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"Four-in-one": A Chinese practice of pedagogical model innovation for graduate courses—A case study of the "environmental economics and management" course at N University

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Abstract:
Deepening the reform of graduate training modes can further improve the quality of cultivating both academically innovative and practice-oriented innovative talents. Taking courses in environmental economics and management as a case study, this study investigates the systematic optimization of graduate teaching modes and their implementation effectiveness. In light of the interdisciplinary nature of such courses, we systematically explored the value-guidance elements embedded in these courses and integrated them into the course content. We then propose a "four-in-one" teaching model that integrates heuristic interactive teaching, case-based teaching, constructivist teaching, and research-oriented teaching. In order to comprehensively assess the effectiveness of the teaching model, a multidimensional evaluation system is established, encompassing value orientation, teaching content, teaching methods, and teaching outcomes. The results indicate that this model can effectively enhance students' classroom participation, strengthen their ability to analyze complex environmental-economic issues and apply knowledge in practice, and also achieve significant outcomes in promoting value guidance. This study provides new insights and an operable framework for innovating graduate teaching models, offering both theoretical value and practical implications for improving the quality of graduate education.

1. Introduction

Against the backdrop of deepening reforms in higher education and the transformation of talent cultivation systems, graduate education plays a crucial role in cultivating high-level innovative talents and supporting national strategic development. The Outline for Building a Leading Country in Education (2024-2035) further proposes advancing a multidimensional, coordinated education mechanism and promoting systematic transformations in learning approaches and teaching paradigms. Therefore, graduate education needs to go beyond spreading specialized knowledge, and students' analytical ability, practical application skills, and moral literacy also should be strengthened. In this context, optimizing graduate teaching models is essential both for improving teaching quality and for responding to national strategies demands.

However, from the perspective of current graduate education practices, the training model remains in a stage of continuous exploration and improvement. Traditional course teaching is largely centered on knowledge transmission and is commonly characterized by relatively limited teaching approaches and insufficient emphasis on practice orientation (Chen & Hao, 2015). This limitation is particularly evident in applied and interdisciplinary fields, where relying solely on classroom instruction is insufficient to effectively support the development of students' abilities to address complex real-world problems. Therefore, optimizing training systems and

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management mechanisms is essential for improving the overall quality of graduate education (Chen et al., 2016).

Courses in environmental economics and management are characterized by a pronounced interdisciplinary nature and a strong orientation toward real-world problem solving. They are closely linked to major national strategic issues such as sustainable development, ecological civilization, and the "dual carbon" goals. The curriculum covers complex topics, such as coordination between economic development and environmental governance, policy instrument design, and evaluation of implementation effects. Therefore, it places high demands on students' comprehensive analytical abilities, systems thinking, and practical application skills. For this reason, such courses not only serve as an important platform for the integration of multidisciplinary knowledge, but also provide a representative and practically relevant context for innovating graduate teaching models.

Based on this, this study takes courses in environmental economics and management as the research focus, aiming to construct a scientific and systematic graduate teaching model and to explore how to achieve an organic integration of specialized knowledge transmission, practical skill development, and the enhancement of comprehensive competencies. Through a systematic analysis of course design, teaching methods, and instructional outcomes, this study seeks to provide assessable pathways for improving graduate course teaching, thereby enhancing both teaching quality and student learning effectiveness.

2. Literature review

2.1 Research on teaching model

Existing studies have extensively explored graduate teaching reform from multiple perspectives, particularly in practice-oriented education, instructional model innovation, and interdisciplinary training.

In terms of practice-based teaching, a systematic practice-oriented teaching framework built through practice bases and industry-education integration has been shown to significantly enhance students' practical and innovative abilities (Han et al., 2022). Curriculum restructuring and the development of collaborative education mechanisms can further strengthen the alignment between talent cultivation and industry needs (Jia, 2022). Meanwhile, in response to the complexity and multidimensionality of socioeconomic issues, interdisciplinary training models have received increasing attention. By integrating knowledge resources across multiple disciplines, such models help improve students' comprehensive analytical capacity and innovation capability (Zou & Zhang, 2022).

With the deepening of the student-centered education philosophy, graduate teaching models are shifting from one-way knowledge transmission toward diversified interaction and deep learning. Emerging instructional approaches such as flipped classrooms, online learning, and blended teaching have continuously developed. The flipped classroom model has demonstrated positive effects in enhancing learning engagement and instructional flexibility (Asunka et al., 2018). A hybrid innovative teaching model integrating virtual reality technology and scenario simulation (VRTSS) can strengthen students' disciplinary knowledge and practical skills (Chang et al., 2025). The most widely adopted teaching model is blended online-offline teaching. This model expands the temporal and spatial boundaries of learning (Su, 2022), and provides more opportunities for completing degrees (Alqurashi, 2019). However, online education is easily affected by factors such as infrastructure and learning support systems (Kithsiri et al., 2018), and it also places higher demands on the learning environment and students' self-regulation abilities (Li & Che, 2022). Therefore, online teaching still cannot fully replace face-to-face instruction in terms of interactivity and learning experience (Chandran et al., 2021; Singh et al., 2024). In addition, with the rapid development of big data and intelligent technologies, graduate teaching is gradually shifting toward a data-driven paradigm, providing new technical pathways for instructional optimization and learning outcome evaluation (Chen et al., 2024).

2.2 Expansion of educational functions and diversified teaching models in graduate education

In the new era, higher education has gradually shifted from a single knowledge-transmission function toward an integrated education system that unifies "knowledge acquisition, competence enhancement, and holistic development." Its core lies in the functional expansion and substantive enrichment based on existing curricular structures (Zhang & Li, 2021). In this process, graduate education not only undertakes the task of spreading professional knowledge but also subtly shapes students' cognitive approaches, thereby exhibiting a distinct educational function (Dong, 2022). From the perspective of practical approaches, scholars have proposed a variety of teaching models and reform strategies to realize the educational function of graduate courses. These include the industry-academia-research-application collaborative education model (Liu, 2016), an outcome-oriented graduate course model featuring "model framework-program design-process implementation-continuous optimization" (Xia et al., 2025), and the "learner-centered and outcome-based" (O-AMAS) teaching model (Jiang et al., 2024).These studies expand the functional boundaries of graduate courses from different perspectives and provide valuable explorations for enhancing their educational effectiveness.

2.3 Limitations of existing studies

Although existing studies have conducted valuable explorations in areas such as practical teaching and instructional model innovation, several limitations remain. First, most studies focus on single teaching methods or partial reforms, lacking the construction of a systematic teaching model. Second, there is insufficient coordination among different teaching elements, which is reflected in the formalization of multidimensional educational objectives (Chen & Zhou, 2023), the lack of coherence between value-guidance content organization and instructional implementation (Xiao et al., 2021), and the inadequate integration between knowledge

transmission and the promotion of holistic development (Wang et al., 2023). Third, the linkage between teaching models and training outcomes requires further investigation, particularly due to the lack of support from quantifiable evaluation systems. Therefore, developing a systematic teaching model that balances knowledge acquisition and holistic development, grounded in the overall characteristics of graduate courses, has become a key issue that urgently needs to be addressed in current graduate education reform.

3. Research design and methodology

3.1 Research design

This study emphasizes the integration of value guidance and professional knowledge. The overall design follows a "theoretical construction–instructional implementation–empirical evaluation" logic, forming a closed-loop research structure.

At the theoretical construction stage, we synthesize disciplinary development logic, frontier research in environmental economics and management, and national strategic requirements (e.g., ecological civilization construction and the "dual carbon" goals). On this basis, value-guided elements are systematically identified and embedded into teaching content through a "top-down" (policy and disciplinary logic-driven) and "bottom-up" (practice and case-driven) integration approach.

At the instructional implementation stage, a "four-in-one" teaching model is constructed, including inquiry-based interactive teaching, case-based teaching, constructivist teaching, and research-oriented teaching. These pedagogical approaches are embedded into a semester-long graduate course to ensure the organic integration of knowledge transmission, competency development, and value cultivation.

At the evaluation stage, we design a multidimensional teaching effectiveness evaluation system and conduct an empirical assessment based on student feedback, thereby enabling a comprehensive assessment of the instructional reform outcomes.

3.2 Analytical approach

3.2.1 Evaluation index system construction

In alignment with the objectives of optimizing teaching models and improving course quality, and considering the disciplinary characteristics of environmental economics and management courses as well as the requirements of postgraduate education, this study constructs an evaluation index system, which involves the four dimensions: value orientation, teaching content, teaching methods, and teaching effectiveness, aiming to comprehensively capture the full-process characteristics from instructional design to learning outcomes.

The value orientation dimension focuses on the alignment between course objectives and real-world development needs. It examines whether the course reflects major national strategic priorities, responds to the requirements of ecological civilization construction and green development, and establishes a clear value-oriented framework throughout the teaching process.

The teaching content dimension emphasizes the degree of integration and disciplinary relevance of course materials. It evaluates whether the relevant teaching resources are organically integrated into the professional knowledge system and whether they reflect the frontier developments and practical orientation of the discipline of environmental economics and management.

The teaching methods dimension primarily examines the effectiveness of diverse instructional approaches, including heuristic and interactive teaching, case-based teaching, constructivist learning, and inquiry-based teaching. It focuses on assessing the extent to which these methods promote students' active engagement, deepen understanding, and enhance their comprehensive capabilities.

Teaching effectiveness focuses on students' learning outcomes. The evaluation indicators include students' cognitive construction, value internalization, problem-solving abilities, and overall competency enhancement.

The specific indicators are presented in Table 1.

3.2.2 Scoring method

A five-point Likert scale was used to quantitatively evaluate the 30 secondary indicators (1 = strongly disagree, 2 = disagree, 3 = neutrality, 4 = recognize, 5 = highly recognize). The mean score of each secondary indicator was calculated firstly. Then we aggregated and averaged scores of all indicators within the same dimension to obtain each student's evaluation results across the four dimensions: "value orientation, teaching content, teaching methods, and teaching effectiveness." Finally, the scores of the four dimensions were summed to generate a composite evaluation value representing the overall implementation effectiveness of the course.

3.2.3 Data sources

(1) Evaluation subjects

We selected full-time master's and doctoral students enrolled in courses such as Environmental Economics, Green Finance, and Resource, Environment and Circular Economy as the evaluation respondents, with a total sample size of 37. The sample exhibits a certain degree of disciplinary relevance and representativeness.

(2) Data collection method

At the end of the course, a centralized evaluation was conducted through an anonymous online questionnaire system. Prior to distributing the questionnaire, students were fully informed that the survey was intended solely for teaching research and improvement purposes. Students' information will be kept strictly confidential. This was done to reduce potential subjective concerns and response bias, thereby enhancing the authenticity and reliability of the collected data.

4. Results

Table 1. Evaluation index system for evaluating course implementation effectiveness.

Criterion layer		Indicators layer
Value orientation	Policy alignment	Whether the course content and instruction are highly consistent with national policies and guidelines
		Whether the concept of rule of law is effectively integrated into the teaching of "environmental policy and regulation"
	Value guidance	Whether the instructional syllabus has a clear and explicit design in terms of value guidance
		Whether the concept of ecological civilization is integrated throughout the entire teaching process
		Whether the teaching of "low-carbon development" is closely aligned with national strategies (e.g., the "dual carbon" goals and the new development philosophy)
	Awareness cultivation	Whether the course, by integrating national strategic priorities such as Beautiful China, ecological civilization, and green development, helps students develop an understanding of social responsibility and professional mission
		Whether the course contributes to strengthening students' strategic awareness, sense of responsibility, and holistic cognition
Teaching content	National strategic relevance	Whether the course content covers key policy areas such as pollution prevention and control, the "dual carbon" goals, coordinated reduction of pollution and carbon emissions, and the construction of a Beautiful China
		Whether it timely reflects China's role and contributions in global environmental governance (e.g., climate negotiations and biodiversity conservation)
	Rule of law and scientific rigor	Whether the course clearly explains environmental laws and regulations as well as their underlying value orientation
		Whether, in teaching environmental economic models or management tools, students are effectively guided to understand the scientific spirit and methodological value embedded within them
	Integration of knowledge and values	Whether the course integrates sustainability ethics and environmental justice with disciplinary knowledge in environmental economics and management (e.g., emissions trading, cost–benefit analysis)
		Whether the historical evolution of ecological governance is appropriately integrated with textbook content
		Whether the course content includes references to the report of the 20th National Congress of the Communist Party of China
		Whether the arrangement of value-oriented content in teaching materials or lecture notes is appropriate and well-balanced
Teaching methods	Ideological and cognitive stimulation	Whether instructors encourage students to approach problems from multiple dimensions, including economic efficiency, managerial effectiveness, social responsibility, and environmental ethics
		Whether students are guided to apply disciplinary knowledge to national strategies and regional green development practices
		Whether students' active thinking is stimulated through questioning, discussion, and other interactive approaches during the teaching process
	Natural integration of teaching methods and application	Whether multiple teaching methods (e.g., case-based teaching, group discussion, and presentations) are comprehensively applied by instructors
		Whether selected cases effectively integrate disciplinary knowledge, real-world issues, and value-oriented guidance
		Whether the explanation of professional concepts naturally extends to themes such as social responsibility, national strategy, and codes of conduct
	Teaching media and formats	Whether thematic summaries, reflective reading sessions, and political/ideological film or documentary screenings are incorporated into the teaching process

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Table 1. Evaluation index system for evaluating course implementation effectiveness.

Criterion layer		Indicators layer
Teaching effectiveness	Cognitive construction	Whether the course helps students clearly understand national strategic policies such as ecological civilization construction and green development
		Whether it enhances students' understanding and awareness of decision-making in green transformation of the economy and society, as well as ecological concepts
		Whether the course helps students theoretically understand the scientific connotation and practical value of ecological civilization concepts such as "lucid waters and lush mountains are invaluable assets"
		Whether the course deepens students' cognition and understanding of policies such as the "dual carbon" goals, the construction of a Beautiful China, and their implementation pathways
	Value internalization and behavioral guidance	Whether students' recognition of and confidence in ecological civilization development pathways are enhanced
		Whether the course strengthens students' initiative and sense of responsibility in practicing green and low-carbon lifestyles and environmental protection
	Problem-solving ability	Whether the course effectively improves students' ability to apply theories and methods of environmental economics and management to analyze and solve real-world environmental problems
	Overall learning experience	Whether, overall, the course enables students to gain knowledge, competencies, and value-based understanding, rather than merely receiving theoretical instruction or passive lectures

4.1 Exploration value-guided elements in graduate courses of environmental economics and management

We systematically explore value-guided elements and integrate them into teaching content, as this is essential for improving both instructional quality and the broader educational function of graduate courses. We adopt an integrated "top-down" and "bottom-up" approach, conducting a comprehensive review and synthesis from both the internal logic of the discipline and the demands of real-world development, so as to organically integrate knowledge transmission with value cultivation.

4.1.1 In-depth exploration based on disciplinary development history and internal logic

The formation and evolution of a discipline itself contain rich theoretical resources and value implications, which constitute an important foundation for graduate-level teaching and value-oriented education. In courses of environmental economics and management, relevant elements can be extracted and teaching resources integrated through the following approaches.

Firstly, starting from the theoretical evolution from "Limits to Growth" to "sustainable development," this part systematically reviews the transformation of human development paradigms. It guides students to recognize that ecological civilization construction represents a significant stage in the evolution of human civilization and deepens their understanding of the core connotation of sustainable development. It also encourages reflection on the traditional "pollute first, clean up later" development path. Through this process, students are fostered to develop a mindset that respects, conforms to, and protects nature.

Secondly, focusing on the intrinsic relationship between "externality theory" and the "Two Mountains" concept, which means that lucid waters and lush mountains are invaluable assets, this part explores the multiple value dimensions embedded in the ecological environment and integrates ecosystem service values with economic values. By combining institutional design and policy instruments (such as property rights definition and market mechanisms), it analyzes pathways for internalizing externalities, guiding students to understand the synergistic relationship between environmental protection and economic development and cultivating dialectical thinking abilities.

Thirdly, using the Environmental Kuznets Curve (EKC) and the pathway of green development as entry points, this part integrates relevant theories with China's practical cases. It guides students to critically examine the EKC hypothesis and to understand that development turning points can be actively shaped through industrial restructuring and energy transition. By reviewing policy practices and real-world outcomes of green transformation, it further strengthens students' understanding of and identification with green development pathways.

4.1.2 Precise exploration based on professional competence and contemporary frontiers

In light of contemporary development needs and the evolving frontiers of the discipline, it is necessary to systematically extract value-oriented content with strong practical relevance and to further expand diversified teaching resources.

Firstly, centering on the "dual carbon" goals, this part integrates the international climate governance process with China's practical experiences. It constructs a multidimensional teaching resource system, including policy documents, carbon market data, and corporate case studies. It guides students to understand China's role and responsibilities in global climate governance. At the same time, by

incorporating frontier topics such as green finance, carbon trading mechanisms, and abatement cost analysis, it enhances students' analytical capacity and innovative thinking in addressing complex environmental problems.

Secondly, guided by the concept of "systematic governance," this part integrates theoretical frameworks such as the integrated protection and systematic management of mountains, rivers, forests, farmlands, lakes, grasslands, and deserts. Drawing on typical cases such as watershed governance and joint prevention and control of air pollution, it constructs teaching scenarios that span multiple factors and regions. It helps students understand the integrity and interconnectedness of ecosystems and strengthens their systems thinking.

Thirdly, in the context of environmental policy evaluation and project management, this part explores value dimensions oriented toward public well-being. By introducing issues such as environmental equity, distributive justice, and the public interest, it enriches case resources and situational analyses. It guides students to pay attention to the social impacts of policy implementation, fosters a sense of public responsibility and professional ethics, and cultivates high-level talent with comprehensive governance capabilities.

4.2 "Four-in-one" teaching model construction

Through the construction of a "four-in-one" teaching model that is characterized by student-centered, grounded in disciplinary knowledge, and supported by diversified instructional methods, value guidance is organically embedded into the professional teaching process. This model promotes a transformation of teaching from passive reception to active knowledge construction, breaks through the traditional teacher-centered, one-way knowledge transmission approach, and fosters the deep integration of knowledge acquisition and value cognition. It also helps to avoid the fragmentation and separation of teaching content.

4.2.1 Inquiry-based interactive teaching

(1) Classroom discussion

This approach constructs a progressively structured chain of questions around key environmental issues, using guided questioning instead of direct presentation of conclusions. It encourages students to develop independent judgments through analyzing problem premises, reasoning through logical relationships, and evaluating real-world consequences. For example, when discussing the "pollute first, clean up later" development path, a sequence of questions can be posed, such as "Who should bear the costs of environmental governance?" Is certain ecological damage irreversible? How should intergenerational environmental responsibilities be defined?" Through such multidimensional inquiry, students are guided to form a rational understanding of development models through argumentation and reflection, thereby enhancing both critical thinking and value judgment abilities.

(2) Integration of real-life examples

This approach connects abstract theories with real-world situations by incorporating everyday cases such as green consumption and green travel, guiding students to apply relevant theories in environmental economics and management for analysis and interpretation. It strengthens the relevance and applicability of theoretical knowledge. For instance, sandstorm events can be used as an entry point to discuss windbreak and sand-fixation measures as well as ecological governance, while overfishing can be used to illustrate the "tragedy of the commons." Such contextualized learning helps students understand the relationship between resource constraints and institutional arrangements, thereby cultivating their comprehensive analytical and problem-solving abilities.

4.2.2 Case-based teaching

By systematically introducing multi-level case resources, this approach constructs a closed-loop teaching model of "pre-class preparation—classroom discussion—post-class extension." It deeply integrates abstract theories with real-world contexts, thereby enhancing the explanatory power and applicability of the course. This model helps to promote students' progression from knowledge comprehension to comprehensive analysis and practical application.

(1) Case-based teaching on national policies and strategic guidelines

This approach centers on key national contexts such as the "dual carbon" targets, the ecological and environmental protection plan of the "14th Five-Year Plan," and the "Yangtze River Protection" initiative. It integrates original policy documents, authoritative interpretation videos, and relevant data resources. Leveraging online learning platforms, students are organized to conduct pre-class independent learning and complete tasks such as summarizing key policy points.

In classroom instruction, the teacher no longer focuses on merely restating policy content but instead emphasizes structured analysis from multiple dimensions, including historical context, theoretical foundations (such as sustainable development theory and resource property rights theory), and real-world implications. For example, when explaining the "dual carbon" targets, students are guided to conduct multidimensional analyses from perspectives such as industrial restructuring, energy system transformation, and the enhancement of national competitiveness. Through a blended "online + offline" teaching approach, students' understanding of macro-level policies is strengthened, while their strategic analytical ability and professional competence are further improved.

(2) Analytical case-based teaching using typical cases

Focusing on key issues in environmental governance, this approach selects representative positive and negative cases to construct a comparative analytical framework. For example, problem-oriented cases such as the "Changzhou toxic soil incident" and the "Tengger Desert pollution incident" are used to explore environmental risks, corporate behavior, and institutional constraints. In contrast, exemplary cases such as the "Saihanba Mechanical Forest Farm" and Zhejiang's "Two Mountains" practice are used to analyze ecological restoration and pathways of ecological value transformation.

Documentary excerpts and on-site visual materials are incorporated to enhance the situational realism and instructional impact of teaching. On this basis, students are guided to apply analytical tools, such as environmental cost–benefit analysis,

public goods theory, the Coase theorem, and environmental regulatory instruments, to deconstruct and evaluate the cases from multiple perspectives. This approach strengthens students' capacities for theoretical application, problem diagnosis, and normative analysis, while fostering professional competence that integrates rigorous analytical reasoning with a strong awareness of real-world issues.

(3) Classics-and-frontier literature-based case teaching

This approach constructs literature-oriented teaching modules centered on both foundational works and cutting-edge research achievements in the discipline. Representative texts such as Garrett Hardin's "The Tragedy of the Commons" and related studies published in journals such as Science and Nature are carefully selected to guide students in conducting in-depth reading and systematic synthesis. Through structured reading reports and in-class presentation sessions, students are required to comprehensively analyze the core arguments, logical structures, and methodological applications of the literature, followed by classroom discussion and academic exchange.

On this basis, students are guided to reflect on the applicability of different theoretical paradigms within the Chinese context. For example, when studying public goods theory and externality theory, they are encouraged to connect these frameworks with transboundary watershed pollution governance issues and to examine their practical application conditions and institutional constraints. This approach enhances students' abilities in literature interpretation, academic expression, and comparative analysis, while cultivating rigorous research competence and dialectical thinking.

(4) The practical application of economic theory in ecological environmental governance

This section uses the application of the Coase theorem in carbon emissions trading as a representative case to illustrate how economic theory is concretely applied in major national strategic practices, aiming to help students understand the practical use of economic theories in China's key strategic initiatives.

In teaching, the case is first introduced through the "dual carbon" strategy, the Administrative Measures for Carbon Emissions Trading, and policies related to the development of China's national carbon market, enabling students to understand the institutional context and strategic objectives. Secondly, the Coase theorem is integrated with the carbon emissions trading system. Emphasis is placed on explaining how emission allowances, as clearly defined property rights, are established and allocated. It further illustrates how enterprises engage in market-based transactions according to differences in marginal abatement costs, enabling low-cost firms to undertake greater emission reductions while high-cost firms reduce less. In this way, resource allocation is optimized and total abatement costs are reduced under a fixed emissions cap. Subsequently, through diagrams, simulated trading activities, and classroom questioning, students are guided to analyze the role of market mechanisms in ecological environmental governance, as well as the applicability and limitations of the Coase theorem. Finally, by connecting the discussion with China's carbon market development practice and national strategic objectives, classroom discussions and practical extensions are organized to strengthen students' institutional identification, strategic thinking, and sense of social responsibility, thereby achieving the organic integration of knowledge transmission, competency development, and value guidance.

4.2.3 Constructivist teaching

Centered on learners' active knowledge construction, this approach reconstructs the teaching process and learning pathways. Through authentic problem-driven learning and multi-stage collaborative activities, it promotes the coordinated development of knowledge understanding, competency enhancement, and value formation. It also facilitates the transformation of the classroom from a "knowledge transmission-oriented" model to a "problem-solving-oriented" model.

(1) Anchoring in context and creating authentic, inquiry-oriented problems

This approach focuses on key issues in ecological environmental governance and designs open-ended and integrative problem scenarios that are conducive to inquiry. Students are organized into groups to conduct systematic investigations. They are required to go through a complete process that includes data collection, literature review, solution design, model construction, and results presentation. Within authentic or simulated contexts, students integrate and apply disciplinary knowledge and methods, thereby strengthening their problem-oriented learning ability and achieving a transformation from knowledge acquisition to practical application.

(2) Collaborative inquiry and the construction of a scaffolding teaching system

The teacher shifts from a traditional lecturer to a designer and facilitator of learning activities. By providing diversified resources such as policy documents, emission data, and techno-economic parameters, a staged and progressive learning support framework is constructed. Meanwhile, through process-oriented guidance and staged progress reports, students are encouraged to analyze environmental issues from multiple perspectives, including economic feasibility, social equity, and environmental benefits. This approach promotes teamwork and deep learning and enhances students' comprehensive judgment and analytical capacity in addressing complex problems.

(3) Outcome construction: developing systematic solutions

Guided by an outcome-oriented approach, students are encouraged to integrate the data, methods, and findings generated throughout the research process. Then they are required to produce practice-oriented outputs such as research reports or policy recommendation proposals. For example, students may be assigned practice-oriented tasks such as "designing pathways to carbon neutrality" or "optimizing ecological compensation mechanisms." Through the process of developing and justifying their proposals, students deepen their understanding of relevant theories and methods. This further enhances their ability to translate academic knowledge into practical decision-making support, thereby achieving a progression from cognitive understanding to practical application.

4.2.4 Research-oriented teaching

This approach reconfigures classroom instruction by orienting it around the research process, embedding knowledge acquisition within authentic research contexts. It promotes learning through "learning by doing" and "learning through research," enabling students to systematically enhance their capabilities from theoretical understanding to problem-solving.

(1) Transforming research methods into teaching tools

The course goes beyond the mere delivery of existing theories and draws on research practices in fields such as "haze pollution control" and "pollution reduction and carbon mitigation" to extract frontier issues as entry points for teaching, thereby constructing a problem-driven learning pathway. The overall teaching process follows a structured research workflow: "problem formulation → literature review and critical analysis → research design → data or case collection and analysis → conclusion development → report or paper writing." This allows students to experience a complete cycle of micro-level research training. Throughout this process, emphasis is placed on strengthening students' systematic academic thinking and innovative thinking, while gradually cultivating a standardized academic research paradigm.

(2) Research tasks are embedded into the teaching process to optimize academic training approaches

By integrating authentic research tasks into course design, students are guided to focus on the practical significance and problem-oriented nature of research topics, thereby avoiding an excessive emphasis on quantitative evaluation indicators. The course emphasizes a problem-solving orientation and encourages students to conduct research on practical issues such as regional green development, environmental governance, and pollution reduction and carbon mitigation. In this way, the learning process is closely aligned with real-world needs. At the same time, systematic training in academic norms is integrated into the teaching process. The authenticity of data collection, the rigor of analytical methods, and the standardization of literature citation are incorporated into course content. Through process-oriented guidance, students are encouraged to develop a rigorous and evidence-based research attitude as well as a strong sense of academic integrity, thereby enhancing their academic expression and research capabilities.

4.3 Course implementation effectiveness

4.3.1 Value orientation dimension

According to the survey results on value orientation effectiveness (Fig. 1), 91.5% of students highly recognized the course's role in value guidance and awareness cultivation. Another 5.4% expressed recognition. Only 3.1% of students held a neutral attitude, and no negative evaluations were recorded. The value orientation dimension scored 34.18 out of 35, indicating that the course has achieved significant effectiveness in value guidance and strategic cognition. The results suggest that the course plays a prominent role in value formation and demonstrates strong educational impact in fostering holistic teaching and moral cultivation outcomes.

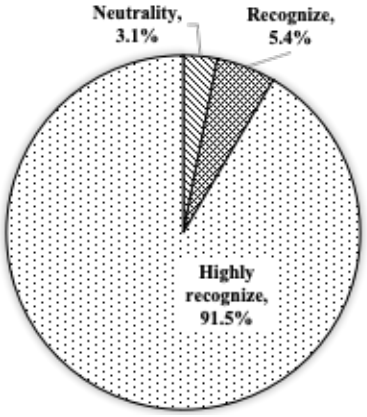

Fig. 1. Survey results of the value orientation dimension.

The course content remains highly aligned with national policies and guidelines, accurately conveying national strategic thinking and reflecting the firm commitment and strategic resolve of the CPC Central Committee in advancing ecological civilization construction. This has effectively strengthened students' understanding of the path of socialism with Chinese characteristics and the rule of law. On this basis, the course further encourages students to translate their understanding of national strategies into practical awareness and proactive behavioral commitment, subtly enhancing their overall consciousness of serving national ecological civilization construction and regional green development.

4.3.2 Teaching content dimension

According to the survey results on teaching content (Fig. 2), 88.5% of students highly recognized the course in terms of value guidance and content design, while 8.8% expressed general recognition. Another 2.4% remained neutral. Only 0.3% of students believed that certain aspects of the course did not fully reflect the spirit of scientific inquiry, particularly noting that the explanations of environmental economic models and management tools did not entirely convey their underlying logic and methodological value. The teaching content dimension scored 38.84 out of 40, indicating that the course content design is solid and effective.

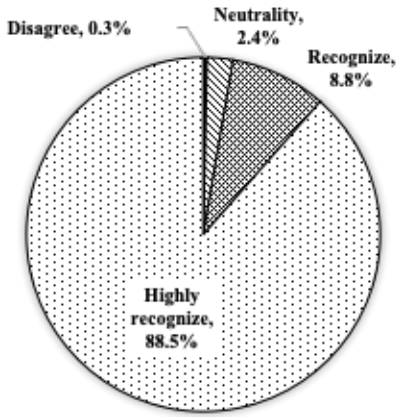

Fig. 2. Survey results of the teaching content dimension.

The evaluation results demonstrate that this teaching model closely integrates major national strategic priorities with global frontier issues, successfully embedding "China's approach" and national strategies into classroom teaching, thereby significantly enhancing the practicality and applicability of the course content. The course emphasizes appropriate and natural integration in content organization, strengthening value orientation while maintaining the centrality of disciplinary knowledge. It achieves an organic integration of theoretical learning, practical skills, and value cognition. Notably, a very small proportion of students (0.3%) raised concerns. Their feedback highlights the need to further strengthen the depth of explanation regarding the logical foundations and methodological implications of environmental economic models and management tools so as to better reflect the spirit of scientific inquiry.

4.3.3 Teaching methods dimension

According to the survey results on teaching methods (Fig. 3), 89.2% of students highly recognized the diversity of instructional approaches and the natural integration of course content with practical application. Another 8.5% expressed general recognition, while 1.9% remained neutral. Only 0.4% of students believed that there is still room for further improvement in teaching methods. The teaching methods dimension scored 34.05 out of 35, indicating a high level of student recognition of the course's instructional design. The classroom formats are diverse and engaging.

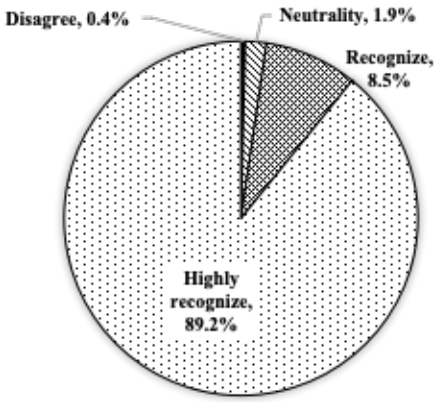

Fig. 3. Survey results of the teaching methods dimension.

This teaching model not only emphasizes knowledge transmission but also effectively fosters postgraduate students' interdisciplinary thinking and independent analytical abilities. Through a "diversified and organically triggered" blended teaching approach, classroom interaction and student engagement have improved significantly. Methods such as case-based teaching, group discussion, and scenario simulation are integrated throughout the instructional process, enabling students to actively construct knowledge through practice and reflection, thereby achieving an organic integration of theory and practice. However, a very small proportion of students (0.4%) suggested that teaching methods could be further improved. This feedback points to the potential for refining the design and implementation of the "four in one" teaching model to better accommodate diverse learning preferences and further enhance the overall effectiveness of the course.

4.3.4 Teaching effectiveness dimension

According to the survey results on teaching effectiveness (Fig. 4), 94.9% of students provided positive evaluations of their overall learning gains from the course. Among them, 83.8% expressed strong recognition, while another 11.1% indicated general recognition. Students generally recognized its significant effectiveness in developing systematic understanding, strengthening strategic cognition, promoting knowledge application and behavioral practice, and enhancing their ability to address real-world environmental problems. Another 4.7% of students remained neutral, while 0.3% of students strongly disagreed and believed that certain parts of the course were still relatively monotonous and lecture-driven. The teaching effectiveness dimension ultimately scored 38.24 out of 40, fully demonstrating the high-quality outcomes achieved by the course in capability development and practical application.

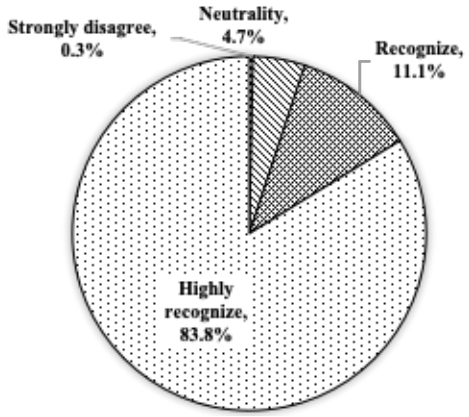

Fig. 4. Survey results of the teaching effectiveness dimension.

Through systematic learning, postgraduate students have not only significantly improved their ability to translate theoretical knowledge into solutions for complex environmental problems but have also gradually developed a holistic strategic understanding and policy-level cognition of ecological civilization construction, green development, and the "dual carbon" goals. The effectiveness of course teaching has been extended beyond classroom learning into practical application, enabling students to achieve comprehensive improvement in theoretical thinking, analytical ability, and practical skills. It is worth noting that the negative feedback from a student highlights a potential imbalance between interactive and lecture-based teaching approaches. It suggests that there is still room to optimize the structural balance between these modes. Future improvements could focus on further strengthening participatory and student-centered instructional design, thereby enhancing students' depth of engagement and promoting more active learning, ultimately leading to continuous improvements in overall teaching effectiveness.

5. Discussion

5.1 Interpretation of key findings

The results indicate the "four-in-one" teaching model has received a high level of student recognition. Its implementation has achieved remarkable results in guiding students' values and enhancing their comprehensive abilities. This finding confirms that practice-oriented and student-centered teaching approaches play a more prominent role in enhancing students' applied abilities and promoting their learning engagement. This is consistent with the findings of Peacock (2017) and Philokyprou (2025). Also, the assessment result of the value orientation dimension demonstrates that the integration of value-oriented elements into professional knowledge in environmental economics and management courses is both feasible and effective. It supports the view that there is no inherent conflict between values transmission and teaching professional knowledge. The two can be organically integrated through systematic instructional design.

The underlying mechanism lies in the multidimensional and coordinated embedding of values and professional knowledge. Specifically, the identification and integration of multilevel value elements can enhance students' cognitive understanding and strengthen their value identification. At the same time, the coordinated application of diverse teaching methods promotes students' participation and initiative. This enables students to progress from knowledge acquisition to capability enhancement and ultimately, to value internalization.

The "four-in-one" teaching model has achieved remarkable results. Students have shown a significant shift from knowledge acquisition to all-round development. Their specialized knowledge, application abilities, and consciousness of social responsibility have been effectively enhanced. This aspect remains underexplored in prior empirical studies. These findings demonstrate that the "four-in-one" teaching model promotes a transformation of the teaching paradigm from a traditional knowledge-centered instructional paradigm toward a more integrated educational paradigm. These findings demonstrate that the "four-in-one" teaching model promotes a transformation from a traditional knowledge-centered paradigm toward a more holistic educational paradigm. This new paradigm emphasizes the coordinated development of cognition, values, and competencies.

5.2 Applicability and limitations the teaching model

The "four-in-one" teaching model is particularly applicable to interdiscipline fields and policy-oriented disciplines, such as environmental economics, circular economy, new energy, and materials science. In these disciplines, the application prospect of professional knowledge is closely aligned with national strategic priorities. In such contexts, value-guided elements can be naturally embedded into knowledge instruction through policy analysis, case studies, and practical applications. Furthermore, this model will be more effective in postgraduate education, as students at this level typically possess a solid theoretical foundation and strong research learning capabilities.

Despite its advantages, this model still has certain limitations. On the one hand, it requires substantial teaching resources, particularly for case-based and research-oriented instruction. On the other hand, different teaching methods need to be systematically integrated. And the teaching content must be carefully designed to ensure an appropriate student workload. Excessive workload may lead students to engage in superficial rather than deep learning.

5.3 Adaptive strategies of the teaching model

To enhance the applicability and sustainability of the "four-in-one" teaching model, several adaptive strategies can be considered.

Firstly, a "one-size-fits-all" rigid application should be avoided. It is necessary to dynamically adjust the intensity and forms of value element integration based on course type, student background, and disciplinary characteristics. Meanwhile, an evaluation system should be established to assess the effectiveness of different teaching methods. Based on the feedback obtained, teachers should further refine and optimize the teaching model.

Secondly, it is necessary to achieve the balance among these four teaching methods. Teaching activities should be systematically and meticulously designed, with a rational allocation of the proportion and implementation rhythm of different teaching methods. This can ensure that learning tasks are carried out in an orderly manner within a manageable workload, thereby effectively promoting students' deep learning.

Thirdly, strengthen teachers' competencies. In addition to knowledge instruction, teachers' competencies in value guidance, case development, and the integrated application of diverse teaching methods also need to be improved. In particular, interdisciplinary collaborative teaching should be promoted.

Finally, it is necessary to establish a shared teaching resource platform. The development of case databases, policy information bases, and data platforms can facilitate resource sharing. Such an initiative helps reduce the workload of individual instructors, thereby supporting the wider implementation of this teaching model.

6. Conclusion

This study analyzes the pathways for improving teaching in environmental economics and management courses and constructs a "four-in-one" teaching model integrating heuristic interaction, case-based teaching, constructivist learning, and inquiry-based instruction. In response to the strong policy-oriented characteristics of this discipline, a quantifiable evaluation index system covering four dimensions—value orientation, teaching content, teaching methods, and teaching effectiveness—is developed to enable a systematic assessment of course implementation effectiveness. At present, this model has been applied in multiple courses such as Environmental Economics, Green Finance, and Resource, Environment and Circular Economy and has achieved significant outcomes, receiving high recognition from students. In teaching practice, the courses have not only effectively improved students' pro-

fessional knowledge and analytical abilities but also enhanced their comprehensive thinking and practical application skills, reflecting the organic integration of theoretical learning and practical implementation. However, the "four-in-one" model has both applicability and limitations. From our teaching experience, it works best for graduate courses that are policy-driven, interdisciplinary, and problem-oriented.

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Conflict of interest

The authors declare no conflict of interest.

References

Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. Distance Education, 40(1), 133-148.

Asunka, S., Freeman, E., & Arthur, L. S. (2018). Implementing constructivist pedagogy in a flipped mode in a postgraduate course. ICERI2018 Proceedings (pp. 3301-3309). IATED.

Chandran, D. S., Kaur, S., & Deepak, K. K. (2021). Student perceptions on synchronous virtual versus face-to-face teaching for leader-centered and participant-centered postgraduate activities during COVID-19. Advances in Physiology Education, 45(3), 554-562.

Chang, L., Wu, F. L., Wang, W. L., Zhao, Y. M., Li, S. Y., Zhao, Q. H., Jia, L. Y., Xu, J., Chen, M. Y., Qi, L. J., Duan, Y. N., Sha, L. L., & Guo, R. X. (2025). Research on the application effectiveness of VRTSS blended innovative teaching model in higher education. Education and Lifelong Development Research, 2(2), 86-91.

Chen, M. H., & Hao, Y. M. (2015). Thought about postgraduate education management mode in China. International Conference on Education, Management and Computing Technology (ICEMCT-15) (pp. 317-321). Atlantis Press.

Chen, S., Xue, Y., & Cui, X. Z. (2024). Information literacy of college students from library education in smart classrooms: based on big data exploring data mining patterns using Apriori algorithm. Soft Computing, 28(4), 3571-3589.

Chen, S. N., & Zhou, Y. H. (2023). Exploration on the reform of curriculum ideological and political education in environmental impact assessment course based on ability orientation. Education and Teaching Forum, (02), 53-56. (in Chinese)

Chen, T., Deng, F.-a., & Ren, S. Z. (2016). Reform and exploration of the training mode of postgraduate with full-time professional degree. 2016 International Conference on Education, E-learning and Management Technology (pp. 493-497). Atlantis Press.

Dong, B. R. (2022). On the essence and connotation of curriculum ideological and political education. Communication of Finance and Accounting, (12), 21-26. (in Chinese)

Han, W. J., Tian, Y. F., Han, Z. Y., Sun, P. F., Jin, X., & Yang, J. C. (2022). Research on the education system of practice base for professional master. In 2022 10th International Conference on Information and Education Technology (ICIET) (pp. 324-329). IEEE.

Jia, H. Q. (2022). Exploration and practice of professional degree postgraduate training mode in industry colleges and universities. Advances in Education, Humanities and Social Science Research, 2(1), 89-93.

Jiang, Z. X., Nian, Y., & Wang, H. L. (2024). Reform and innovation practice of course ideological and political education in financial management. Research in Higher Education of Engineering, (05), 153-159. (in Chinese)

Kithsiri, U. G., Peiris, A. P. T. S., Wickramarathna, T., Amarawardhana, K., Abeyweera, R., Senanayake, N. N., Jayasuriya, J., & Fransson, T. H. (2018). A remote mode master degree program in sustainable energy engineering: Student perception and future direction. International Conference on Interactive Collaborative Learning (pp. 673-683). Cham: Springer International Publishing.

Li, J. L., & Che, W. Y. (2022). Challenges and coping strategies of online learning for college students in the context of COVID-19: A survey of Chinese universities. Sustainable Cities and Society, 83, 103958.

Liu, F. (2016). Research on the cultivation mode of postgraduates' scientific research ability in the new situation. In 2016 2nd International Conference on Economy, Management, Law and Education (EMLE 2016) (pp. 457-460). Atlantis Press.

Peacock, E. E. (2017). The postgraduate research methods course in conservation: The practical approach taken at the University of Gothenburg. In CeROArt. Conservation, Exposition, Restauration d'Objets d'Art. Association CeROArt asbl.

Philokyprou, M. (2025). Linking teaching and research in conservation of the built environment: Case studies from courses of the University of Cyprus graduate programme on conservation. Studies in Conservation, 70(5), 343-357.

Singh, G. K. S., Sidhu, G. K., Ramasamy, R., Nair, S. M., & Derioh, M. M. G. (2024). Exploring new horizons in professional development: Teachers' shifting perspectives on postgraduate education. Journal of Ecohumanism, 3(8), 1432-1442.

Su, B. (2022). Enhancement of online education to the teaching paradigm: Taking academic medical postgraduate cultivation as an example. Frontiers in Medicine, 9, 807469.

Wang, P., Xie, Q. Y., & Ouyang, W. (2023). Practice of a teaching model for curriculum ideological and political education in environmental programs based on the historical perspective of ecological civilization. The Research

of Ideological and Political Courses, (01), 133-142. (in Chinese)

Xia, X., Gu, Z. J., & Chen, Z. (2025). Exploration and practice of ideological and political construction of graduate courses based on OBE. Journal of Shandong Technology and Business University, 39(02), 102-112. (in Chinese)

Xiao, Z. L., Zang, Y. H., & Hua, C. M. (2021). Research on the path of integration of ideological and political materials with professional curriculum knowledge in higher vocational colleges. Journal of Science and Education, (08), 145-149. (in Chinese)

Zhang, X., & Li, H. L. (2021). Clarification and reconstruction: Returning to the essential connotation of curriculum ideological and political education. Studies in Ideological Education, (05), 116-121. (in Chinese)

Zou, J., & Zhang, Y. (2022). The Cross-postgraduate training mode driven by intelligent signal processing technology: Taking the major of finance as an example. Advances in Mathematical Physics, 2022, 1-13.