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THE CONSTRUCTION OF PRACTICE TEACHING IN PRINCIPLES OF URBAN PLANNING COURSE

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Abstract: Under the background of integration of specialization and creation, the practical teaching of Principles of Urban Planning is reformed and explored based on the CDIO concept in the Human Geography and Urban and Rural Planning Program of Xinjiang Normal University as an example. We reconstructed the four-in-one curriculum system of "theory+ practice+ innovation+ ideological and political education" and designed the practical teaching framework and cases based on CDIO concept. The teaching practice has achieved the results of improving students' ability and the effectiveness of course construction, but it also faces some challenges. In the future, we will continue to optimize the teaching mode in order to cultivate high-quality urban planning professionals.
Keywords: Principles of urban planning; Curriculum construction; Practical teaching; CDIO concepts

1 INTRODUCTION

Principles of Urban Planning, as a core course in the specialty of human geography and urban and rural planning, is the cornerstone for constructing students' knowledge system of urban and rural planning[1]. Under the strong impetus of the trend of specialized and creative fusion education, the traditional teaching mode has been difficult to meet the needs of cultivating innovative and practical talents, and the reform of the practical teaching of the course has become imperative[2-4].

Based on the human geography and urban-rural planning major of Xinjiang Normal University, this study introduces the concept of CDIO (Conceive-Design-Implement-Operate) engineering education[5], and devotes itself to reconstructing the curriculum system of Principles of Urban Planning, exploring effective practical teaching methods, and deeply integrating innovation and entrepreneurship education with the practical teaching of the curriculum, so that the students The students can apply theoretical knowledge in real project situations, enhance their ability to solve real urban problems, and promote the comprehensive development of their comprehensive literacy[6-7].

2 RECONSTRUCTION OF CURRICULUM SYSTEM

Integrate innovation and entrepreneurship education into the Principles of Urban Planning course, and construct a four-in-one curriculum system of "theory + practice + innovation + ideological and political education ".

2.1 Basic Theory Module

Diversified teaching methods, such as classroom lectures, literature reading, case studies and project-driven teaching, are adopted to help students master the basic principles and framework of urban planning. Taking the project of urban historical and cultural district protection planning as an example, the theoretical teaching covers various aspects and lays the foundation for practical operation.

2.2 Practical Skills Module

Through experimental courses, practical projects and software operation training, students' practical skills are effectively enhanced. In the practice of urban historical and cultural neighborhood conservation planning projects, students use various technologies to obtain spatial data, analyze and present the planning scheme, so that they can master the key skills of data processing and expression of results.

2.3 Frontier Topics Module

Organize classroom discussions, group research and case study activities to guide students to pay close attention to industry dynamics. For example, discussing the impact of big data analysis on the planning decisions of historical and cultural neighborhoods, analyzing the application of innovative technologies in successful cases at home and abroad, broadening students' professional horizons, understanding the cutting-edge trends of the industry, and providing theoretical foundations and technical reserves for innovation.

2.4 Ideological and Political Education & Integration of Specialty and Innovation Module

Organically integrate the elements of ideology and politics and innovation and entrepreneurship education into the curriculum. In the historical and cultural neighborhood protection planning project, students are guided to think about its significance to cultural heritage and social stability, encouraged to propose innovative business models combining cultural and creative industries, emphasized to follow the principles of scientific and sustainable development, and cultivated correct values and professional views.

3 CONCEPTUALIZATION OF THE PRACTICAL TEACHING FRAMEWORK BASED ON THE CDIO CONCEPT

In order to better combine theoretical knowledge with practical operation, actual urban planning projects are introduced, and project-driven teaching guides students to carry out full-scale practical activities in an orderly manner according to the CDIO concept.

3.1 Conceive Stage

Focusing on the hot topics of urban development, the design theme stimulates students' interest and social responsibility. For example, for the transformation of old neighborhoods in the city, students are guided to go deep into the community to find out the problems, so as to provide a context for the subsequent design.

3.2 Design Stage

Students are organized into groups to collaborate, formulate planning schemes combining course knowledge and ideological and political requirements, encourage innovative thinking, and comprehensively consider various factors. For instance, in the design of old residential quarter renovation, factors such as residents' needs, cultural inheritance, and environmental friendliness are taken into account.

3.3 Implement Stage

Organize field research for students to collect data, verify and improve the preliminary plan. Adopt innovative practice methods, such as public participatory planning, to improve the scientific and democratic nature of the program.

3.4 Operate Stage

Use advanced technology to simulate the implementation process and impact of the program, and develop students' ability of prediction and evaluation. Students present the results in various forms and receive comments, and think about the social value of the program.

3.5 Reflect and Improve

Establish a feedback mechanism to assess and summarize the results of the program from multiple dimensions. Organize students to share their experiences and adjust and optimize the teaching content and methods according to the feedback.

4 DESIGN OF PRACTICAL TEACHING ACTIVITIES BASED ON THE CDIO CONCEPT

Starting from the conception phase, innovative urban planning solutions are proposed for specific urban spatial issues, thus forming preliminary design schemes.

4.1 A Case Study on "Current Situation Investigation of Urban Functional Zoning and Land Use Selection"

4.1.1 Conceive stage

(1) Theme Determination: The theme of "Analyzing the current situation of urban functional zoning and land use selection, and optimizing urban spatial layout" is clarified, with focuses on the rationality of urban spatial structure, land use efficiency, coordination between industrial layout and functional zoning, and ecological environment protection.
(2) Problem Analysis: Students are organized into groups to conduct in-depth investigations in various urban areas, aiming to identify problems in functional zoning and land use selection, such as the concentration of functions in urban central areas, inappropriate separation between industrial and residential areas, inadequate supporting facilities in residential areas, and the existence of idle or inefficiently used land.
(3) Goal Setting: To cultivate students' abilities in comprehensive application of interdisciplinary knowledge, investigation and research, innovative thinking, teamwork, and communication.

4.1.2 Design stage

(1) Theoretical Learning: In-depth study is conducted on urban planning-related theories and technologies, including functional zoning theory, principles of land use planning, and GIS applications. Students are required to understand the characteristics, formation mechanisms, and development laws of different functional zones, and master methods such as land suitability evaluation and land use efficiency assessment, so as to provide theoretical support for field investigations and data analysis.
(2) Field Research: A combination of multiple research methods is adopted. On-site surveys are carried out in different urban functional zones to observe the current situation of land use, building types and distribution, transportation facilities, and environmental quality. Scientific and reasonable questionnaires are designed to investigate different groups regarding their satisfaction with functional zoning, land use needs, and expectations for urban development. Interviews are conducted with relevant departments, enterprise representatives, and community residents to obtain first-hand information, including urban planning policies, land transfer information, enterprise development plans, and residents' living demands. Remote sensing images and GIS technology are used to acquire basic data such as urban topography, land cover types, and transportation networks. Detailed maps of the current situation of urban functional zoning and land use selection are drawn to provide an accurate data basis for subsequent analysis.
(3) Conceptual Design: Based on the research results and theoretical knowledge, group brainstorming is carried out to conceive an analysis framework and preliminary optimization ideas for the current situation of urban functional zoning and land use selection. Combined with the urban development orientation and goals, innovative investigation and analysis perspectives and potential solutions are proposed. Preliminary conceptual maps are drawn to show the current situation of urban functional zoning, characteristics of land use selection, spatial distribution of existing problems, as well as preliminary optimization directions and ideas.

4.1.3 Implement stage

(1) Detailed Design: Professional software is used for in-depth analysis and data processing. The economic, social, and environmental benefits of different functional zones and land use types are evaluated, the causes of problems in functional zoning and land use selection are analyzed, and optimization suggestions are put forward, including functional zone adjustment, land replacement, and development intensity control.
(2) Simulation and Demonstration: Simulation software or physical models are used to simulate the urban operation status. By simulating processes such as traffic flow, population distribution changes, industrial development trends, and ecological environment evolution, the problems and impacts of urban spatial layout are demonstrated. Based on the simulation results, the conclusions of the current situation investigation and analysis are verified and improved to provide a basis for optimization schemes.
(3) Expert Consultation: Experts from multiple fields are invited to form a team to review the current situation investigation results and optimization suggestions. Students revise and improve the results according to the experts' opinions to ensure the professionalism and practicability of the outcomes.

4.1.4 Operate stage

(1) Achievement Display and Communication: The investigation results are displayed to all sectors of society through various forms to promote communication and cooperation between the government, academia, and the public, and to collect opinions and suggestions from all parties.
(2) Simulation Implementation: VR or AR technology is used to simulate the implementation process and possible effects of the optimization scheme for urban functional zoning and land use selection, evaluate the feasibility and effectiveness of the scheme, and collect feedback to provide a basis for the dynamic adjustment of the scheme.

4.1.5 Reflect and improve

(1) Feedback Integration: Feedback information from all parties is collected, the advantages and disadvantages of the research results are sorted out and summarized, and the key factors and difficult problems affecting the optimization of functional zoning and land use selection are clarified.
(2) Reflection and Summary: Students are guided to write practical summary reports, reflect on their personal growth and team collaboration processes, provide references for subsequent learning and practice, and put forward suggestions for teaching improvement.

4.2 A Case Study on "Campus Master Plan Design"

4.2.1 Conceive stage

(1) Theme Determination: The theme of "Creating a campus master plan with complete functions, beautiful environment, and rich cultural characteristics" is focused on, with emphasis on teaching and research needs, convenience of students' life, inheritance and innovation of campus culture, and ecological environment protection.
(2) Problem Analysis: Students are organized to conduct a comprehensive survey of the campus, and problems are sorted out, such as the long distance between teaching and living areas, chaotic traffic flow, insufficient public activity space, lack of distinctive landscapes, and irrational building functional layout that cannot meet the needs of modern education and teaching.
(3) Goal Setting: To cultivate students' ability to solve practical campus problems using urban planning principles, stimulate their innovative thinking, improve their teamwork and communication skills, and provide planning suggestions for campus construction.

4.2.2 Design stage

(1) Theoretical Learning: In-depth study is conducted on knowledge related to campus planning and design, and students are required to fully master the principles of campus functional zoning, building layout requirements, traffic organization methods, landscape creation techniques, and ecological sustainable development strategies to lay a theoretical foundation for scheme design.
(2) Field Research: Campus information is obtained through multiple methods such as field measurement, questionnaire survey, and interviews with teachers and students. Basic data are measured, teachers' and students' satisfaction with the current campus layout, expectations for future campus construction, and actual needs in daily study and life are collected, and the school's development plan, characteristics of teaching and research activities, and needs of student associations are understood. A detailed campus current situation map is drawn, covering building distribution, traffic flow, green space system, and public facility distribution, to provide data support for design.
(3) Conceptual Design: Based on the research results and theoretical knowledge, group discussions are held to conceive the design concept and framework of the campus master plan. Combined with the school's historical and cultural traditions, disciplinary characteristics, and future development direction, innovative ideas are put forward. Preliminary conceptual design sketches are drawn to show the overall ideas of campus functional zoning, building group layout, transportation network planning, and landscape space creation.

4.2.3 Implement stage

(1) Detailed Design: Professional design software is used for scheme design. According to the school's scale and development needs, the layout of buildings and functional areas is reasonably determined, spatial relationships are optimized, and transportation systems are designed. Combined with campus cultural characteristics and landscape resources, landscape node design and greening system planning are carried out, with consideration of ecological and environmental protection factors.
(2) Simulation and Demonstration: VR technology or models are used to simulate the actual operation of the campus under different master plans, experience the spatial environment, evaluate the rationality of different traffic organization schemes, test the scientificity of functional zoning layout, and optimize landscape design schemes. Problems and deficiencies in the scheme are identified based on simulation results to provide a basis for optimization.
(3) Expert Consultation: Experts from multiple fields are invited to review the scheme. Experts put forward opinions and suggestions from multiple dimensions, and students revise and improve the scheme accordingly to ensure its feasibility.

4.2.4 Operate stage

(1) Achievement Display and Communication: Design results are displayed to all parties of the school through various forms, opinions and suggestions are widely listened to, and the scheme is optimized.
(2) Simulation Implementation: Digital simulation technology or sand table models are used to simulate the implementation process of the campus master plan and the actual operation status after completion, evaluate the impact of the scheme on existing campus infrastructure during implementation, predict possible problems and challenges, and formulate response measures to provide suggestions for the sustainable development of the campus.

4.2.5 Reflect and improve

(1) Feedback Integration: Feedback information from all parties is collected, the advantages and disadvantages of the scheme are analyzed and summarized, and the key factors affecting the implementation effect are clarified.
(2) Reflection and Summary: Students are guided to write practical summary reports, reflect on their personal growth and team collaboration processes, provide references for subsequent learning and practice, and put forward suggestions for teaching improvement.

5 EFFECT OF PRACTICE TEACHING BASED ON THE CDIO CONCEPT

5.1 Improvement of Students' Abilities

5.1.1 Enhancement of professional skills

Through participation in practical projects and case studies, students have accumulated rich practical experience, and their professional skills in the application of urban planning principles, operation of planning and design software, field research, and data analysis have been significantly improved. For example, in the urban historical and cultural block protection planning project, students proficiently mastered historical building surveying and mapping technology, used total stations and other equipment to accurately measure building dimensions and spatial relationships; through GIS spatial analysis, they deeply explored the spatial characteristics and historical and cultural value of the block; and used CAD drawing software to carefully draw detailed planning drawings, accurately evaluate the protection value of the block, and formulate reasonable planning strategies.

5.1.2 Stimulation of innovative thinking

Innovative practical activities and diversified teaching models have effectively stimulated students' innovative thinking. In the campus master plan project, students put forward many innovative ideas, such as an intelligent building management system under the concept of a smart campus to realize efficient energy utilization and intelligent control of campus buildings; an ecological wetland purification system under the concept of an ecological campus to treat campus

sewage and create ecological landscapes; and a campus cultural exhibition corridor under the concept of a cultural campus to display the school's historical culture and teachers' and students' artworks. These innovative ideas are skillfully integrated into the planning scheme to improve the campus quality.

5.1.3 Improvement of teamwork and communication skills

Project-driven teaching and group cooperative learning have cultivated students' good teamwork and communication skills. In the urban new district traffic planning project, students divided labor and cooperated: traffic engineers were responsible for traffic flow analysis and road design; geographic information experts used GIS technology for spatial analysis and data processing; environmental experts evaluated the impact of traffic planning on the environment. Students with different professional backgrounds cooperated and complemented each other to complete the planning task, effectively improving teamwork efficiency. Meanwhile, students' communication skills were exercised in group discussions, exchanges with experts, and presentation of results to the society.

5.2 Achievements in Curriculum Construction

5.2.1 Optimization of curriculum system

The reconstruction of the curriculum system based on the CDIO concept has made the content of the *Principles of Urban Planning* course more diverse and the structure more reasonable. The integration of innovation and entrepreneurship education and curriculum ideological and political education has not only kept the course in line with the times but also enhanced its educational function, realizing the organic unity of knowledge impartment, ability training, and value shaping. For example, integrating innovative cases and entrepreneurial practice requirements into the course content cultivates students' innovative awareness and entrepreneurial spirit; through the infiltration of ideological and political elements, students are guided to establish correct professional ethics and social responsibility.

5.2.2 Innovation of teaching methods

The application of diversified teaching models has enriched teaching methods and significantly improved teaching quality. In the flipped classroom model, students independently learn relevant knowledge and cases before class, enter the classroom with questions and thoughts, and through in-class discussions and teacher's answers, they have a deeper understanding of knowledge and can better apply theoretical knowledge to practice. Project-driven teaching allows students to exercise their abilities in real projects, stimulating their learning interest and initiative.

5.2.3 Expansion of teaching resources

In the process of practical teaching, rich teaching cases, practical project results, and enterprise cooperation resources have been accumulated. These resources provide strong support for curriculum teaching and lay a solid foundation for subsequent teaching reform and curriculum construction. For example, the detailed case materials formed by students in the urban historical and cultural block protection planning project, including research data, planning schemes, and implementation effect evaluation, can be used as vivid teaching cases for subsequent students; carrying out projects in cooperation with enterprises not only provides practical opportunities for students but also enables the school to obtain cutting-edge industry information, promoting the close integration of the curriculum with market demand.

6 CONCLUSION

The practical teaching reform of Principles of Urban Planning based on the concept of CDIO under the background of specialized integration is an important exploration to adapt to the development of the times and improve the quality of talent cultivation. A series of reform measures, such as reconstructing the curriculum system and designing the framework and cases for practical teaching, have achieved remarkable results in the improvement of students' ability and the effectiveness of curriculum construction. However, the reform process still faces some challenges, such as the further optimization of teaching articulation, the deeper integration of cutting-edge technologies and the improvement of the evaluation system. In the future, it is necessary to continue to deepen the reform, constantly optimize the teaching mode, strengthen the cooperation between schools and enterprises, improve the evaluation system, promote teachers to actively carry out teaching research and practical exploration, and make unremitting efforts to cultivate high-quality urban planning professionals.

COMPETING INTERESTS

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