The Interdisciplinary Construction Exploration of Pedagogical Content in the Course Site Design

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Abstract—Through exploring the new challenges posed to the teaching of "Site Design" in the context of urban renewal, rural revitalization, and the era of artificial intelligence, an interdisciplinary construction and exploration of course content was conducted. Utilizing CNKI as a data source, a statistical analysis of keyword co-occurrence frequencies was carried out using knowledge mapping analysis after retrieving relevant discipline content, serving as a crucial reference for adjusting teaching content. The traditional emphasis of the "Site Design" course on design theory and skill fundamentals was shifted, with a renewed focus on repositioning teaching objectives, updating and expanding course content, and rationally allocating practical teaching activities both inside and outside the classroom. This pedagogical reform aims to ensure that students cultivate innovative thinking, logical reasoning, and interdisciplinary knowledge structures and proficiencies through their studies, equipping them to adapt to the novel opportunities and challenges presented in the current era.

Keywords-site design; interdisciplinary; knowledge map; innovative thinking; practical ability

1. INTRODUCTION

As China's construction enters a new stage of urban renewal development, the tasks of old city renovation and stock renewal are becoming increasingly heavy. As a key link in urban renewal and rural revitalization, site design can meet the demand for renewal and promote the sustainable development and transformation and upgrading of urban and rural areas through optimizing spatial layout, improving environmental quality and enhancing functions. At the same time, the rapid development of technology in the era of artificial intelligence(AI) has brought new opportunities and challenges for site design. As AI technology effectively improves the efficiency and precision of site design and realizes more intelligent and personalized design, its application puts forward higher requirements on the professional quality and skills of site practitioners. Therefore, the course of Site Design needs to be constantly updated and improved to adapt to the development trend of the AI era and cultivate talents with innovative thinking and practical ability.

In the age of AI, the knowledge of a single discipline can no longer meet the needs of solving complex problems. The effective addition of interdisciplinary content in the course teaching can enable students to come into contact with a wider range of knowledge, in addition to urban and rural planning, architecture, landscape design, AI and other disciplines, but also to expand to land management, urban management, economics, sociology and other related disciplines[1]. This

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will broaden students' horizons and ideas, and enhance their ability to accurately understand and quickly and rationally solve complex problems in urban renewal construction. The expansion of interdisciplinary teaching content can cultivate students' key comprehensive qualities and abilities required in the era of AI, including innovative thinking, logical thinking, critical thinking, communication and collaboration skills, problem solving skills, etc.

2. The current state of the traditional Site Design course and the main issues

At present, the traditional "Site Design" course focuses on laying a solid foundation of design theory and skills for students, mainly through progressive teaching content and methods such as basic knowledge, case study, special design training to master the site construction conditions analysis, site layout, roads, plazas and parking facilities, vertical layout, landscape layout and site design and other professional knowledge, as well as the necessary creative ability, expression and communication skills in the design work. However, with the rise and application of AI technology and the new demands of urban renewal, the traditional mode can no longer meet the new requirements of the industry for students. Therefore, the current curriculum needs to be adjusted and optimized in a targeted way, so as to promote the improvement of students' multifaceted abilities through the organic integration of more diversified interdisciplinary teaching contents. To this end, a comprehensive restructuring of the "Site Design" course has been carried out, including repositioning the teaching objectives, updating and expanding the teaching contents, as well as rationalizing the allocation of teaching and practicing links inside and outside the classroom, so as to ensure that the cultivated students are not only equipped with the traditional skills, but also possess the innovative thinking, logical thinking, and cross-disciplinary knowledge structure and literacy.

3. An Exploration of the Interdisciplinary Construction of Pedagogical Content in Site Design

The objectives of the course "Site Design" are to cultivate in students the ability to develop a good synergy between technical design and artistic expression, combining proficiency in technical details with a good sense of artistry and aesthetics. Meanwhile, the core elements of creative thinking, design logic and critical thinking skills are cultivated to ensure that students are able to independently think, analyze, evaluate and refine their design proposals, more fully utilize the advantages of the comprehensive interdisciplinary knowledge structure, improve design quality and efficiency.

The teaching objectives of the course are precisely positioned to emphasize the cultivation of students' innovative thinking, design logic, interdisciplinary knowledge and practical application ability while focusing on traditional design theories and skills. Therefore, the organization and reconstruction of the teaching content of the unit is particularly important, and the interdisciplinary cooperation mechanism is established with related disciplines, including urban management, land management, sociology, economics, etc., to carry out teaching and research activities, in order to cultivate students' interdisciplinary thinking and comprehensive problem solving ability; through the introduction of project-based knowledge and practical project cases,

to guide students to combine the knowledge they have learnt with practical problems; and through the introduction of project-based design, to guide students to develop their knowledge and practical application ability. Through the introduction of AI technology-related knowledge and actual project cases, students will be guided to combine what they have learned with practical problems; through the means of project-based hands-on design learning and interdisciplinary competitions, students will be stimulated to be interested and motivated in learning.

3.1. Exploring the construction of interdisciplinary cooperation mechanisms

The construction of an interdisciplinary cooperation mechanism for the teaching of the course "Site Design" helps to integrate the knowledge and viewpoints of different disciplines and provide a more comprehensive and integrated perspective for course. Based on the knowledge of architecture, urban and rural planning, and landscape architecture, site design is also integrated with land management, urban management, sociology, and economics. In order to ensure the comprehensiveness and authenticity of the correspondence analysis between Site Design and related disciplines, the research group based on CNKI, the most comprehensive Chinese academic journal, as the sample data source[2]. On the basis of the search results, the group screened the results manually, excluded the irrelevant objects such as the introduction of the results, newspaper reports, etc., and carried out the statistics and analysis of the frequency of keyword co-occurrence in the way of knowledge mapping analysis, and analyzed the hot trends of the related disciplines in the current academic development through the node coverage, node connection, node highlighting, etc., which is used as an important reference for the course content setting.

3.2. Exploration and Practice of Interdisciplinary Organization of Instructional Content

3.2.1. Site Design and Land Management

Land resources are the basis of site design, involving land use planning, land resource survey and evaluation, etc., which are inseparable from site design. By searching the literature with "urban renewal*land management" as the theme word, and screened the literature from 2020 to 2022, and obtained 207 valid samples, and generated the keyword clustering map (Fig. 1). Through analysis, it is found that the above samples appear more frequently in the fields of land space, urban planning, and urban renewal, with larger centrality values, reflecting a stronger importance in the map, which shows that the knowledge content in the field that is importantly related to the site design in the context of urban renewal.

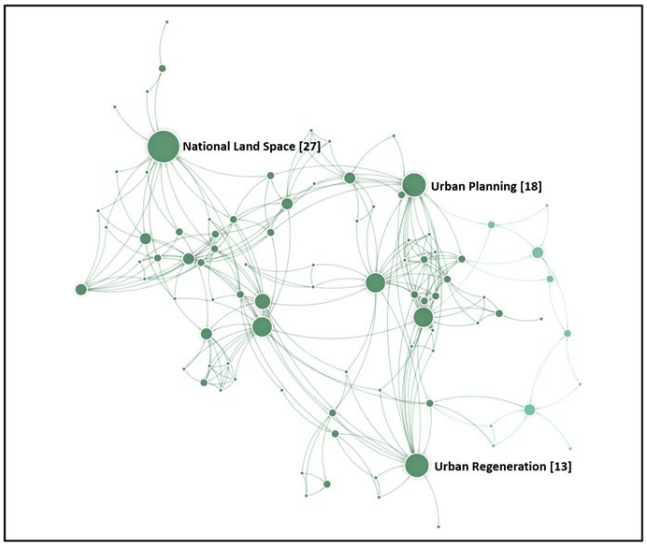

Fig 1 Keyword clustering mapping of urban regeneration research results related to land management, 2020-2022

For this reason, it is important for the course to guide students to understand the basic principles and methods of land management and to apply them to territorial spatial planning, urban planning and urban renewal design. Students can analyze the current land use status and potential of a site, and propose a reasonable land use plan in combination with the urban renewal concept. At the same time, the concept of land resource protection in land management will be incorporated throughout the design of the site to ensure the sustainable development of the site under the perspective of "Double Carbon target".

3.2.2. Site design and urban management

Urban management involves urban planning, infrastructure construction, public services and other aspects, and is of great significance to site design. By searching the literature with "urban renewal*urban management" as the subject term, and screened the literature from 2020 to 2022, and obtained 87 valid samples, and generated a keyword clustering map(Fig. 2). Through the analysis, it is found that urban development, urban planning, historical and cultural preservation, can be seen that the knowledge content in the field of urban management that is importantly related to the site design in the context of urban renewal is concentrated in the corresponding part.

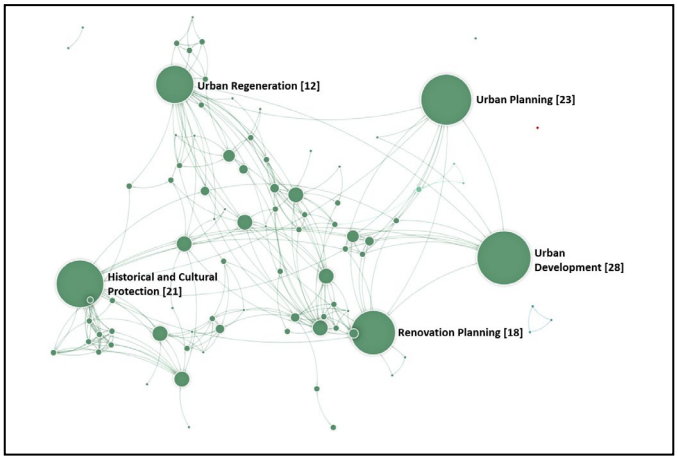

Fig 2 Keyword clustering mapping of urban renewal research results related to urban management in 2020-2022

Based on this, the course guides students to pay attention to the relevant policies and regulations of urban management, and to understand the trends and needs of urban development[3]. Through the introduction of urban management concepts and methods, students can better grasp the positioning and role of site design in the urban environment, put forward design solutions that are in harmony with urban development, and realize the actual needs of urban renewal to meet the actual needs of urban development.

3.2.3. Site design and sociology

Sociology studies human social behavior and social structure, and has a deep understanding of human needs and behavioral patterns in site design, especially in the process of urban regeneration, the process of stock renewal involves a direct interface with the existing users, which is of great significance to the site design work. By searching the literature with "urban regeneration*urban sociology" as the subject term, and screened the literature from 2020 to 2022, and obtained 125 valid samples, and generated a keyword clustering map (Fig. 3). Through analysis, it is found that urban space, urban development, old city transformation, urban village, old city renewal appear more frequently in the above samples, and the degree centrality value is larger, reflecting the importance of the map, which shows that the knowledge content in the field of urban economics that is importantly related to the design of sites in the context of urban renewal is concentrated.

According to the above analysis, in the course teaching, students are guided to use sociological theories and methods to analyze the needs and behavioral habits of the users of the venue, so as to design a venue that is more in line with the actual needs of the people, which is an important link to better understand and analyze the user's ideas and make the design close to the user's needs in the design[4]. In the practical part of the course project, students are guided to conduct research and interviews with the users in the pre-project stage to deeply understand their expectations and needs for the venue, which can be used as an important basis for the design.

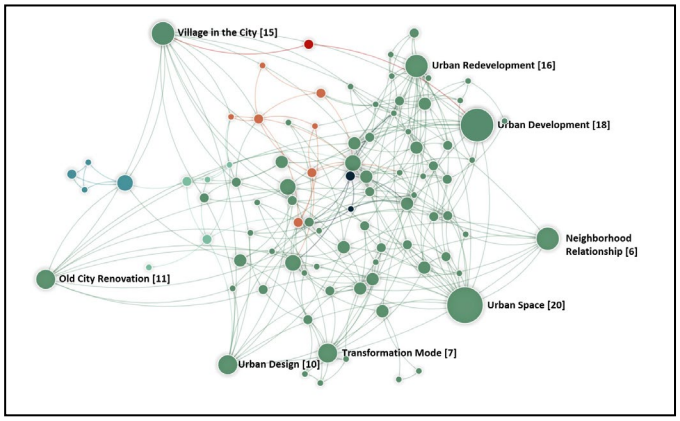

Fig 3 Keyword clustering mapping of urban renewal research results related to urban sociology in 2020-2022

3.2.4. Site design and economics

The decisive role of price leverage in actual projects should not be underestimated, and the economics study of resource allocation and utilization is of great significance to the cost control and benefit analysis in site design. By searching the literature with "urban renewal*urban sociology" as the subject term, screened the literature from 2020 to 2022, and obtained 72 valid samples, and generated the keyword clustering map (Fig. 4). Through the analysis, it is found that urban development, urban economy, urban construction, old city renovation, urban planning appear more frequently in the above samples, and the degree centrality value is larger, which reflects a stronger importance in the map, so it can be seen that the knowledge content in the field of urban economics that is importantly related to the site design in the context of urban regeneration is concentrated in the corresponding part.

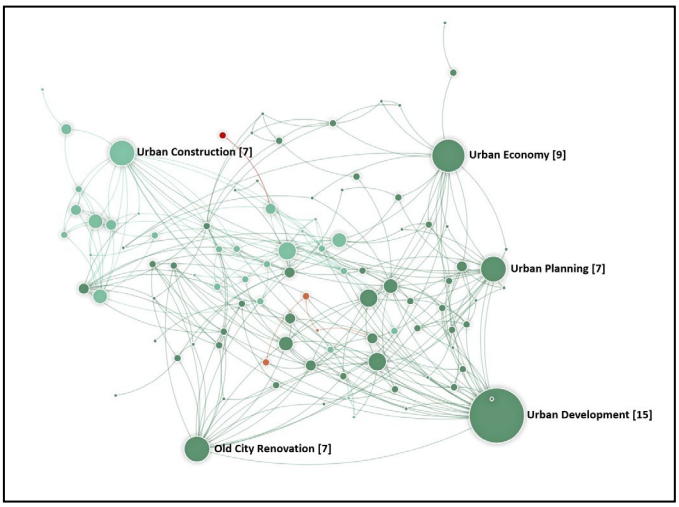

Fig 4 Keyword clustering mapping of urban renewal research results related to urban economics, 2020-2022

Based on this, students are guided to use the principles of economics to analyze and evaluate the investment budget and economic benefits of site design. By comparing the costs and benefits of different design options in the practice, students can choose the most economically reasonable option. At the same time, students can also be guided to pay attention to the balance between economic and social benefits of the site to ensure the sustainable development of urban renewal and site design[5].

In order to effectively integrate the knowledge of related disciplines in Site Design, an interdisciplinary cooperation mechanism is constructed by inviting teachers in the fields of land management, urban management, sociology, economics and other fields to form a teaching team to participate in the teaching of the course. Through the intersection and integration of professional knowledge, students are provided with a comprehensive interdisciplinary perspective. Students are organized to carry out interdisciplinary practical activities, such as urban renewal and real estate planning competitions. During the practices, they will deepen their application and understanding of interdisciplinary cooperation mechanisms through the cooperation and exchange of different disciplines, promoting interdisciplinary knowledge sharing and collision.

4. EXPLORATIONS IN TEACHING INTERDISCIPLINARY COURSES

In the process of building comprehensive interdisciplinary elements in the teaching content of the course "Site Design", a certain degree of adjustment has been made in the overall course teaching content setting and practical teaching content organization. The practical teaching can fully cultivate students' comprehensive design ability and interdisciplinary cooperation consciousness, and realize the effective integration of interdisciplinary knowledge and concepts. For this reason, the teaching is divided into two parts: in-class urban renewal practice and extracurricular discipline competition practice.

4.1. Optimization of the pedagogical content setting

Relevant interdisciplinary knowledge is introduced in the theoretical teaching of Site Design (Table 1). In the stage of basic principles and methods of site design, relevant knowledge of land management is introduced to help students understand the connotation and extension of the site; in the stage of excellent case study, relevant knowledge of green ecology and sustainable development is introduced to help students expand their design ideas and lay the foundation for sustainable urban development; in the stage of preliminary research on the renovation of the existing site, relevant knowledge of urban management, geographic information, etc., is introduced to guide students to perceive the actual situation and needs of urban renewal; in the stage of design plan selection, relevant knowledge of urban management, geographic information, etc., is introduced to guide students to perceive the actual situation and needs of urban renewal; in the stage of design plan selection, relevant interdisciplinary knowledge is introduced. In the pre-investigation stage of existing site renovation, students are taught urban management, geographic information and other related knowledge to guide them to perceive the actual situation and needs of urban renewal in a diversified way; in the stage of design scheme selection, related knowledge of economics is added to guide students to understand the important role of economic leverage in the actual project through the calculation of quantitative indexes; in the stage of designing, selecting and optimizing the urban renewal project, related knowledge of sociology is

introduced to guide students to communicate effectively with the residents, property owners and users through the sociological perspective and promote the scheme design and optimization of the project. In the design, selection and optimization phase of urban renewal projects, sociological knowledge is introduced to guide students to use sociological perspectives to communicate effectively with residents, owners, users and other groups, and to promote the real connection between program design and actual needs.

TABLE 1 INTERDISCIPLINARY PEDAGOGICAL CONTENT SETTING FOR SITE DESIGN

Part	Chap-ter	Specialized Content	Cross-disciplinary Content
Part I Macrocognition	1 Over-view of site design	Basic concepts of site design	Land management: land use classification system, land use policy
		Site design constraints	Urban management: urban infrastructure planning, urban public service facilities planning, etc.
	2 The integrated layout of the site design		Urban management: spatial structure Economics: economic rationality and return on investment Sociology: Social impact assessment in the design of public spaces
	3 Gener-al layout	Site selection and planning requirements	Land management: land quality assessment, land suitability assessment, etc. Economics: project feasibility studies, evaluation of economic benefits, etc. Sociology: social context, demographics, social needs, etc.
		Practice: general layout exercise	
Part II Meso-specific	4 Road layout	Elements of road layout	Land management: land tenure, land-use restrictions, etc. Urban management: transportation planning, traffic flow analysis, etc
		Design of roads in residential areas	
		Practice: Road system design exercise	
	5 Park-ing Facili-ty Lay-out	Elements of Parking Facility Layout	Urban management: parking demand forecasts, parking policies, etc. Economics: analysis of investment in the construction of parking facilities, etc. Sociology: needs analysis, user experience, social justice, etc
		Design of parking lots in residential areas	
		Practice: Parking lot design exercise	
	6 Plaza set-up	Elements of plaza layout	Urban management: public space planning, public space systems, etc. Economics: financing of public projects, etc. Sociology: community planning, social behavior analysis, etc.
		Barrier-free design of residential areas	
		Practice: Plaza Design Exercise	
	7 Vertic-al arrangem ent	Elements of vertical arrangement	Land management: address surveys, land suitability evaluations, etc. Economics: estimation of earthworks, cost control, etc. Sociology: use of public space, analysis of human behavior, etc.
		Residential areas vertical drainage design	
		Practice: Vertical Design Exercise	

	8 Land -scape layout	Site Landscape Garden Design Elements, The Design of landscape gardens for residential ascent sites Practice: Exercise in landscape garden design for ascent sites	Land management: land conservation, soil erosion, etc. Urban management: green space system planning, open space planning Economics: maintenance management costs Sociology: analysis of social needs, study of user behavior, etc. Ecology: environmental protection and restoration, ecological engineering measures
Part III Microd esign	9 Site design phase and depth		Economics: economic analysis of projects
	10 Integrated Practice in Site Design		Land management: ownership structure and impact of changes on renewal projects, etc. Urban management: traffic safety management, community management and security prevention, etc. Economics: project investment estimation, financing strategies, measures for social capital introduction, etc. Sociology: Matching the needs and opinions of residents, community participation and cooperation, stakeholder assessment, etc.

4.2. Exploration of Practical Teaching Content

4.2.1. Urban Renewal and Rehabilitation Practices

Urban renewal practice is an important practical teaching link in the site design course, aiming at enabling students to participate in urban renewal through actual projects to enhance their practical ability and sense of social responsibility. The practical projects are selected from the urban renewal projects according to the representative requirements of the corresponding special training or comprehensive training, such as the renovation projects of old neighborhoods (Fig. 5) and the reuse projects of industrial sites (Fig. 6).

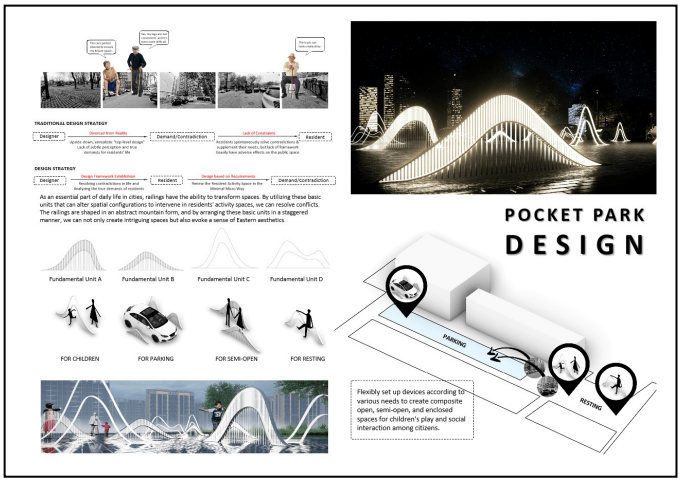

Fig 5 Small and micro-space renovation projects in old neighborhoods

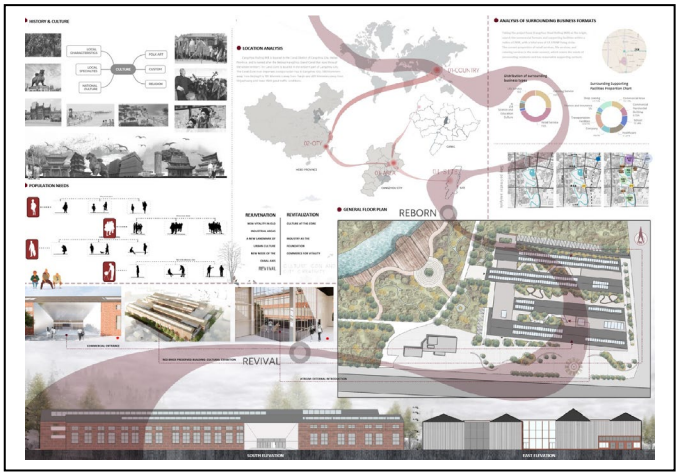

Fig 6 Industrial site reuse projects

The team of the in-class practice program is allowed to be combined across multiple majors in the same course according to the actual needs of the project, including architecture, urban and rural planning and other majors. In order to better understand the actual needs, the students organized themselves into teams to conduct on-site research to understand the background of the project, site conditions, and to obtain the needs of the residents through questionnaires and interviews. Afterwards, they gradually advanced the conceptualization and deepening of the project, including planning layout, architectural design, landscape design, economic calculation, and program selection. In the program results reporting stage, not only the evaluation of industry experts, lecturers, but also the evaluation and suggestions of users.

4.2.2. Comprehensive practice of disciplinary competitions

Comprehensive practice in disciplinary competitions outside of classroom teaching is an important and useful supplement to the cultivation of students' abilities. Through participating in various design competitions, students' innovation ability, interdisciplinary collaboration ability, teamwork spirit and practical problem solving ability can be effectively enhanced. Combined with representative and influential design competitions, such as the National Real Estate Planning Competition for College Students, students of multiple majors can participate in these competitions according to their interests and specialties. Multi-specialty students can voluntarily form interdisciplinary teams according to their interests and specialties, and are encouraged to form interdisciplinary teams. According to the requirements of the competition, combined with the professional background and interests of the team members to determine the design theme and direction, and then jointly complete the design program, including conceptualization, program design, and expression of results(Fig. 7, Fig. 8). The process of participating in disciplinary competitions is an important part of multidisciplinary and cross-disciplinary comprehensive practice, from which students are able to summarize and reflect more fully, refine the lessons learned, consolidate the understanding of professional knowledge and enhance the practical problem-solving ability.

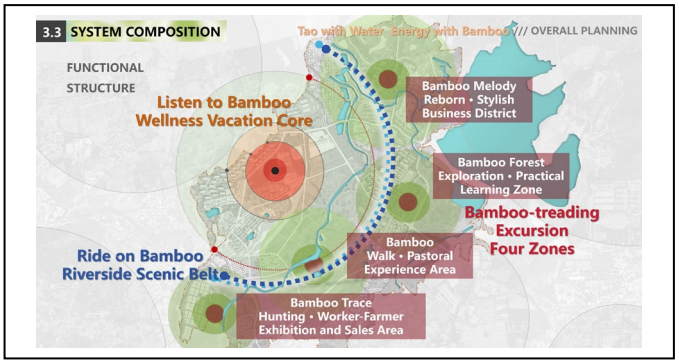

Fig 7 Site Analysis and Industrial Planning Program A

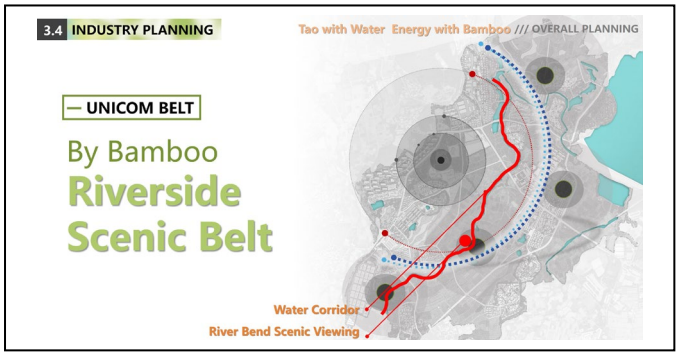

Fig 8 Site Analysis and Industrial Planning Program B

5. CONCLUSIONS

5.1. Experience summary

In the new period of national development and change of the times, the teaching of the course further focuses on the teaching objectives precisely and optimizes the organization and framework of the teaching content through the exploration and practice of interdisciplinary construction of the teaching content, so that the students, while mastering the basic knowledge and skills of site design through learning, cultivate the interdisciplinary thinking and the ability to solve the practical problems collaboratively, and lay a solid foundation for the adaptation to the new needs of the era of urban renewal and AI. In the process of interdisciplinary resource integration, effective realization of interdisciplinary integration and innovation can be achieved through the integration of teachers' resources, teaching contents, and practice links of different disciplines, as well as the joint development and design of course contents and teaching methods.

As an important part of the course, the practical teaching introduces real urban renewal projects, allowing students to participate in actual design and practice, and cultivating their practical ability and complex problem solving ability. In the process of participating in off-campus academic competitions, students' cross-disciplinary and cross-class teamwork, observation and thinking

from multiple perspectives will greatly benefit the stimulation of innovative thinking, including the improvement of communication skills, teamwork skills, etc., which will lay the foundation for students' future career development. In parallel with the integration of teaching content, innovative teaching methods are also introduced into the curriculum. Suitable for multidisciplinary knowledge systems and ways of thinking, combined with project-based practice and other diversified teaching methods, effectively mobilize the role of the main body of the students to play, stimulate their learning initiative and enthusiasm, and effectively improve their learning effect and participation. In the result evaluation stage, the important opinions from industry experts and project users also form a reliable evaluation and feedback mechanism for students to find out the problems in time and make continuous improvement.

5.2. Future prospects

The exploration of interdisciplinary curriculum teaching content construction in the future will make full use of the opportunity of industry-university-research cooperation, will further strengthen the cooperation with relevant industries and enterprises, while promoting the integration of industry-university-research, providing students with more contact with industry and enterprises, participate in practice and employment opportunities. The latest technological achievements and researches originated from the industry and enterprises can also feed back to the education in a timely manner, so as to maintain the advanced and practicality of the teaching content. During the subsequent development of the course, giving fuller consideration to the integration of intelligent teaching technology, through means such as AI-assisted design software and virtual reality technology, can be envisioned. This incorporation aims to further amplify teaching efficiency and quality, presenting students with a more vivid, intuitive, and personalized learning journey. It also aspires to cultivate students' capabilities in innovative thinking, design logic, and critical thinking, empowering them to execute program design expression and optimization in a more efficient manner. The exploration and practice of interdisciplinary construction of the teaching content of the course is a continuous work with the development of the times and the needs of the industry. In the future, by introducing international excellent cases, advanced design concepts, technical methods, and more, the international horizons of students can be broadened, and their professional skills and international competitiveness can be comprehensively enhanced.

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