



Design and Implementation of Virtual Simulation Experiment for Government Procurement Management Course

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Abstract. Drawing from an in-depth analysis of the advantages associated with virtual simulation experiments within the framework of experimental teaching in government procurement management courses, this study outlines the development of virtual simulation experiment content specially designed for government procurement management courses. The designed content includes essential components such as experimental objectives, experimental content, experimental principles, and experimental methodologies. It provides a virtual simulation experimental teaching system for government procurement management courses, and proposes a virtual simulation experimental architecture and implementation method for government procurement management courses. This research has a promoting effect on establishing an open, networked virtual simulation experimental teaching system for government procurement management courses, while also fostering innovation in talent cultivation methodologies pertinent to government procurement management.

Keywords: Experimental teaching; Government procurement management; Virtual simulation

1 Introduction

Government procurement management course represents a significant component of academic curricula in logistics management, enterprise management, supply chain management, and other majors in universities, which is a course that closely combines theory and practice. The virtual simulation experiment of government procurement management is an important form of practical teaching in procurement management courses. It is in the form of plan and rehearses military chess, and through a series of storytelling plots, comprehensively reproduces the decision-making game, means game, interest game, and character game between procurement personnel and suppliers, as well as between suppliers and suppliers in the process of government procurement management. Through comprehensive training throughout the entire

process, students can master the core knowledge points of procurement management in a virtual environment, cultivate their practical operational abilities, improve their ability to comprehensively analyze, solve problems, and innovate their thinking, achieving a teaching effect of applying what is learned.

2 Advantages of Virtual Simulation Experiment Teaching in Government Procurement Management Course

2.1 Virtual Simulation Experiments in Government Procurement Management Can Overcome the Temporal and Spatial Limitations of Traditional Simulation Practices

Some government procurement of major engineering projects takes a long time, ranging from 1-2 years to 3-5 years, with a large spatial span. The whole process hands-on practice of major engineering procurement is generally not feasible, but virtual simulation experiments can achieve multiple repeated hands-on training of procurement activities, providing students with an equal and enhanced learning experience that traditional laboratories cannot provide. The virtual simulation experiment in government procurement management enables students to acquire profound conceptual understanding and apply reasoning, critical thinking, innovation, and creative skills without the constraints of time, resources, or physical space. The experiment can be repeated multiple times and students can change relevant parameters to immediately observe the visual presentation results and receive feedback from the experiment.

2.2 Virtual Simulation Experiments Can Enhance the On-site Immersion of Government Procurement Management Simulation Practices

The virtual simulation experimental teaching of government procurement management combines virtual simulation technology with procurement management practical teaching, simulates the entire process of government procurement management, and integrates relevant important knowledge points into the procurement management simulation experimental stage. Through the interactivity, practicality, and exploratory nature of the experimental process, enables students to gain a real immersive experience on site, make simulation experiments more approachable, and form a positive emotional relationship between learners and the virtual environment. Learners participate in experiments in the form of role-playing, experiencing the entire process of procurement management firsthand, applying professional knowledge and practical operations to complete tasks in each stage of procurement management, and obtaining direct knowledge and experience to construct knowledge during the experimental process (see Fig. 1).

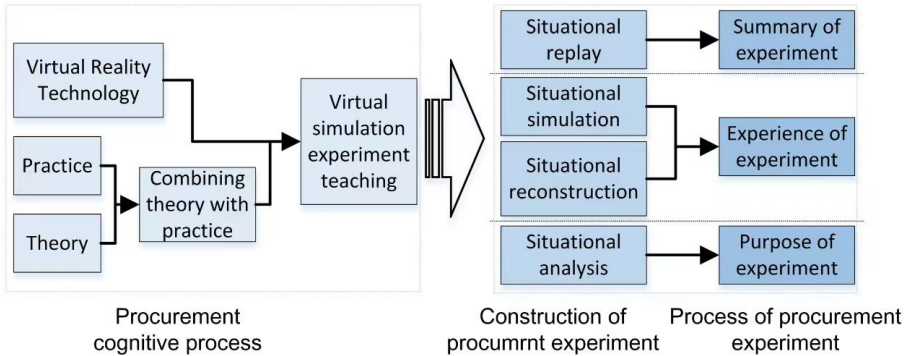


Fig. 1. Process diagram of procurement capability formation based on virtual simulation experiments

3 Design of Virtual Simulation Experiment for Government Procurement Management Course

3.1 Analysis of Experimental Objectives

The virtual simulation experiment of the government procurement management course follows the talent cultivation concept of "student-centered and ability oriented" and the principle of "combining ability with reality and combining virtual and real"^[1-4]. It adopts a combination of online and offline methods, combines virtual simulation technology with the teaching of the government procurement management course, and simulate government procurement activities throughout the entire process and all elements, integrating relevant important knowledge points into the entire experimental process.

The purpose of the virtual simulation experiment of government procurement management course is to expand the breadth and depth of practical teaching in government procurement management course. Through the interactivity, practicality, and exploratory nature of the experimental process, students can gain a real on-site immersion in government procurement, experience the entire process and elements of government procurement firsthand, use professional knowledge to complete various tasks in government procurement. Through comprehensive training throughout the entire process, students can complete the training and assessment of various knowledge points in government procurement through systematic training, cultivate their practical operation ability, comprehensive analysis of problems, problem-solving, and innovative thinking ability, and achieve a good teaching effect of applying what is learned.

3.2 Experimental Content Design

According to relevant regulations such as the Government Procurement Law of the People's Republic of China, government procurement can adopt procurement methods

such as open bidding, invitation bidding, competitive negotiation, single source procurement, inquiry procurement, and competitive negotiation. From a procedural perspective, each procurement method can be divided into stages such as preparation and release of procurement documents, clarification and modification of procurement documents, preparation and submission of bidding (response) documents, supplementation, modification and withdrawal of bidding documents, evaluation, and winning (closing) bids. In the process of government procurement, if suppliers (potential suppliers) raise doubts and complaints about government procurement projects, they should also respond to the doubts raised by the suppliers, handle the complaints raised by the suppliers, and achieve legal compliance, fairness, impartiality, simplicity, and efficiency. For government procurement projects entrusted to procurement agencies, procurement activities also involve the selection and management of government procurement agencies. The government procurement methods and activities mentioned above are all experimental contents of the government procurement course. According to the principle of "can be real but not virtual", after transforming these projects into virtual simulation experiments, students can quickly simulate the entire procurement process of a major engineering project, without being limited by time and space. They can also practice multiple times, bringing theory and application closer together. The virtual simulation experimental teaching system of government procurement management course is shown in Fig. 2.



Fig. 2. Virtual Simulation Experiment Teaching System for Government Procurement Management Course

3.3 Analysis of Experimental Principles

Deeply analyze the entire process of government procurement, simulate the government procurement environment through virtual scenes and storylines, comprehensively reproduce the decision-making game, means game, interest game, and character game between purchasers and suppliers, suppliers and suppliers,

purchasers and procurement agencies, suppliers and regulatory agencies in the government procurement management process, and stimulate students' interest in learning, Elaborate on procurement theory through real government procurement projects, and combine hollow theories with complex government procurement processes. The experimental process emphasizes the systematization, completeness, and practicality of knowledge, allowing students to experience government procurement procedures and master operational skills firsthand. This plays an important role in improving teaching quality.

3.4 Experimental Methods

Using virtual simulation technology, carefully design the tasks of government procurement projects, simulate different types of government procurement methods, and draft procurement requirements, prepare procurement documents, conduct supplier qualification review, prepare and submit response documents, evaluate, win bids (transactions), as well as prepare and publish government procurement announcements and public information involved in each stage of government procurement The knowledge and practical operations of answering and handling doubts and complaints can only be integrated into various experimental stages.

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The government procurement virtual simulation supports multiplayer functionality, allowing participants to assume various roles such as purchasers (1 person), suppliers (multiple people), and evaluation experts (multiple people). In the virtual simulation experiment, a single purchaser, multiple suppliers, evaluation experts, and additional personnel collaborate to complete the tasks. Students can either independently complete the government procurement virtual simulation experiment as purchasers, suppliers, or evaluation experts (single person mode), or work in pairs (double person mode) to jointly complete the government procurement virtual simulation experiment as purchasers and suppliers, suppliers and evaluation experts. Within the single-person, two-person, and multiplayer modes, vacant roles are pre-set during system development and automatically filled by the system during the experiment, ensuring smooth operation and enhancing the flexibility of the experimental organization.

4 Virtual Simulation Experiment Architecture and Implementation of Government Procurement Management Courses

The virtual simulation experiment of government procurement management course is supported by an open and running virtual simulation experiment teaching management platform. The two are seamlessly integrated through data structures and can ensure that users can access them anytime and anywhere through a browser. It automatically realizes functions such as intelligent guidance and automatic correction services for users, helps users achieve independent experiments as much as possible, strengthen the implementation of project open service functions, and improve the effectiveness of open services. [5-8] The platform that supports project operation and the architecture of project operation are divided into five layers, each layer providing services for its upper layer until the construction of the specific virtual experimental teaching environment is completed, as shown in Fig. 3.

4.1 Data Layer

The virtual simulation experiment of government procurement management course involves the entire elements and process of government procurement management, including various types of virtual experimental components and data. Therefore, it is necessary to set up the basic component library, experimental course library, typical experimental library, standard answer library, rule library, experimental data, user information, etc. of the virtual experiment separately to achieve the storage and management of corresponding data. [9-10]

4.2 Support Layer

The support layer is the core framework of the virtual simulation experiment teaching and open sharing platform for government procurement management courses. It is the foundation for the normal open operation of various experimental projects and is responsible for the operation, maintenance, and management of the entire basic system. The supporting platform includes security management, service containers, data management, domain management, etc.

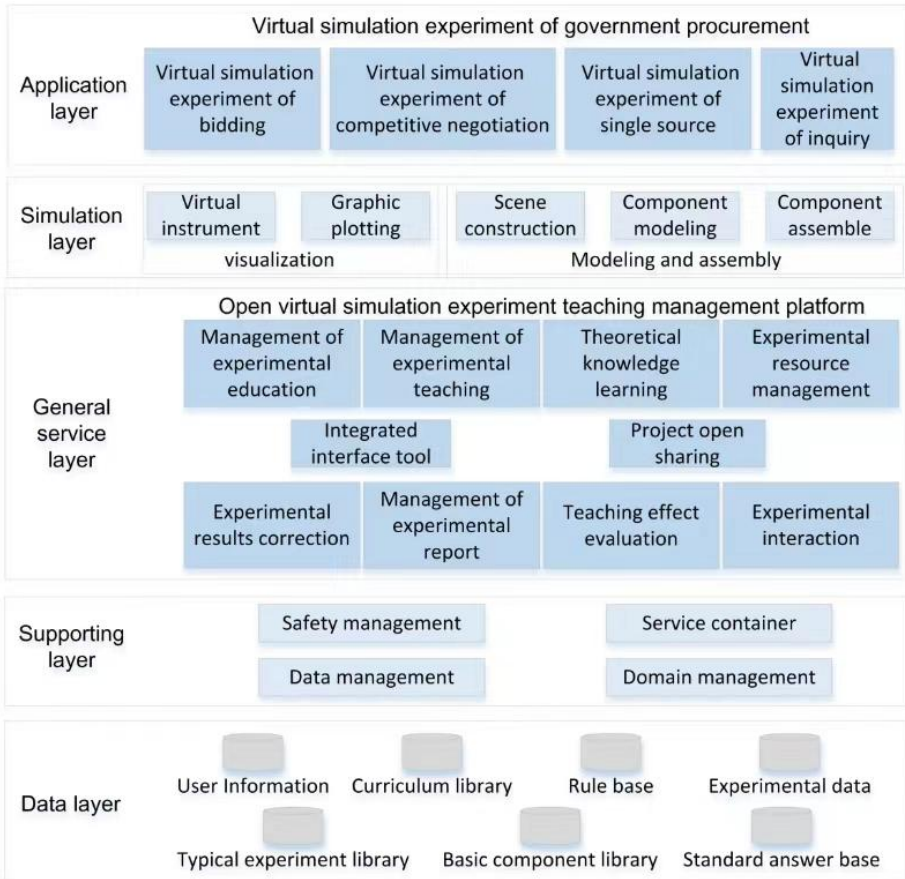


Fig. 3. Virtual Simulation Experiment Architecture of Government Procurement Management Course

4.3 General Service Layer

The general service layer can provide some common support components for the virtual simulation experimental teaching environment of government procurement management courses, enabling users to quickly complete virtual simulation experiments in the virtual experimental environment. General services include: experimental academic management, experimental teaching management, theoretical knowledge learning, experimental resource management, experimental result correction, experimental report management, teaching effectiveness evaluation, experimental interactive communication, project opening and sharing, etc. At the same time, corresponding integration interface tools are provided to facilitate the integration of third-party virtual experimental software into unified management on the platform.

4.4 Simulation Layer

The simulation layer mainly focuses on equipment modeling, experimental scene construction, virtual instrument development, providing universal simulators for the virtual simulation experiment project of government procurement management course, and finally providing formatted output of experimental result data for the upper layer.

4.5 Application Layer

The application layer mainly includes virtual simulation experiments of the entire process, elements, and activities of government procurement management. Experimental teachers can use various tools provided by the service layer and corresponding equipment models provided by the simulation layer according to teaching needs, design various typical experimental examples, and achieve virtual simulation experiments of government procurement management that can be open and shared, with good scalability. ^[11]

5 Conclusion

Adhering to the experimental teaching concept of "student-centered", selecting accurate and suitable experimental teaching content, applying virtual simulation technology to the experimental teaching of government procurement management courses, establishing an open and networked virtual simulation experimental teaching system for government procurement management courses, can effectively compensate for the shortcomings of traditional experimental teaching, innovate the talent training mode of government procurement management, and mobilize students' enthusiasm and initiative to participate in experimental teaching, and enhance students' innovative and creative abilities.

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