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Research on the Construction of Teaching Model for Integrating Ideological and Political Education into the Real Estate Economics Course through Digital Technology

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Abstract:
Under the dual background of "carbon peak and carbon neutral" goal driving and digital transformation of education, the green and low-carbon transformation of the real estate industry puts forward new requirements for professional talent training. In view of the current problems existing in the teaching of real estate economics, such as the disconnection between theoretical knowledge and the goal of "double carbon", the rigid integration of ideological and political elements, and the superficial application of digital technology, this study is supported by the Constructivist Learning Theory result-oriented education concept, technology enabling education theory and the concept of "big ideological and political course". A three-dimensional fusion model of "digital technology-dual carbon knowledge-ideological and political elements" is constructed. By deconstruction of the five knowledge modules of the course, a mapping matrix integrating the application scenarios of digital technology, the new knowledge content of "double carbon" and the guidance of ideological and political value is designed. On this basis, the "DITE" four-step teaching model is innovatively proposed, which is data-driven perception, interactive inquiry learning, theoretical thinking sublization, and expanded achievement evaluation, aiming to realize the closed loop of teaching from situation creation, practical inquiry to theory improvement and multiple evaluation. The research also discusses the implementation guarantee and expected effect of the teaching mode from the aspects of teachers, resources, environment and multiple evaluation system, so as to provide a reference for the teaching reform program of real estate professional courses to fulfill the fundamental task of cultivating morality and cultivating people and serve the major strategic needs of the country.

Keywords:
Real Estate Economics; Curriculum-Based Ideological and Political Education; Digital Technology Empowerment; Dual Carbon Goals; Teaching Model

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1.Introduction

The acceleration of global climate governance and the proposal of China's carbon peak and carbon neutrality goals have pushed the real estate industry into a critical stage of green and low-carbon transformation. As a key sector in energy consumption and carbon emissions, the green development of the real estate industry not only requires technical and policy support, but also relies on a combination of talents with low-carbon concepts, responsibility awareness, and professional capabilities. Real estate economics, as the core basic course for real estate-related majors in universities, has the important mission of imparting economic theories and analyzing industry laws. However, its traditional teaching model has problems such as disconnection between knowledge and the dual-carbon goals, awkward integration of ideological and political elements, and insufficient application of digital technology, making it difficult to meet the needs of talent cultivation in the new era.

At the same time, the promotion of the digital education strategy and the deepening of the construction of the major ideological and political courses have provided new opportunities for curriculum reform. Digital technology can break the limitations of teaching time and space and realize the visual and interactive presentation of knowledge; course ideological and political education emphasizes the organic unity of value guidance and knowledge transmission. Integrating digital technology, dual-carbon knowledge, and ideological and political elements into the teaching of real estate economics and constructing a systematic teaching model has become an inevitable choice to solve the current teaching difficulties and cultivate talents that meet the development needs of the industry and the national strategy.

2.Theoretical Basis and Literature Review

2.1 Collation of Core Theoretical Foundations

2.1.1 Traditional Educational Theories

The main educational theories currently in use include the following three: Firstly, the constructivism learning theory centered on students as the design basis of teaching. This theory holds that knowledge is not imparted by teachers in a one-way manner, but is the result of students' autonomous construction through interaction and exploration in specific contexts. In real estate economics teaching, this theory requires breaking the traditional lecture-based teaching model and using digital technology to create real problem scenarios related to carbon neutrality, such as green building development decisions and low-carbon community planning, to guide students to actively participate in the construction of knowledge.

Secondly, the Outcome-Based Education (OBE) concept is centered on students' learning outcomes. It emphasizes the consistency of teaching objectives, teaching processes, and evaluation methods. When applied to this research, it is necessary to clearly define the core competencies and value goals of real estate professionals in the context of carbon neutrality, namely, having a solid economic theory foundation, proficient digital technology application skills, and a firm green development mindset. This is used to reverse-engineer the teaching content and steps.

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Finally, the blended teaching theory advocates integrating the advantages of online and offline teaching to achieve seamless connection between preclass, in-class, and post-class. Digital technology provides technical support for blended teaching, such as using MOOC platforms to push micro-lessons on carbon neutrality online, and conducting interactive exploration offline, forming a teaching loop of online autonomous learning and offline in-depth discussion.

2.1.2 Technology-Empowered Education Theory

The theory of technology empowering education holds that digital technology is not merely a teaching tool, but rather serves as a resource carrier and environmental support, fundamentally reshaping the relationship between teaching and learning. This theory divides technology empowerment into three levels: the tool level, such as software like BIM and GIS, which serve as specific operational tools to help students visually present real estate economic phenomena; the resource level, such as building energy consumption data and carbon emission statistics provided by big data platforms, which provide real data sources for teaching; the environment level, such as virtual simulation technology that builds green building development scenarios, which create immersive learning environments for students. The empowerment effects of these three levels shift real estate economics teaching from abstract theoretical explanations to concrete practical exploration.

2.1.3 The Essence of Curriculum-based Ideological and Political Education

The curriculum-based ideological and political education concept emphasizes the close integration of ideological and political education with social reality and industry development. It requires that ideological and political teaching break free from the isolated situation and achieve an organic combination of value guidance and knowledge imparting. In light of the dual carbon goals, the core essence of the curriculum-based ideological and political education in Real Estate Economics lies in: guiding students to recognize the strategic significance of the national green transformation in the real estate industry, and fostering the ecological civilization ideology that green mountains and clear waters are as valuable as gold and silver; cultivating students' sense of responsibility in real estate development and operation, such as the craftsmanship spirit in low-carbon architectural design and the concepts of integrity and law-abiding in real estate transactions; strengthening students' overall perspective, and understanding the intrinsic connection between carbon emission control in the real estate industry and the national dual carbon goals.

2.2 Review of Domestic and Foreign Research Status

2.2.1 Research Progress of Digital Technology in the Field of Education

In the field of educational application of digital technology, foreign countries started earlier. For instance, the educational technology plan in the United States promoted the application of BIM, big data, etc. in the teaching of architecture-related majors, forming a teaching model centered on practical projects. Europe, through the Erasmus+ program, constructed a cross-institutional digital educational resource sharing platform, providing rich online teaching resources for real estate-related majors. In China, research focuses on the construction of smart classrooms and the application of MOOC platforms, exploring the role of digital technology in improving teaching efficiency and enhancing student participation. However, most of the research remains at the technical application level and lacks a systematic design for the three-dimensional integration

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of technology, knowledge, and value.

2.2.2 Relevant Research on the Reform of Real Estate Economics Teaching

Researchers at home and abroad have focused their studies on the optimization of course content and the innovation of teaching methods for real estate economics. Foreign studies emphasize integrating the dynamics of the real estate market, introducing case-based teaching and project-based learning. For example, using a green building development project as a case to explain cost-benefit analysis. Domestic studies, on the other hand, focus on the integration of ideological and political elements, such as incorporating national real estate regulatory policies and green building standards into the teaching, but there are issues of the integration of ideological and political elements being too rigid and insufficient connection with carbon neutrality knowledge. Moreover, the application of digital technology is mostly limited to basic aspects such as courseware production and online quizzes.

2.2.3 Research on the Integration of Dual-Carbon Education and Ideological and Political Education

With the proposal of the dual-carbon goal, a number of related studies on dual-carbon education have emerged in China, mainly focusing on environmental science, energy engineering, etc., and exploring the integration paths of dual-carbon knowledge and ideological and political education. Research in the real estate sector is relatively scarce. Only some literature mentions that green and low-carbon concepts should be integrated into real estate professional teaching, but no systematic teaching model has been formed, and there is a lack of specific plans for the integration of dual-carbon knowledge and ideological and political elements under the empowerment of digital technology.

2.2.4 Literature Review

Based on the existing research, there are three major research gaps: First, the application of digital technology in real estate economics teaching is mostly at the tool level, and no systematic framework for deep integration with dual-carbon knowledge and ideological and political elements has been formed; Second, the ideological and political education in real estate economics courses mostly focuses on policy interpretation, lacking a value literacy cultivation system that matches the industry demands under the dual-carbon target; Third, the integration of dual-carbon education in the real estate major lacks an operational teaching model support. The innovation point of this study lies in: constructing a three-dimensional integration model of digital technology - dual-carbon knowledge - ideological and political elements, clarifying the integration logic of each dimension; proposing the DITE four-step teaching model to achieve the unity of theoretical construction and practical operation; designing a diversified evaluation system to comprehensively assess students' knowledge, ability and values.

3.Construction of the Three-Dimensional Integration Model of Digital Technology-Dual Carbon Knowledge-Ideological and Political Elements

3.1 Deconstruction of Knowledge Modules in Real Estate Economics Courses

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Based on the course outline of real estate economics and the requirements of the dual carbon goals for the industry, the core content of the course is decomposed into five knowledge modules. The core contents of each module and their connections with the dual carbon goals are as follows:

(1) Land and Location Module: The core content includes land supply and demand, location theory, and land intensive utilization. The dual carbon connection points are the low-carbon orientation in land planning, such as the impact of the location of urban satellite centers on carbon emissions, and the relationship between land utilization intensity and building energy consumption.

(2) Development and Financing Module: The core content includes the real estate development process, cost-benefit analysis, and financing channels. The dual carbon connection points are the cost control in green building development and the application of green financial tools, such as green loans and the role of carbon futures in real estate financing.

(3) Market and Transaction Module: The core content includes the structure of the real estate market, the mechanism of price formation, and transaction norms. The dual carbon connection points are the market competitiveness of low-carbon buildings and the information disclosure system in green residential transactions.

(4) Property and Maintenance Module: The core content includes the property management process, facility maintenance, and operating costs. The dual carbon connection points are building energy-saving renovations and the reduction effect of smart operation and maintenance technologies on carbon emissions, such as the application of intelligent water and electricity control systems.

(5) Policy and Planning Module: The core content includes real estate regulatory policies, urban planning and real estate development. The dual carbon connection points are real estate policies under the dual carbon goals, such as green building subsidy policies and the impact of carbon emission rights trading policies on the real estate industry.

3.2 Construction of the Three-Dimensional Integration Mapping Matrix

The technical dimension aims to empower the teaching process and enhance learning outcomes. By considering the characteristics of each knowledge module, it selects appropriate digital technologies and clarifies their application scenarios and functions. The knowledge dimension aims to update course content and align with industry demands. It integrates new knowledge related to carbon neutrality into each knowledge module, forming a content system of traditional theories and new knowledge on low-carbon issues. The ideological and political dimension aims to provide value guidance and cultivate qualities. By considering the content characteristics of each knowledge module, it identifies and extracts ideological and political elements that match them.

Based on the above dimensions, a three-dimensional integrated mapping matrix is constructed to clearly define the specific integration contents of the three dimensions in each knowledge module. The design framework of the teaching mode is shown in Table 1.

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Table 1 Three-Dimensional Integration Mapping Matrix of "Digital Technology-Dual Carbon Knowledge-Ideological and Political Elements" for Real Estate Economics

Knowledge Modules	Technology Dimension	Knowledge Dimension	Ideological and Political Dimension
Land and Location	GIS; Big Data Platform	Low-carbon urban planning theory, land ecological carrying capacity assessment, location impact of carbon emission costs	Ecological civilization thought, resource conservation awareness
Development and Financing	BIM; Carbon Footprint Calculator; Green Financial Platform	Green building standards, carbon emission accounting methods, application of green credit/ bonds	Craftsmanship spirit, corporate social responsibility, integrity concept,
Market and Transaction	Visualization Platform	Low-carbon building value evaluation, consumer preference analysis	Integrity and law-abiding, fairness and justice, contractual spirit
Property and Operation & Maintenance	Energy Consumption Simulation Software; Intelligent Operation and Maintenance Platform;	Building energy-saving transformation technology, smart operation, and maintenance principles	Professional dedication, innovation awareness, conservation concept
Policy and Planning	Big Data Platform; Virtual Simulation	Real estate policies, carbon trading system	Institutional confidence, overall awareness, sense of responsibility

4.Construction of the DITE Four-Step Teaching Model

Based on the three-dimensional fusion mapping matrix, a four-step teaching model of DITE is constructed, namely Data-driven Perception - Interactive Inquiry Learning - Theoretical Thinking Sublimation - Expanded Achievement Evaluation. This achieves a teaching loop of context introduction - practical exploration - theoretical improvement - comprehensive evaluation. Each step is centered around the three-dimensional fusion content, ensuring the simultaneous advancement of knowledge transmission, ability cultivation, and value formation.

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4.1 D - Data-driven Perception

This section uses digital technology to present real issues and aims to stimulate students' intuitive understanding as the core objective. It accounts for approximately 15% of the duration of a single class. Teachers utilize digital technology tools to transform real issues in the real estate industry under the context of carbon neutrality into visual and perceptible teaching scenarios, breaking away from the abstraction of traditional theoretical teaching.

Take the chapter on land and location as an example. Before the class, the teacher collects local real estate project energy consumption data, satellite remote sensing data on the urban heat island effect, and carbon emission comparison data between green buildings and traditional buildings through a big data platform. During the class, using GIS technology and big data visualization tools, the data is presented in forms such as heat maps, line graphs, and three-dimensional models, such as showing the carbon emission heat distribution of real estate projects in different areas of a certain city, and comparing the energy consumption differences between green residences and ordinary residences. At the same time, combined with cases, questions are raised: Why are there significant differences in carbon emissions among real estate projects in different areas of the same city? Can the high cost of green buildings bring long-term benefits? Through data presentation and problem guidance, students can intuitively feel the impact of the carbon neutrality goal on the real estate industry, stimulate their interest in learning about carbon neutrality knowledge and real estate economic theories, and initially establish a cognition of low-carbon development.

4.2 I - Interactive Inquiry Learning

This section is centered on students as the main body, collaborative exploration, and integration of three-dimensional content. Its duration accounts for approximately 40% of a single class. Based on the questions raised in the data-driven part, students are divided into several groups. Each group focuses on the core content of a certain knowledge module and conducts practical exploration using digital technology tools to achieve synchronous deepening of technology application, knowledge acquisition, and value perception.

Specific implementation process as following: Taking the development and financing module as an example, the group task is to design a development plan for a green residential project and conduct cost-benefit analysis. Students use BIM technology to build a green building model, apply a carbon footprint calculator to calculate the carbon emissions throughout the project's life cycle, and optimize the design plan in accordance with green building standards; they query suitable financing channels through the green finance platform and use real estate economic theory to analyze the project's cost and benefits. During the collaboration process, the teacher guides students to pay attention to design details, the authenticity of financing information, and the responsibility for carbon emission reduction of the project. Each group shares their results through an online collaboration platform, conducts internal discussions and exchanges between groups, and the teacher provides on-site guidance to solve difficult problems in technology application and knowledge understanding.

4.3 T - Theoretical Thinking Sublimation

This part aims to apply the regression theory, extract patterns, and strengthen value guidance, with the core objective being to account for approximately 30% of the total class time. Based on students' practical explo-

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ration, the teacher guides them to return from specific practice to abstract theory, deeply discussing the economic principles, policy logic, and value connotations behind the practice, achieving the improvement from practical cognition to theoretical consciousness.

The specific implementation process as follows: The teacher combines the exploration results of each group and proposes progressive questions. Through group representatives' speeches and class discussions, the application patterns of real estate economics theory in the green and low-carbon scenarios are sorted out, and the strategic significance of the dual-carbon policy is interpreted. At the same time, the teacher incorporates ideological and political elements through cases to strengthen students' sense of responsibility and craftsmanship spirit.

4.4 E - Expanded Achievement Evaluation

This section aims to comprehensively assess students' knowledge, abilities and values, and it runs throughout the entire teaching process. It breaks away from the traditional evaluation model of "one exam determines one's fate" and builds a multi-dimensional evaluation system that combines process evaluation and final evaluation, as well as quantitative evaluation and qualitative evaluation.

Process-based assessment (accounting for 60%): This mainly assesses students' performance in interactive exploration and group discussions, including their ability to apply digital technologies, their level of knowledge acquisition, their collaboration skills, and their participation; through classroom questions, periodic reports, etc., it evaluates students' understanding and acceptance of ideological and political elements, such as asking students to explain the significance of the low-carbon transformation in the real estate industry and assessing their establishment of ecological civilization concepts.

Summative assessment (accounting for 40%): It adopts a non-standardized assessment method. Students can choose their own form of achievements, such as digital models, analysis reports, presentation videos, etc. The evaluation indicators include the scientificity, innovativeness, and value orientation of the achievements. At the same time, multiple evaluation entities are introduced, in addition to teacher evaluation, group self-evaluation and industry expert evaluation are also added to ensure the comprehensiveness and objectivity of the evaluation.

5. Implementation Guarantee and Expected Effect Analysis

5.1 Guarantee Conditions for the Implementation of the Teaching Mode

5.1.1 Teacher Capacity Assurance

Teachers are the core entities in the implementation of the teaching model and should possess comprehensive qualities including knowledge of real estate economics theory, application of digital technologies, and ideological and political education. The safeguard measures include: conducting specialized training, inviting experts in digital technology, ideological and political education, and real estate industry to give lectures to enhance teachers' technical application abilities in BIM, GIS, etc. and their ability to identify ideological elements; establishing a school-enterprise-school cooperation mechanism, organizing teachers to undertake

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temporary assignments in real estate enterprises to understand the dynamic of industry green transformation and enrich teaching cases; encouraging teachers to participate in research projects related to curriculum ideological and political education and digital education to enhance the ability to combine theoretical research with teaching practice.

5.1.2 Teaching Resource Assurance

High-quality teaching resources form the fundamental support for the implementation of the model. A multi-dimensional resource system needs to be established: in terms of digital technology resources, professional software such as BIM, GIS, and energy consumption simulation should be introduced to build an intelligent teaching platform within the school, and public data sources such as satellite remote sensing data and building energy consumption data should be integrated; in terms of carbon neutrality knowledge resources, contents such as green building standards and carbon trading systems should be included, and case libraries of green real estate at home and abroad should be compiled; in terms of ideological and political resources, national dual carbon policy documents, typical deeds of green real estate enterprises, and video interviews with industry experts should be collected to build a case library of ideological and political elements. At the same time, a resource update mechanism should be established to promptly supplement the latest policy, technology, and case resources.

5.1.3 Teaching Environment Guarantee

The teaching environment should meet the requirements of digital technology application and interactive exploration: build smart classrooms, equip with multimedia display equipment, group collaboration terminals, and virtual simulation equipment, and support online and offline integrated teaching; establish an internal digital technology practice platform to provide students with practical environments for BIM, GIS and other software; collaborate with real estate enterprises and industry associations to establish off-campus practice bases, organize students to participate in real projects such as green building development and low-carbon community operation, and achieve seamless connection between classroom teaching and enterprise practice.

5.2 Prediction of Expected Effects of the Teaching Mode

5.2.1 Knowledge Mastery

Through the above course design, we expect that students will be able to solidly master the core theories of real estate economics, and at the same time, proficiently acquire new knowledge in the industry under the background of "carbon neutrality", such as green building standards, carbon emission accounting methods, and green financial tools; they will be able to combine economic theories with "carbon neutrality" practices, such as using cost-benefit theory to analyze the feasibility of green building development, and using market theory to interpret the development laws of low-carbon real estate markets. Through the application of digital technology, students' understanding of abstract theories becomes deeper and their knowledge system becomes more complete.

5.2.2 Ability Improvement

Through the above-mentioned course design, students will be able to proficiently apply digital technology

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tools such as BIM, GIS, and big data visualization to complete the design, data analysis, and scheme optimization of real estate projects; possess strong practical exploration abilities and innovative consciousness, and be able to propose practical solutions to problems in the low-carbon transformation of the real estate industry, such as designing low-carbon building renovation plans and planning green community operation models; at the same time, their collaboration, communication, and expression abilities will be significantly improved, and they will be able to complete complex projects through group collaboration and clearly present research results in the form of reports and videos.

5.2.3 Ideological and Political Literacy

It is expected that students can deeply understand the national strategic significance of the "dual carbon" goals and establish a firm sense of ecological civilization; clarify the responsibilities of the real estate industry in the low-carbon transformation and form the awareness that "low-carbon development is everyone's responsibility"; consciously practice the craftsmanship spirit, integrity concept, and law-abiding awareness in professional learning and practice, such as focusing on detail optimization in project design and emphasizing information transparency in transaction analysis; enhance institutional confidence and the feelings of serving the country through science and technology, recognize the scientificity of the national "dual carbon" policies, and stimulate the enthusiasm for participating in the research and development and application of low-carbon technologies.

5.3 Design of Teaching Effect Evaluation Index System

To accurately measure the implementation effect of the teaching mode, a multi-dimensional evaluation index system is designed as shown in Table 2, reserving interfaces for subsequent empirical research. The index system is divided into three first-level indicators corresponding to knowledge, ability, and ideological and political literacy. Each first-level indicator has second-level and third-level indicators, clarifying the indicator connotation and assessment methods.

Table 2 Multi-Dimensional Teaching Effect Evaluation Index System

First-Level Indicators	Second-Level Indicators	Third-Level Indicators	Assessment Methods
Knowledge Mastery (40 points)	Mastery of Core Theories	Basic theories of Real Estate Economics	Theoretical tests, analysis reports
		"Dual carbon" related professional knowledge	Case analysis, project reports
	Knowledge Application Capability	Integration of theories and "dual carbon" practices	Program design, practical reports

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First-Level Indicators	Second-Level Indicators	Third-Level Indicators	Assessment Methods
Ability Improvement (35 points)	Digital Technology Application	Operation of tools such as BIM and GIS	Digital models, technical operation assessments
	Practical Innovation Capability	Design and optimization of low-carbon schemes	Project results, expert evaluations
	Collaboration and Communication Capabilities	Group collaboration performance, result presentation	Group mutual evaluation, classroom presentations
Ideological and Political Literacy (25 points)	Ecological Civilization Thought	Cognition of the significance of "dual carbon"	Classroom speeches, paper elaboration
	Sense of Responsibility	Cognition of industry responsibilities, practical performance	Case analysis, enterprise evaluations
	Professional Literacy	Integrity, craftsmanship spirit	Project process, result evaluations

6. Conclusions and Prospects

6.1 Research Conclusions

This study, based on the dual-carbon goals and the digital transformation of education, focuses on the ideological and political education reform of the real estate economics course, and has constructed a three-dimensional integration model of digital technology - dual-carbon knowledge - ideological and political elements, as well as a DITE teaching mode. The core conclusions of the study are as follows:

1. Three major theoretical foundations have been clearly identified and their supporting roles have been clarified: the constructivist learning theory and the OBE concept in educational theories provide logical support for student-centered teaching design; the theory of technology empowering education clarifies the path of digital technology reshaping the relationship between teaching and learning; the concept of the major ideological and political course defines the value orientation of ideological and political education in the course, and the three together constitute the theoretical framework of the study.

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2. A three-dimensional integration mapping matrix has been constructed: by deconstructing the five knowledge modules of real estate economics, the application scenarios of digital technology in each module, the content of integrating dual-carbon new knowledge, and the direction of extracting ideological and political elements have been defined, forming a systematic integration blueprint, which solves the problems of the awkward integration of ideological and political elements and the disconnection between dual-carbon knowledge and the course.

3. An operational DITE teaching mode has been proposed: creating scenarios through data-driven perception, deepening understanding through interactive inquiry learning, enhancing value guidance through theoretical thinking, and comprehensively evaluating through expanded achievements, achieving the organic unity of knowledge transmission, ability cultivation, and value shaping.

4. Implementation guarantee conditions and evaluation systems have been designed: measures for guarantee have been proposed from three dimensions: teachers, resources, and environment. A multi-dimensional evaluation index system covering knowledge, ability, and ideological and political literacy has been constructed, providing support for the implementation of the teaching mode and the measurement of its effects.

6.2 Research Prospects

The teaching mode constructed in this study provides theoretical and practical references for the reform of curriculum ideological and political education in Real Estate Economics, but there are still certain limitations. Future research can be deepened in the following directions: first, conducting empirical research, selecting pilot colleges and universities to implement the teaching mode, verifying the effectiveness of the mode through questionnaires, score analysis, student interviews, etc., and optimizing and improving it; second, expanding the research scope, applying the three-dimensional integration concept and the "DITE" mode to related professional courses such as Real Estate Development and Management and Engineering Cost to form a curriculum ideological and political reform system at the professional group level; third, strengthening the application of technological innovation, combining emerging digital technologies such as artificial intelligence and metaverse to enrich teaching scenarios, enhance the immersion and interactivity of teaching, and further strengthen the teaching effect.

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