Study on Virtual Simulation Experimental Teaching System of Modern Port Logistics

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***Abstract*—Modern port logistics is an important part of modern logistics, industry flavor of which is special, and requires the higher ability of engineering practice. Virtual reality and other virtual simulation technology has been applied to the experimental teaching of related majors，but also there exist such problems as fewer function, repeated system and lack of openness. And, to solve the problems of the lack of innovation awareness, scientific research project, practice condition and so on, this paper discussed how to develop virtual simulation system and resource platform for modern port logistics, which is an effective exploration of the new technology used to cultivate the innovative ability of students with engineer majors.**

***Index Terms*—virtual simulation, innovation ability, port logistics, resource platform**

I. Introduction

The backward training mode of professional logistics in colleges and universities has become an important external factor for the lack of high-end talents in logistics industry. In the past ten years, more than 500 domestic colleges and universities to open logistics engineering, but as a result of school-running level and base is uneven, the laboratory construction level difference is big, which is not conducive to college student's innovative ability training.

Virtual simulation experiment teaching relies on virtual reality, multimedia, human-computer interaction, database and network communication technology to build a highly simulated virtual experimental environment and experimental objects. Students conduct experiments in a virtual environment that can achieve teaching functions, which are not available or difficult to complete in real experiments. They involve high-risk or extreme environments, inaccessible or irreversible operations, high costs, high consumption, large-scale or comprehensive training, etc. When it comes to providing reliable, safe and economical experimental projects, it fully embodies the principles of combining facts with reality, complementing one another, and being practically invaluable [1], which is conducive to the training of practical and practical abilities of college students. Lu et al. [2] proposed a 3d simulation component platform for constructing the virtual simulation system of container terminals, which solved the problem of reusable use. Deng [3] proposed a set of new technologies and methods for container terminal simulation, which provided a new approach for the planning, design, analysis and evaluation of container terminal logistics systems. Sun [4] applied the virtual reality (VR) technology to the practical training teaching of logistics, and replaced some physical devices in the logistics system. Xu [5] studied the application of VR technology in three different levels of logistics practice teaching in logistics facility equipment, warehouse management system and logistics system planning and design, and analyzed the key issues of applying VR technology. The existing literature has done a lot of exploratory work in the application of virtual simulation technologies such as virtual reality to logistics professional teaching. However, there is obviously a lack of a relatively systematic teaching system and a platform of teaching resources that meets the characteristics of logistics professionals.

This paper aims at the cultivation of innovation ability, and explores the application of virtual simulation technology in the modern port logistics professional virtual experiment method.

II. Analysis of Problems in Experimental Teaching of Port Logistics

A. Cultivation of Innovation Ability

China's higher education is still not suited to the requirements of national economic development for talents training for a variety of reasons. In particular, the port logistics profession is reflected in a single talent training model, lack of diversity and adaptability, and the lack of engineering and weak practice has not been resolved for a long time. The school assessment system leads to essay, light design, and lack of practice. It pays less attention to students' innovative education and entrepreneurship training. The combination of production, education and research is insufficient, enterprises do not attach importance to the personnel training process participation and so on. The cultivation of students' innovation ability mainly has the following problems [6-8]:

(1) Lack of innovation awareness.

Due to the limitation of port safety production conditions, teaching methods are mainly based on

classroom theory teaching, neglecting or not paying attention to practical education, let alone integrating theory with practice. Most of the students are trained in the traditional education model of teaching, knowledge, and closure. Teachers are the spreaders of ideas and truth, and students are the recipients. Due to scripted teaching mode, the students' knowledge is limited to textbooks and lack of training in scientific research ability, which seriously affects the enthusiasm of students in learning and suppresses their independent thinking ability, judgment ability, and subjective initiative. This virtually eliminates students' sense of innovation and inhibits student personality. Because of this development, it is difficult to cultivate talents who are dedicated to thinking and innovation.

(2) Lack of scientific research practice

Participating in scientific research and practice activities is extremely important for the cultivation of students' innovative ability. However, from the statistical data analysis (Natural Sciences) of the universities and colleges directly under the Ministry of Education of our country, the students' participation in the "Research and Development" topic is not extensive enough. There are insufficient scientific research activities such as participating in basic research, applying research and practical development. Under conditions such as teaching conditions, education funds, and other aspects of teachers and hardware, there has been no obvious improvement. Most students' experimental facilities and practical conditions are unable to meet the requirements and restrict the improvement of students' practical ability and the development of scientific research quality.

(3) Lack of international vision

At present, there are relatively few academic activities in colleges and universities in China, and the academic atmosphere is not strong enough. Students have fewer opportunities to participate in scientific research and academic activities. They are conducive to broadening academic horizons and advancements for cutting-edge and international academic lectures and academic salons. The curriculum of practical ability is not enough attention. These are not conducive to the training of innovative talents and should be highly valued. Due to the current performance evaluation system, teachers are busy with their own teaching and research, and they are not concerned enough with the academic activities of students, which makes students feel narrow academic perspectives, lack understanding of the subject's international status, and lack of scientific research ability and innovation awareness.

(4) Lack of practical environment

There are generally poor conditions for students to practice in schools, and there are limited laboratories, instrument, and equipment for undergraduates who can independently conduct innovative experiments. There are fewer opportunities for students to directly participate in innovative projects such as research projects and research projects. At the same time, the enterprises are affected by factors such as production, safety pressure, and greater emphasis on economic efficiency. They are reluctant to assume the social responsibility for talent cultivation, and their enthusiasm for accepting internships has decreased, making it difficult to guarantee the practical teaching process.

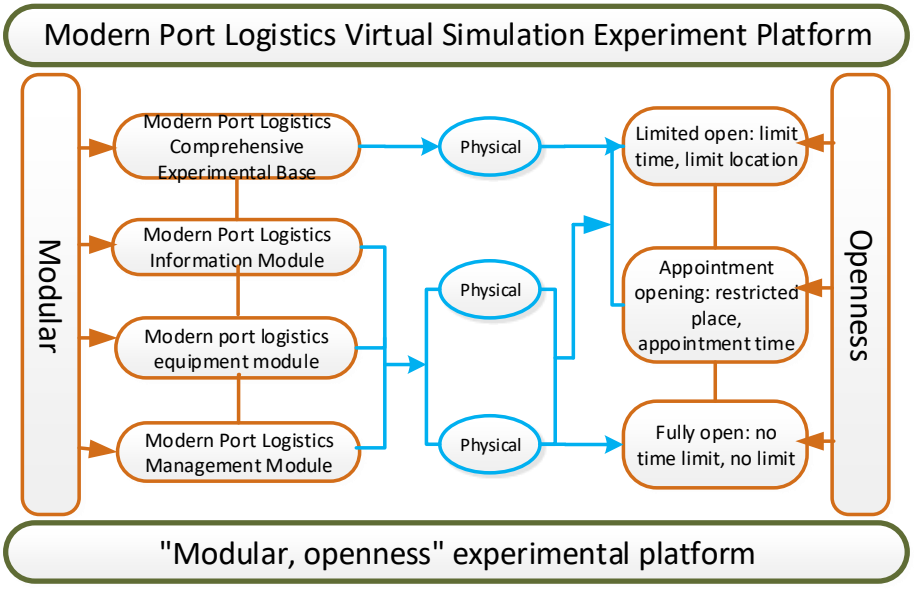

Figure 1. Virtual simulation experiment platform of port logistics

B. Characteristics of Port Logistics Experimental Teaching

The logistics industry is a composite service industry that integrates transportation, warehousing, freight forwarding, information, and equipment, which is a basic and strategic industry that supports the development of the national economy. Vice premier Wang Yang once pointed out that a city can have no industrial agriculture, but it cannot have no logistics industry. Modern port logistics is refers to the center of the port city of using its own port advantage, which is based on the advanced software and hardware environment, strengthening its radiation ability of the port logistics activities and highlighting the port

cargo, inventory, and distribution expertise. Based on Lingang industry and supported by information technology, with the aim of optimizing the integration of port resources, we will develop a comprehensive port service system that covers all aspects of the logistics industry chain. The characteristics of port logistics experimental teaching are: (1) Long transportation process of logistics. The transportation of a container includes loading empty containers, transporting the containers to the yard in the mainland, transporting roads, railways or waterways to coastal terminals, and shipping to sea; (2) The organization of is loading and handing is complicated. The wharf cargo organization involves complex production organization and equipment scheduling; (3) High security requirements. The work site has strict safety regulations and has certain risks; (4) Field experiments are difficult. On the one hand, the job is busy, generally do not accept training and practice, on the other hand, the scale is very big, such as the height of the container terminal in a container is 2.5m high, it is difficult to see a process at the scene. Using the virtual simulation experiment method can effectively solve the above problems, and change the limitations of hardware such as equipment, sites, funds, etc., and many experiments can not be carried out to avoid risks (real experiment or operation often leads to a variety of dangerous), break the space, The time limit. By using information technology, students can do various experiments in a virtual environment, gain the same experience as real experiments, and avoid possible risks. Under the premise of guaranteeing teaching effects, great savings are achieved and safety is guaranteed. Increased efficiency.

III. CONSTRUCTION OF VIRTUAL SIMULATION TEACHING SYSTEM OF PORT LOGISTICS

A Planning of Experimental Teaching System

In view of the problems existing in the current port logistics related professional innovation ability training, in the process of continuous exploration of experimental practice teaching, according to the characteristics of the discipline itself, a virtual simulation experiment teaching system of “full process, integration, and multi-level” has been formed.

(1) The whole process emphasizes that the coverage of the experimental project design covers a wide range and covers the entire modern port logistics system. Including: First, the whole process of forming the port logistics system. Design experimental projects based on the formation cycle of port logistics systems such as port planning, program evaluation, process plan, layout, equipment configuration, operation management, plan scheduling, maintenance and operation. Second, the whole process of port logistics transportation. Including the entire process of port logistics transportation, storage, loading and unloading, handling, dismantling boxes and distribution. Thirdly, port logistics expands the whole process to modern port logistics. Change the traditional single cargo handling function, and gradually provide a modern logistics service; change a single port logistics is not only limited to the port internal logistics, but extends upstream and downstream to form a port supply chain system.

(2) Integration refers to the systematicness and integrity of experimental project design, and emphasizes the integration of various elements in the port logistics system. First, the integration of the port logistics system planning. The unified planning of various stages of the port logistics, such as the planning of container terminals and bulk terminals, requires the consideration of equipment configuration, management methods, process flow, planned dispatch methods, and equipment maintenance and maintenance methods during the planning phase. Second, the integration of the port logistics process. When evaluating or optimizing a port logistics system, the overall system needs to be considered. Third, the integration of port logistics system elements. The port logistics system involves many elements, mainly including equipment, information, management and other factors. It also includes finance, trade, and e-commerce. The overall performance of the system depends on the integration of multiple factors.

(3) The hierarchy is to consider the students' cognitive laws, and establish a layered system of virtual simulation experiment content from easy to difficult. Contains three levels: The first level, demonstrative and basic verification experiments, through basic experimental learning, ensure that students master the basic knowledge and basic skills of the profession. The second level, design and comprehensive experiments, through professional experimental learning, requires students to master the analysis, design, and development of single or integrated elements in the logistics system in order to improve the students' comprehensive experimental ability and ability to analyze and solve problems. The third level, research and innovative experiments. Through the support of national or provincial-level scientific research projects, off-campus practice bases, provincial-level scientific research platforms and other projects or institutions, select real topics and conduct on-site research.

B Planning of Experimental Teaching Platform

By constructing a highly realistic virtual experiment environment and experimental object, it can meet the requirements of the experimental teaching syllabus for the training of logistics professionals. According to the training objective of logistics undergraduate education and the specific content of experimental teaching, with the modern port logistics experimental system as a guide, the experimental content is divided into four modules according to functions, as shown in Figure 1.

(1) Port logistics management in virtual simulation platform is mainly for port logistics management mechanism, law, planning, organization, operation, technology, simulation, optimization, decision making, etc., complete demonstration, validation and comprehensive virtual simulation experiments.

(2) Virtual simulation experiment platform of port logistics information is mainly carried out virtual simulation experiment of port logistics information collection, tracking, monitoring, information processing

and information control technology.

(3) The virtual simulation experiment platform of port logistics equipment is mainly carried out virtual simulation experiments, such as automation, informatization, intelligence and joint performance analysis and optimization of port logistics equipment.

(4) The Port Logistics Integrated Experimental Base is dedicated to the port process management and optimization, information tracking and control, and port logistics handling system and equipment experiments for high-efficiency, health, environmental protection, and energy-saving technologies (such as energy-saving control, integrated innovation, testing, and Physical simulation, etc.)

The virtual simulation laboratory of port logistics is divided into three levels. The first level is limited and open. Limit the time and location of experimental projects, such as have been discharged into the experimental teaching task list must do or choose to do experimental projects; the second level, appointment opening. Restricted locations, experimental projects that can be scheduled, such as software or systems with commercial use (license protection), and hardware-in-the-loop simulation systems that are open to purchase inside and outside schools; the third level is completely open. There is no time and the site's experimental projects limit, full open 7×24 online, students can use unlimited virtual simulation experiment resources free of charge.

C Construction of Experimental Teaching Resources

In the process of improving the experimental teaching system, for existing experimental courses, combined with the content of the repeat each other, keeping relatively independent content, increase reflects the academic frontiers of knowledge, the experiment project according to the functional division of modern port logistics management in virtual simulation experiment teaching platform, virtual simulation experiment teaching of modern port logistics information platform, virtual simulation experiment teaching of modern port logistics equipment comprehensive experimental platform and modern port logistics base. Make full use of virtual reality, multimedia, interactive, system simulation and other modern information technology, in order to "to be real is not empty, bricks, complement each other" for the construction of ideas, to build the virtual simulation environment of logistics system, enables the student to engage in the logistics system by means of flexible man-machine interaction in the planning, design, management and operation, to enhance students' learning interest, improve the effect of experiment teaching, as shown in “ Fig. 2”.

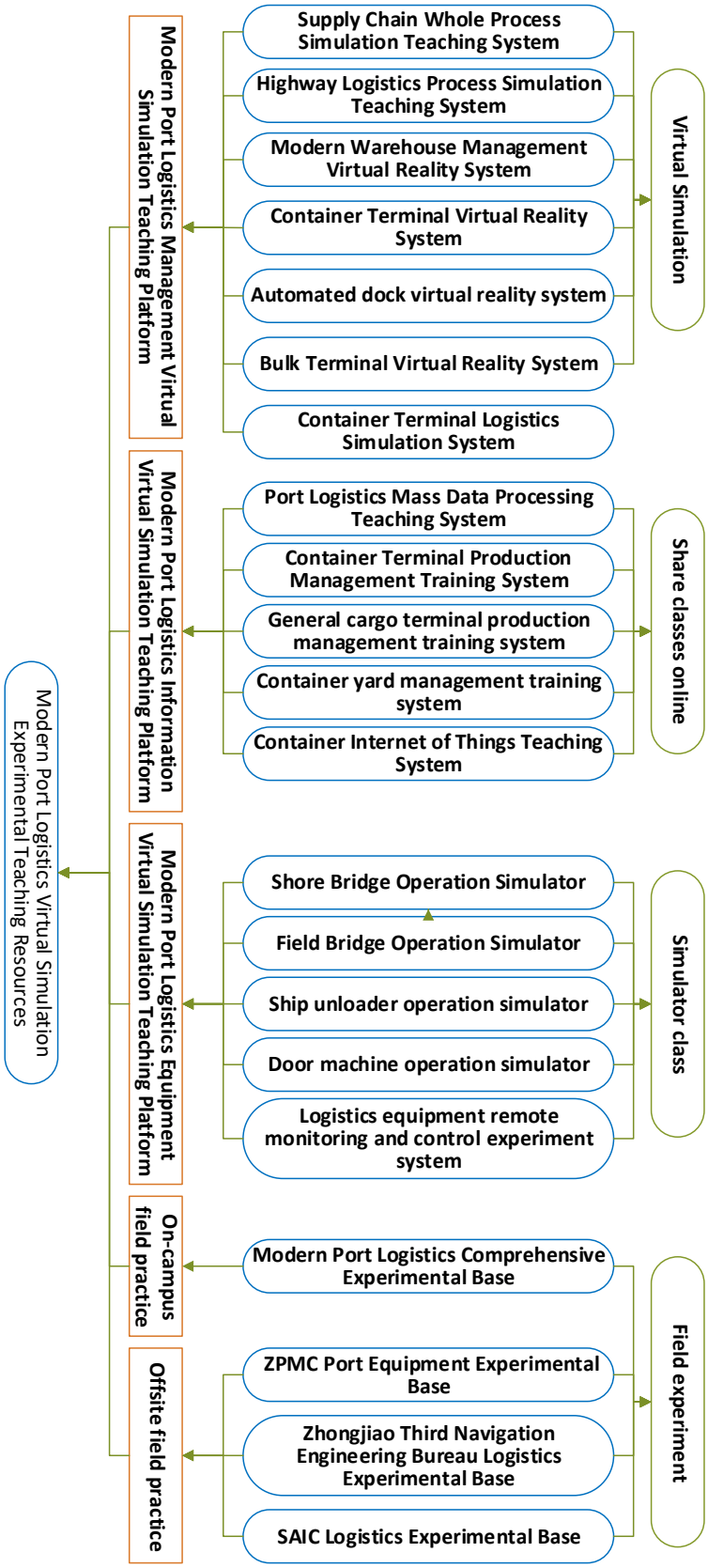

Figure 2. Virtual simulation experiment teaching resources of port logistics

IV. Conclusion

Relying on the discipline advantage of Shanghai University High School and emphasis subjects in Shanghai, which consist of Management Science and Engineering (Logistics Engineering and Management) and emphasis subjects of Logistics Engineering. In addition, Management Port Machinery Electronic

Engineering is also included to flourish the teaching content of virtual simulation experiment through high-level scientific research achievements. According to the teaching philosophy of Shanghai Maritime University, focusing on the application of personnel training, taking demand as a guide and innovation as the core, establishing an experimental and practical teaching system that meets the needs of high-quality personnel training. The experimental teaching concept is formatted by a mass of experimental teaching practices along many years. The concept is that focus on the demand of enterprises, take students as the main body and virtual simulation experiment teaching as the carrier, paying more attention on cultivating students' exploration spirit, scientific thinking, practical ability and innovation ability, and cultivating outstanding talents whose combination of application, innovation and international engineering and management. Moreover, more than 100 national or Shanghai science and technology innovation projects completed or in progress in terms of college students' innovative ability, similarly, a number of various types of awards received by students.

This paper aims at the industry characteristics of modern port logistics related professions and aims at innovation ability training. Using virtual simulation technology such as virtual reality to discuss the system's virtual simulation resources construction method. It is an active exploration of laboratory management and experimental teaching.

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