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Exploration of the Curriculum Reform of "Logistics System Simulation" Based on Chinese-foreign Cooperation in Running Schools

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Abstract: *Faced with the requirements of curriculum reform in Chinese-foreign cooperation in running schools, this article explores the reform of the compulsory courses "Logistics System Simulation" for logistics engineering majors. Based on the OBE (Outcome based education) education philosophy, with students as the center, specific goals are proposed for course learning in terms of knowledge, application, integration, emotion, value and learning. Then, teaching contents are designed and teaching methods are studied. Finally, course assessment is explored.*

Keywords: *Logistics System Simulation, Curriculum Reform, Chinese-foreign Cooperation, Student-centered*

1. Introduction

Logistics system simulation is a compulsory course for logistics engineering majors and an important practical course. The construction goal of the course is to apply logistics system simulation technology to the field of modern logistics, use relevant computational simulation software to scientifically plan and design actual logistics systems, so as to achieve good operational control of logistics systems and allocation of logistics resources, thereby promoting the optimization of logistics systems and providing good decision-making for the operation of actual logistics systems. The focus of the course is to cultivate students' ability to comprehensively apply the professional knowledge they have learned, and to proficiently master a certain logistics system simulation tool to solve and optimize logistics problems. The course is a comprehensive course that combines theory and practice.

In order to meet the needs of the internationalization development trend of higher education, Joint Jiaotong College of Beijing Union University at Beijing United University and the School of Management and Digital Technology at Russian University of Transport, have jointly conducted in-depth cooperation in Sino Russian cooperative education, and conducted beneficial exploration and practice in the construction of professional courses. Based on the teaching characteristics of our school's logistics engineering major, we have expanded the channels for course exchange, adhered to the combination of internationalization and localization, and conducted relevant reform explorations on the "logistics system simulation" course.

2. Course Introduction and Pre Reform Status

2.1. Course Introduction

The course 'Logistics System Simulation' is a compulsory course in logistics engineering (joint cultivation by China and Russia). Logistics System Simulation mainly explains how to use logistics system simulation software to simulate basic logistics systems. Through the training of the course, students can master the application of relevant logistics simulation software and be able to apply logistics simulation technology to analyze and simulate basic logistics systems, thereby solving professional related problems. The course of 'Logistics System Simulation' combining theory with practice is an important practical course. This course requires students to have theoretical knowledge

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related to advanced mathematics, probability theory, and statistics, professional knowledge in logistics engineering, good computer operation and object-oriented programming skills. By learning and practicing logistics system simulation knowledge, as well as using simulation software, a solid foundation is laid for future graduation projects and solving practical logistics problems.

In recent years, domestic scholars have reformed and practiced teaching modes and methods for courses such as "Logistics System Simulation" based on OBE concepts, online and offline technologies, curriculum ideology, and reverse classroom methods, achieving significant results. Zhao et al. (2023) [1]explored the blended teaching mode and assessment system for the "Logistics System Simulation" course, summarized the advantages and disadvantages of online teaching and traditional offline classroom teaching, and proposed a blended teaching mode of "one center, two dimensions, and three scenarios", which improved the quality of applied talent cultivation. Wang et al. (2023) [2]constructed a curriculum teaching reform framework based on the OBE-CDIO concept in the face of new requirements for curriculum teaching reform, and practiced the logistics system simulation and optimization course, achieving good results. Li et al. (2022)[3] used OBE theory to explore the optimization of teaching design for the course "Physical System Simulation and Application". This optimization can fully consider students' progress and learning achievements, and help improve the practicality of the course and students' sense of gain. Mao et al. (2021) [4] analyzed the characteristics of the "Manufacturing and Logistics System Simulation" course and explored the application and practical solutions of blended teaching in the "Manufacturing and Logistics System Simulation" course, providing new ideas for teaching improvement. Zhang et al. (2020)[5] designed a logistics system simulation practice platform to address the main problems currently existing in the teaching process of the "Logistics System Simulation Experiment" course, based on practical platforms from the perspectives of teaching objectives, teaching content, teaching methods, and assessment forms, which was not only meets the requirement of "no suspension of classes", but also saves teaching space and funds, furthermore comprehensively improves students' practical abilities.

2.2. Pre Reform Status

Since 2020, our college has been recruiting students majoring in Logistics Engineering ((joint cultivation by China and Russia). The main target audience for the course is students majoring in Logistics Engineering in Sino Russian Cooperative Education. Due to the different requirements of the course system and student needs, the course needs to place special emphasis on practical teaching. At the same time, in order to meet the requirements of Sino Russian cooperation in education, it is necessary to choose logistics simulation software that can be shared by both the Russian and Chinese sides as much as possible, which can facilitate students' graduation design or participation in engineering practice in the later stage. At present, nearly 100 students in this major have already studied this course in two sessions, which means that the teacher has conducted two rounds of course teaching. During the teaching process, the Anylogic simulation software that can be used by both China and Russia has been selected, and new textbooks have been adopted. During the teaching process, emphasis has been placed on strengthening practical teaching. However, currently, the development of teaching cases is insufficient, and the course hours are limited. How to enable students to achieve significant improvement in practical abilities within limited academic hours is a problem that needs to be addressed in this curriculum reform.

3. Exploration of Curriculum Reform

The logistics engineering is an industry oriented towards global supply chains. Joint Jiaotong College of Beijing Union University and the School of Management and Digital Technology at Russian University of Transport jointly cultivate versatile talents with the ability to plan and design digital supply chains and intelligent logistics systems, international communication skills and scientific innovation literacy, and serve national industrial construction. Logistics system simulation, as an important course in smart logistics systems, has undergone relevant reforms in accordance with the requirements and characteristics of both sides. The scheme of overall design of the course is shown in Figure 1.

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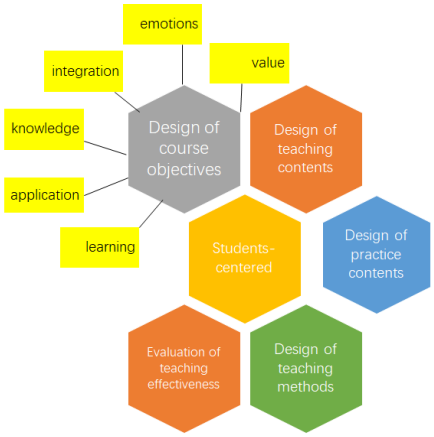

Figure 1: The scheme of overall design

3.1. Specific Course Objectives

In the course, the concept of OBE is combined to propose relevant goals for students' learning in terms of knowledge, application, integration, emotion, value, and learning. Through the learning of this course, students can achieve the following goals:

(1) In terms of knowledge, it is necessary for students to master the basic theory of system simulation, understand the practical application of logistics system simulation theory and methods in logistics systems, and master the basic operations of Anylogic simulation software. Possess the ability to simulate and model basic logistics problems, and cultivate students' ability to analyze and solve specific logistics systems.

(2) In terms of application, students should possess the ability to model, simulate, and apply various basic logistics systems, possess innovative awareness, and accumulate experience and skills for subsequent supply chain system simulation comprehensive design courses.

(3) In terms of integration, students can combine relevant professional knowledge and integrate the basic theory of logistics system simulation to model and simulate basic practical logistics problems.

(4) In terms of emotions, students can recognize the importance of team learning and cooperation, fully communicate and discuss, cooperate closely during the execution of projects and tasks, cooperate with each other to showcase and defend results, and appropriately express support and gratitude.

(5) In terms of value, students have a certain national perspective and can understand and abide by professional ethics and norms in system simulation practical teaching, and fulfill their responsibilities.

(6) In terms of learning, students can utilize online and offline learning resources for course learning, and has a certain ability to use modern information technology to acquire knowledge. Students develop the habit and awareness of using various online and offline resources for autonomous learning before and after class, and have the ability to learn independently.

We have integrated the relationship between course objectives and graduation requirements. The goal requirements in terms of knowledge support the professional basic knowledge and abilities in logistics system planning and design, intelligent logistics information technology application, which are included in the graduation requirements. In terms of application goals, it supports the ability to apply logistics system optimization and control theory in modern industrial chains, carry out logistics infrastructure planning and design, logistics information technology application, and logistics facility operation management. In terms of value, it supports the need for a certain international perspective and cross-cultural communication ability, as well as the ability to use modern information technology to acquire knowledge. In terms of situation, it supports a certain level of organizational management ability, strong expression and interpersonal skills, as well as team cooperation ability. In terms of learning, it supports the ability to have comprehensive applied knowledge, including practical analysis ability, comprehensive experimental ability, engineering practice ability, and engineering comprehensive ability. At the same time, it has the awareness of independent learning and lifelong learning, and the ability to learn improperly and adapt to development.

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3.2. Course Content Arrangement

In the teaching arrangement, we have adopted a project-based teaching approach to arrange the relevant course content. At the same time, the course is arranged in the logistics engineering laboratory, allowing students to learn while operating. Additionally, course materials, after-school exercises, and assignments are used to help students master the relevant simulation software and achieve the goal of logistics system simulation teaching.

To the simulation software, we used Anylogic simulation software [6]. AnyLogic simulation software is a widely used software tool that supports discrete event systems, system dynamics, multi-agent and multi method integrated modeling and simulation. Its application fields include logistics, supply chain, manufacturing, transportation, pedestrian evacuation, urban planning and architectural design, urban development, ecological environment, economics, business processes, service systems, emergency management, GIS information, public policies, ports and airports, disease spread, etc. AnyLogic is an original simulation software based on the latest complex system design methodology. It is the first tool to introduce UML language into the field of model simulation and the only commercial software that supports mixed state machines, which can effectively describe discrete and continuous behavior languages. With AnyLogic, users do not need to learn any additional languages. All modeling techniques of AnyLogic are based on UML-RT, Java, and differential equations, which are currently familiar to most users. AnyLogic also provides a series of professional libraries for different fields, allowing users to build simulation models using what you see is what you get.

We have mainly designed the following practice contents: Project 1 is an introduction to complex system simulation, Project 2 is an introduction to Anylogic simulation software, Project 3 is multi-agent Anylogic simulation and practice, Project 4 is discrete event system simulation and practice, Project 5 is system dynamics AnyLogic simulation and practice, Project 6 is AnyLogic multi method integration, Project 7 is Anylogic simulation advancement, Project 8 is Anylogic production logistics system simulation, Project 9 is the analysis and system practice of Anylogic simulation methods, Project 10 is the logistics system of Anylogic simulation distribution center, and Project 11 is the extension of relevant knowledge. In the teaching process, we adopted the methods of case teaching, project driven, interactive teaching, online and offline teaching, after-school practice and practice, as well as communication and discussion. In the design of teaching cases, we designed queuing models, system dynamics, intelligent agent modeling, GIS supply chain distribution, processing workshop models, warehouse internal loading and unloading and handling models, road traffic and rail transit models, warehouse simulation models, and pedestrian depots and other simulation model cases to help students quickly master relevant project teaching and software operation.

3.3. Exploration of Course Teaching Methods

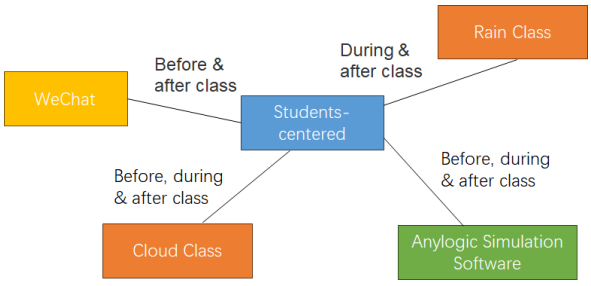

Figure 2: The overall framework of teaching

The logistics system simulation adopts the blended teaching mode which is online and offline teaching. Taking students as the center, the tools of WeChat, cloud class, and rain class are used online to help students learn before, during and after class. In class, teaching in computer laboratory is mainly based on the Anylogic simulation software platform, and the overall framework is shown in Figure 2. WeChat mainly provides notification and Q&A to students before and after class, emphasizing personalized teaching. For example, homework and task requirements will be notified in the WeChat group, and students will have their own questions answered one-on-one through WeChat private messages. Cloud class is mainly used to release some reference materials before class, record students' attendance during class, give exercises to students for participating in to evaluate their practice grades in class, and assign relevant assignments and activities for students to complete after class for

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evaluating their homework grades. The Rain Class platform is mainly used to assign tests during and after class to measure students' mastery of knowledge. In addition, students are required to use Anylogic simulation software for modeling, design and simulation before, during and after class.

The following methods are mainly used throughout the entire teaching process:

Through classroom teaching, case teaching, project driven teaching methods, and other teaching methods, the focus is on enabling students to use the basic theories and steps of logistics system simulation taught earlier to model, analyze, and simulate practical problems.

Through classroom practice and completing the practical assignments, students can draw inferences from one example, apply what they have learned, and develop practical abilities.

Through group collaborative learning and communication and discussion, this study builds the sense of teamwork and cultivates the ability of effective thinking and communication.

Through autonomous learning and data retrieval, this study cultivates the awareness of autonomous learning and the habit of using information technology to learn, and carries out mixed online and offline teaching.

Emphasis was placed on blended online and offline teaching in teaching. By combining the advantages and characteristics of the "online & offline" approach, students can gradually learn from the shallow to the deep, and use the theoretical knowledge they have learned to achieve practical transformation and application of inferences. In the teaching process, it is necessary to cultivate students' abilities to discover, analyze, and solve problems. By utilizing online platforms such as cloud class and rain classrooms on campus, students are guided to use their learned logistics expertise to think about the essence and solutions of problems during the teaching process, starting from actual logistics problems and bottlenecks. Simulation optimization methods are used to transform actual problems into models, and model optimization is used to analyze and optimize the actual system. In practice, it is particularly important to emphasize the combination of theory and practice, so that students can achieve practical and practical abilities. Teachers should pay attention to understanding students' mastery and application of previous knowledge, and can design methods such as online sharing of learning resources and online testing. In the teaching design, attention should also be paid to training students' ability to process data. It is necessary to combine the theoretical knowledge of simulation to enable students to understand the important role of data analysis such as original data collection, simulation result analysis, etc. Students' achievements can be displayed through discussion posts or forums, and online communication and offline practical operation can be carried out for problems encountered to help students master the essence of system simulation. Teachers should engage in interactive communication with students through multiple channels, both online and offline, in order to gain a more comprehensive understanding of their mastery. In teaching design, students' ability to collaborate as a team can be strengthened through group collaboration, communication and cooperation, allowing them to deeply appreciate the importance of teamwork.

3.4. Course Assessment

Course assessment is a powerful promotion of teaching mode and learning effectiveness. Combining teaching content and methods, it is crucial to assess the effectiveness of students' process-based learning. In terms of quantitative evaluation, it is necessary to fully consider students' daily performance, including attendance, participation, and presentation of exercises and assignments, so that both students' learning and teachers' teaching have a digital experience of results. The learning trajectory of students is reflected in platforms such as BB online schools, cloud classes, and rain classes used, making it easier to objectively consider students' learning process. The course grades are mainly evaluated comprehensively based on their usual grades and final assignments, accounting for 70% and 30% respectively. The usual grades consist of attendance and performance (accounting for 20% of the usual grades), and homework (accounting for 50% of the usual grades).

At the end of the practical phase of the course, the experimental defense demonstration phase and the evaluation of the experimental report are completed. This study requires one or more students to work in groups to complete large assignments and lab reports. The presentation and defense of the report should be conducted in small groups during class, and students' mastery of the course objectives should be assessed based on specific criteria for evaluation elements, including experimental reports, communication and expression, and questions. The specific requirements for evaluation elements are shown in the table shown as Table 1.

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Table 1: The specific requirements for evaluation

Assessment element	Weight	90-100 score	80-90 score	70-80 score	60-70 score	Below 60 score
Experimental report	50%	The argument is clear, the structure is complete, the logic is clear, the evidence is rich, and there is innovation	The argument is relatively clear, the structure is complete, the logic is correct, and the evidence is relatively rich	The argument is partially clear, the structure is acceptable, the logic needs to be strengthened, and the argument is average	Unclear, lack of architecture, poor logic, and average arguments	Unable to explain any issues
Communication and expression	30%	Fluent expression, accurate wording, logical approach, and appropriate speed	Express fluently, use words accurately, logically, and with appropriate speed	Express fluently, use words carefully, strengthen logic, and speed appropriately	Insufficient fluency in expression, inaccurate wording, and poor logic	Not clearly expressed
Question answering	20%	Able to accurately answer all questions and act gracefully and gracefully	Able to answer all questions accurately and behave appropriately with a large demeanor	Able to answer basic questions, but unable to delve deeper, with average behavior	Can only answer simple questions and exhibit irregular behavior	Unable to answer relevant questions, unreasonable etiquette

3.5. Reflections on the Integration of Ideological and Political Education in Curriculum

Educators receive education first, and curriculum reform poses new challenges for teachers. Teachers need to learn more and explore how to use online platforms, instructional design, and teaching methods to organize online teaching of courses. Teachers are the first responsible person for classroom management[7]. They should take every course seriously, treat every classmate seriously, not only impart knowledge to them, but also help them establish correct worldviews, life views, and values. This is also an important component of curriculum ideology. every classmate seriously, not only impart knowledge to them, but also help them establish correct worldviews, life views, and values. This is also an important component of curriculum ideology[8].

Design ideologic and political elements for each knowledge point and integrate them into the teaching process of each class. Combining online and offline teaching, in addition to teachers emphasizing the introduction of curriculum ideological and political education, students are also involved in curriculum ideological and political discussions. In the logistics system simulation course, students were assigned relevant discussion topics to collect cutting-edge simulation development and excellent achievements in the field of simulation in China. The students actively demonstrated and shared the simulation models based on the competitions they participated in. Some students shared simulations of advanced domestic distribution enterprises, and some collected simulations related to the current epidemic. By learning from each other and praising each other, not only did we learn more knowledge, but we also gained new improvements in our ideological understanding[9].

Starting from the construction of urban and applied university, adhering to the school motto of " learning for practice", we are committed to cultivating applied talents. During the teaching process, practical cases are cited to inspire thinking and stimulate learning motivation of students. Educators should receive education first, and infect students with their noble moral character, excellent professional skills, and selfless dedication to their work. Being a role model and teaching by example can serve as a good example[10-12].

4. Conclusion

Chinese-foreign cooperation in running schools is of great significance for the development of higher education in China. In this context, how to design courses that conform to the characteristics of cooperative education on the basis of existing courses is also an important research direction. This article explores the reform of the logistics system simulation course based on the logistics engineering major. Mainly targeting the situation of students, based on the concept of OBE and curriculum teaching reform ideas, a student-centered curriculum reform approach has been explored.

In teaching, the blended online and offline teaching method was adopted, exploring and practicing the organization of the course before, during and after class, the integration of ideological and political education into courses, and the used of online teaching platforms and simulation software. Before class, students' preparation is very important. Classroom time is limited, and how to make full use of the time in class to complete relevant teaching content is inseparable from students' pre class preparation. Before class, teachers need to spend time carefully on preparing and designing rich course resources

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and various activities in class, and arranging pre class previews for students. During class, student-centered teaching is adopted to encourage students to think more, ask more questions, and communicate more. How to test the effectiveness of students' pre class preparation, how to improve students' enthusiasm for participating in the classroom, and how to establish an effective online learning evaluation system are worthy of in-depth research. After class, verify students' mastery of knowledge and provide personalized tutoring. How to consolidate the knowledge learned by classmates after class, as well as the methods of individualized tutoring, also requires in-depth consideration. Teachers need to design and evaluate homework, discussions, and exercises after class. In daily teaching, efforts should be made to consider how to fully integrate the "salt" of ideological and political education into the "soup" of professional education, so that students can not only learn professional theoretical knowledge, but also develop and shape their outlook on life and values fully and reasonably.

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