities and kindergartens, mainly reflected in theoretical learning, skill training, and professional practice. However, against the digital backdrop of the integrated publishing era, preschool education virtual simulation teaching and training platforms can have the following characteristics.

2.1 Optimizing the Preschool Education Talent Cultivation Mechanism

Establishing an applied talent cultivation mechanism and teaching model based on virtual simulation technology can strengthen key aspects of preschool education professional skills. Preschool education virtual simulation teaching and training platforms can simulate real kindergarten environmental scenes, educational events, and teacher educational behaviors, focusing on professional skill training with the goal of developing preschool professional skills and emphasizing the demonstration and training of preschool teachers' educational teaching skills. They can also construct virtual simulation classroom teaching scenes and virtual simulation laboratory scenes based on the principle of integrating theory and practice according to various requirements of preschool education professional literacy. This allows students to conduct multiple training projects in virtual educational situations through perception, operation, and human-computer interaction, gradually improving professional cognition and professional capabilities.

On the one hand, preschool education virtual simulation teaching and training platforms can solve the temporal and spatial conflicts of off-campus training venues and teaching, enabling kindergarten training to be conducted anytime and anywhere. On the other hand, they can overcome the dilemma that accidental and safety incidents in early childhood education cannot be reproduced. They enable multiple trials of complex scenarios or similar scenarios to find optimal solutions, allowing students to work confidently and skillfully in real kindergartens after training. In summary, preschool education virtual simulation teaching and training platforms can optimize the entire preschool education professional talent cultivation mechanism and enhance the effectiveness of preschool education talent cultivation.

2.2 Promoting and Meeting the Personalized Blended Learning Needs of Preschool Education Majors

Learning in preschool education is essentially a complex learning process. Complex learning refers to the fundamental learning method exhibited by the behavioral agents constituting the system as they purposefully and creatively respond to challenges from environmental changes [4]. The key to preschool education

professional teaching lies in cultivating students' professional literacy and practical abilities. Students need to integrate the knowledge and skills they have learned and transfer them to complex educational situations, attempting to analyze and solve problems, develop educational reflection abilities, and improve practical teaching skills. Virtual simulation teaching and training platforms utilizing digital technology can adjust the environment, content, process, and evaluation according to teachers' immediate needs, emphasizing personalized learning and blended learning (Figure 2 [Figure 2: see original paper]). This transforms students from traditional imitation and practice to active inquiry and collaborative learning, providing adaptive learning support to meet learners' personalized needs.

For example, the actual kindergarten scenes in preschool education virtual simulation teaching and training platforms can set up kindergarten scene libraries based on common types of kindergarten environments and regional characteristics in China, with the ability to re-edit in virtual scenes to meet the teaching needs of different types and regions of preschool education majors. The skill modules in the virtual simulation teaching platform can also preset personalized content such as ethnic dances, dialect songs, and folk culture to meet teaching needs.

3. Development Practice of a Preschool Education Virtual Simulation Teaching and Training Platform by a Publishing House

3.1 System Design of the Preschool Education Virtual Simulation Teaching and Training Platform

The development entities of this platform include universities, publishing units, technology companies, and kindergartens. Publishing units need to possess Internet thinking, planning platform-related topics and publishing on demand based on user-centered principles and market demand. Universities and kindergartens mainly undertake tasks such as content design and planning, curriculum script design, teaching resource construction, and teaching feedback. Technology companies undertake technical support work, such as software development, 3D modeling, three-dimensional model design, graphic design, experimental construction, network operation and maintenance management, and platform maintenance and optimization.

Preschool education professional teaching requires learners not only to understand preschool education professional knowledge and develop theoretical literacy and skills for scientific education but also to fully utilize Internet technology to expand knowledge acquisition, increase capabilities, and broaden the coverage and depth of training. The structure of the preschool education virtual simulation teaching and training platform includes curriculum construction modules, training environment modules, and teacher training modules, basically covering the entire process from teaching to job placement and subsequent professional

development for preschool education majors.

The curriculum construction module includes professional curriculum systems, teaching resource libraries, and three-dimensional textbooks. The platform encourages preschool education professional institutions and teachers to assist in constructing teaching resources and cases during development and iteration, while also supporting other curricula and three-dimensional textbooks that use the platform. The training environment module is the main body of the platform (Figure 3 [Figure 3: see original paper]), including the preschool education professional virtual simulation teaching system (Figure 4 [Figure 4: see original paper]), training scene settings (interactive training rooms and integrated training bases). This helps preschool education students simulate kindergarten environments before actual training, familiarize themselves with work processes, and handle common events, laying a solid foundation for actual work. The teacher training and enhancement module is oriented toward in-service preschool teachers and preschool education professional teachers and students, mainly setting up learning modules and mock examination platforms related to the national preschool teacher qualification certificate examination.

In 2019, the National Textbook Committee issued the “National Planning for Textbook Construction in Primary, Secondary, and Tertiary Education (2019-2022),” proposing the strengthening of practical textbook construction in higher education. Educational publishing units have already begun developing three-dimensional textbooks and handbook-style, loose-leaf textbooks for preschool education majors based on multiple media. Platform supporting textbooks can enable students to enter the preschool platform by scanning codes from textbooks, interconnecting curriculum, textbooks, and platforms. Learners can freely choose learning scenarios and time periods, making learning more autonomous.

3.2 Development Pathway of the Preschool Education Virtual Simulation Teaching and Training Platform

3.2.1 Extensive Investigation of User Needs During platform design planning and development promotion, investigation methods and centralized discussion methods can be employed. It is necessary to widely solicit teaching suggestions and actual needs from directors, teachers, and students of preschool education departments at all levels and types of institutions regarding basic and skill courses in preschool education majors. It is also essential to widely solicit opinions from preschool education teaching researchers and kindergarten principals across multiple regions regarding the professional literacy and skill requirements for preschool teachers and childcare workers, and to extensively photograph and record actual environments and design styles of kindergartens in different regions and types across the country. Additionally, organizing preschool education skill curriculum resource construction seminars at various levels can help excavate real teaching cases and professional scene cases, ultimately designing the module system and project resources for the preschool education virtual

simulation teaching and training platform.

3.2.2 Emphasizing the Learner-Centered Concept Virtual simulation teaching and training platforms utilize modern digital technology to adjust the teaching and training environment, content, process, and evaluation according to learners' needs, guiding learners to actively discover and summarize during learning. This forms a learning method and teaching model where learners are the main body and engage in independent thinking. Therefore, when constructing teaching and training projects and planning curriculum teaching sections, it is necessary to design columns such as practical experience, operation playback, knowledge point prompts, and independent design scenario reproduction to help learners understand knowledge and master various skills and problem-solving abilities in an engaging way.

3.2.3 Emphasizing Feedback and Updates First, during the use of the teaching and training platform, communication groups and feedback-based course gifting can be established to continuously excavate feedback opinions. Based on this feedback, content and technology can be iterated to secure a longer lifecycle for the platform. Second, teaching cases and resources should be continuously updated based on teaching reforms and needs, gradually enriching the teaching resource library to achieve a national teaching resource library containing different types, regions, and cultural characteristics of real kindergarten scenes and featured curricula. Additionally, the platform's supporting three-dimensional textbook publishing should be continuously improved, striving to achieve a completely new teaching effect that integrates textbooks, classrooms, and kindergartens through the platform. This will cultivate applied preschool education professionals with strong autonomous learning abilities, problem-solving skills, and adaptability to actual kindergarten positions.

Integrated publishing refers to the integration of traditional publishing and emerging publishing in products, platforms, and services. However, when implemented in specific products, it possesses both traditional publishing attributes and digital publishing attributes [5], forming a trinity of textbooks, technology, and platforms. In the era of integrated publishing, technology-driven development is the core, and content innovation is fundamental. The development and construction of preschool education virtual simulation teaching and training platforms align with the characteristics of the integrated publishing era. The collaboration among universities, educational publishing units, and technology companies in platform development and construction has also created a new pattern of cross-sector interaction and integrated publishing.

The preschool education virtual simulation teaching and training platform introduced in this article focuses on regional economic and social development and the application of cutting-edge information technology. For higher education institutions, the preschool education teaching and training platform aligns with the cultivation goals of preschool teachers in the new era, promotes progress

