Teaching Model to Enhance Environmental Awareness for Interior Design Undergraduate Students in Chengdu, China

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Abstract

Globalization has exacerbated environmental issues like climate change and resource depletion, prompting the international community to focus on sustainable development since 1992, with the United Nations adopting 17 goals in 2015. This research aims to elucidate the stage and requirements for environmental awareness in interior design courses, develop and focus on teaching the model of interior design to enhance environmental awareness, and confirm the effectiveness of the interior design model in increasing environmental awareness. The study aims to use a Mixed Methods Research (MMR) approach. Phase One involves collecting and analyzing data, while Phase Two involves developing a new teaching model. The research sample consists of 17 undergraduate institutions in Chengdu that specialize in interior design, and the respondents are undergraduate students from grades 1 to 4 and graduates who have been involved in interior design for 1 to 5 years. The research instruments include surveys, semi-structured interviews, and focus group discussions. The data were analyzed using frequency distribution, percentage, mean, standard deviation, and priority demand index. The results indicate: 1) Firstly, the most pressing need is to enhance work-integrated learning (WIL) opportunities, as students show significant deficiencies in this area; secondly, there is a substantial lack of knowledge and skills related to Education for Sustainable Development (ESD); the third area is the Project-Based Learning (PBL) teaching method, which received a moderate level of recognition. Lastly, students performed well in terms of attitudes and values, demonstrating a strong recognition of the importance of environmentally friendly design, indicating that the demand in this aspect is the least urgent. 2) The developed methodology encompasses seven key components, including knowledge, skills, innovative teaching methods, practice-oriented learning, teacher development and support, and student autonomous development. 3) The model's suitability rating was 4.51–5.00, indicating that it was very suitable; the feasibility rating was 4.51–5.00, indicating a very high likelihood of successful implementation.

Keywords: Teaching Model, Environmental Awareness, Interior Design, Chengdu, China.

1. Introduction

Globalization has led to a rise in environmental problems, including climate change, ecological damage, and resource depletion. The international community has been focusing on sustainable development since 1992, with the United Nations adopting 17 Sustainable Development Goals in 2015. However, the trend of global environmental deterioration remains a significant obstacle to human development. China has made ecological and environmental protection a core element of its national strategy, promoting harmony between nature and humanity. General Secretary Xi Jinping proposed the concept of ecological civilization in 2017, and China's Central Party Committee convened the National Conference on Ecological Environmental Protection in 2018. Major conferences, plans, and continuous practical efforts reflect China's actions in environmental protection. The country is integrating green development into all aspects of economic and social development, striving to achieve sustainable progress while adhering to its fundamental national policy of conserving resources and protecting the environment.

Environmental protection is a global concern that is crucial for the future of human society and a major challenge worldwide. UNESCO and the OECD emphasize the importance of Education for Sustainable Development (ESD). Environmental awareness is essential for addressing global and local environmental issues, enhancing individual commitment to conservation, and creating a healthy, livable environment for future generations. Environmental knowledge, values, and attitudes drive environmental awareness and positively influence environmental behaviors. Higher education plays a pivotal role in addressing environmental challenges by fostering environmental conservation awareness among students and promoting participation in protecting, improving, and building the environment. Environmental education also strengthens students' environmental knowledge and cultivates their environmental values and attitudes, enhancing their awareness and encouraging responsible behavior. Higher education institutions have a unique responsibility globally, shaping future decision-making leaders and professionals and contributing to achieving Sustainable Development Goals through research, public engagement, and university policies (Ahn et. al, 2013; Channuwong, 2018).

In China, the National Standards for Teaching Quality of Undergraduate Programs in General Higher Education Institutions emphasize the educational objective of cultivating high-quality specialists in environmental science and engineering. The success of education lies in stimulating students' practical abilities and innovative spirit, enabling them to apply theoretical knowledge to practical work, especially in specialized fields like interior design and environmental design. Sustainable interior design requires designers to create spaces that are aesthetically pleasing and functional while considering environmental responsibility, social welfare, and economic viability. Interior designers play a critical role in promoting sustainable transformations in building environments and adopting eco-friendly design practices. However, early interior design focused on aesthetic effects and neglected the importance of ecology and environmental protection. Higher education institutions must educate future design professionals, shaping talents with a responsible attitude towards environmental protection, profound knowledge, proficient skills, and steadfast values. Training future decision-makers in the interior design industry necessitates not only knowledge and skills specific to their field but also the cultivation of environmental awareness. Sustainable development in architecture focuses

on minimizing environmental pollution and maximizing the recycling of building materials at all stages of design, construction, and use. Material selection, energy efficiency, and research and development of environmentally friendly new materials are crucial for achieving sustainable development and preventing resource depletion and environmental degradation (Bo et al., 2022; Channuwong et al., 2024).

The lack of proper environmental knowledge hinders the adoption of green innovations in the interior design industry. To promote sustainable design principles, it is essential to cultivate designers' environmental awareness and enhance their professional knowledge and skills. Traditional teaching models in interior design education often fail to consider the challenges students may face in real-world environments and neglect to integrate environmental awareness into the teaching process (Bangbon et al., 2024). To address this disconnect, the Chinese government has implemented measures to promote the integration of industry and education, encouraging collaboration between schools and enterprises. Since 2010, the Ministry of Education has incorporated concepts such as "integration of work and learning, school-enterprise cooperation, and internships" into the "National Medium and Long-term Education Reform and Development Plan Outline (2010—2020)." In the field of interior design, the integration of industry and education means combining theory with practice to enhance students' awareness of environmental protection. This includes knowledge, attitudes, values, and action capabilities related to environmental conservation. Students not only learn about environmental and sustainable design theories in the classroom but also apply these theories in real business and community projects. This hands-on approach helps boost students' environmental consciousness, prepares them to better meet the demands of the industry after graduation, and promotes sustainable development in the field of interior design. Researchers are hoping to develop new teaching models in interior design to enhance students' environmental awareness. This new teaching model, based on Education for Sustainable Development and incorporating Work-Integrated Learning (WIL) and Project-Based Learning (PBL), provides a fresh perspective for interior design education. By engaging in hands-on projects to apply environmental concepts in real-world scenarios, students develop genuine skills to tackle environmental issues. This model significantly boosts students' environmental consciousness and provides theoretical support and practical guidance for the reform of eco-friendly interior design education in Chengdu and across China.

2. Research Objectives

1. To study the stage and requirements for environmental awareness in interior design courses
2. To develop the teaching model of interior design to enhance environmental awareness
3. To confirm the interior design model to increase environmental awareness

3. Conceptual Framework

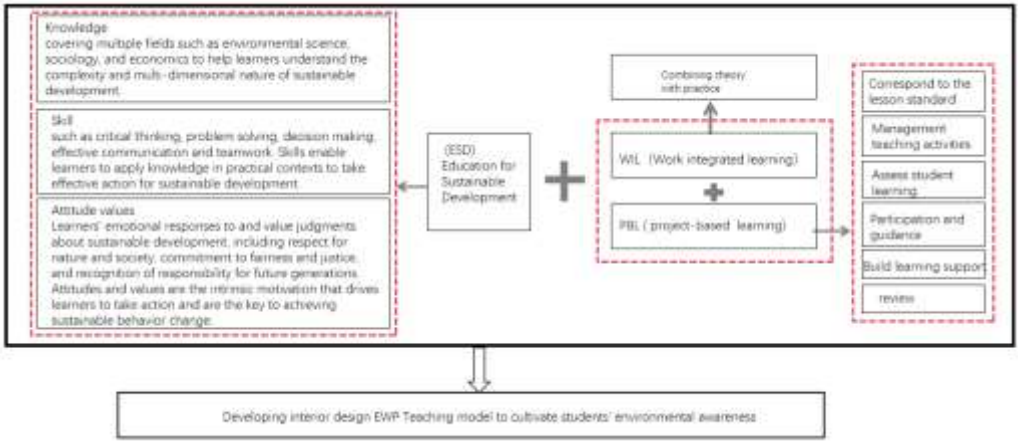

Figure 1: Research Conceptual Framework

4. Research Methodology

This study employs a mixed-methods approach to enhance the environmental awareness of undergraduate interior design students in Chengdu, China, through the collection and analysis of both quantitative and qualitative data. The researcher selected various tools, including literature reviews and relevant studies, questionnaires, interviews, and focus group discussions, to propose a constructed model divided into three phases as follows:

Phase One: Investigating the current state and requirements for environmental awareness among interior design students. This phase is divided into two parts: the first part gathers data on students' environmental practices through questionnaires, while the second part collects data on the needs for environmental awareness through interviews. The target sample comprises undergraduates from 17 institutions specializing in environmental design in Chengdu, including 9 public universities and 8 private colleges. The study employs a stratified random sampling technique and anticipates delivering roughly 400 questionnaires to the students. The informants will include final-year students and graduates working in interior design for 1 to 5 years, totaling 400 participants. The tools used will be a five-point Likert scale questionnaire, with the content validity of the basic demographic questions rated at 0.950 and the content validity for the current state of environmental awareness at 0.912. Additionally, the questionnaire response rate was 382, yielding a recovery rate of 95.5%. Data analysis will utilize frequency distribution, percentages, means, and standard deviations. The second part of the data was collected through interviews to understand students' environmental awareness needs. The interview sample will include two educational experts, two industry professionals, and two interior designers with over three years of practical experience. These experts will provide professional insights into students'

needs for environmental awareness from the perspectives of educational theory, industry requirements, and career development. The tools utilized will derive a necessary needs index from both the questionnaire and structured interviews (analyzed using SPSS PRO software), which the researcher generated from a theoretical framework of variables and indicators. The researcher rated the content validity of the basic demographic questions at 0.999, and the content validity of the current environmental awareness needs at 0.944.

Phase Two: The researcher developed a teaching model based on the hypothetical framework, analyzed relevant literature and research findings, evaluated the current status of environmental awareness and needs among undergraduate students in the field of interior design, and conducted an analysis and synthesis to design a preliminary framework for a new teaching model. The researcher submitted the model (draft) to the advisor for review and feedback, making revisions and improvements based on the advisor's suggestions.

Phase Three: The researcher invited stakeholders to evaluate the model's appropriateness and feasibility. The researcher convened an expert focus group for the evaluation of the model, analyzing the quality, suitability, and feasibility of the framework. The selection criteria for experts included scholars from interior design and environmental education, sustainable development experts, and distinguished design instructors representing teaching practices, totaling six individuals. The researcher appointed a moderator to facilitate the discussion and designated a recorder and assistant to handle audio recording, photography, and videography. The study compiled the results of the focus group discussions into a consensus regarding the proposal and analyzed the content to ensure consistency. A total of six experts participated in the group discussion, achieving a 100% participation rate.

5. Results

The findings of this study are divided into two sections: the present state and requirements, which aim to improve the environmental consciousness of Chengdu's interior design undergraduate students, and the evaluation outcomes of the established model as follows:

1. Current status and needs of environmental awareness among interior design undergraduates in Chengdu

The results regarding the current state show that Chengdu interior design undergraduates have the highest mean values in the dimension of attitudes and values, ranging from 3.73 to 3.95, with a standard deviation between 1.02 and 1.12, indicating a general high recognition and positive attitude towards the importance of environmentally friendly design. The second dimension is the PBL (Project-Based Learning) teaching model, with a mean feedback of 3.15 regarding the consistency of course content with national and local educational standards and a course structure satisfaction mean of 3.09. The mean values for the effectiveness of other teaching activities range from 3.13 to 3.31, showing a moderate level of recognition. In terms of skills, the mean values for students' competencies in implementing energy-saving, water-saving, and material-saving measures are between 2.73 and 3.05, with a standard deviation between 1.28 and 1.34, reflecting a demand for practical skills and the ongoing necessity for skill training. Regarding knowledge, the mean scores of students' grasp of environmental theory knowledge

are between 2.83 and 2.96, with a standard deviation between 1.22 and 1.32, indicating that the course has achieved some success in imparting environmental theory knowledge; however, there are still disparities among students that need further reinforcement. The most deficient aspect was the practical implementation of the Work-Integrated Learning (WIL) theory. The mean score for students' chances to work on real projects was 2.47, while the mean scores for school-enterprise collaboration projects and actual participation projects were 2.51 and 2.73, respectively. This indicates a moderate value for practical work opportunities.

According to the research on curriculum needs, the course requires further enhancement in both theoretical depth and breadth, and students lack relevant environmental knowledge and skills. Therefore, optimizing the curriculum is urgent; it needs to incorporate richer theoretical content on environmental awareness and integrate interdisciplinary knowledge from environmental science and sustainable development to ensure the course remains cutting-edge and practical. Innovative teaching methods are also necessary, employing diverse approaches such as case analysis, simulation projects, and interactive discussions to stimulate students' interest and initiative in learning. Additionally, we should strengthen practical teaching by providing abundant internships and competition activities to enhance students' hands-on abilities. Deepening school-enterprise cooperation is crucial; by establishing long-term and stable partnerships, enterprises can actively participate in the school's curriculum design and teaching, providing real project cases and industry experience to help students better understand market demands and trends. Furthermore, training for teachers should be conducted to enhance their knowledge of environmental design and teaching standards, enabling them to better guide students in learning and practice. Students themselves should also strengthen their self-driven environmental awareness, actively learning relevant knowledge and skills while cultivating innovative thinking and problem-solving abilities. Looking ahead, as societal awareness of environmental protection increases, the interior design industry will pay more attention to the integration of intelligent and sustainable technologies. Continuously improving and optimizing teaching models can significantly enhance the environmental awareness and capabilities of interior design students, better serving the industry's sustainable development needs through the collective efforts of all parties. It can be summarized as follows:

Table 1 Analysis Results

Name	Coding Theme	Subcode
ESD	Knowledge and Skills	The depth and breadth of environmental awareness theory content in existing courses.
		Interdisciplinary Knowledge Integration
		Important Environmental Protection Theoretical Knowledge
		Ensure the forefront of environmental design knowledge.
		Practical activities to enhance environmental design skills.
	Attitudes and Values	Teaching Methods for Establishing Environmental Awareness and Values
		Teaching Strategies to Transform Students' Environmental Awareness
PBL	Corresponding to the curriculum standards	The Gap Between Curriculum Standards and Actual Teaching Content and Methods for Bridging It
	Manage Teaching Activities	Management and allocation of learning activity time
	Assessing Student Learning	Standards for Assessing Students' Comprehensive Abilities
	Participation and Guidance	Methods and strategies for guiding students to discover and address environmental issues and achieve balance.
	Building a Learning Scaffold	Methods and Adjustment Strategies for Building Learning Scaffolds for Students
	Review and Reflection	Methods for Reflecting on and Summarizing Students' Understanding of Environmental Design
WIll	Theory combined with practice	Challenges Faced by Students and Support Strategies from Teachers

Name	Coding Theme	Subcode
		Effective Teaching Models and Methods and Their Application in Real Work Scenarios

The results of the research analysis focus on enhancing environmental awareness among interior design students. This model's theory encompasses three main dimensions. The first dimension, based on the theory of Education for Sustainable Development (ESD), emphasizes promoting sustainable development through education, cultivating students' knowledge, skills, attitudes, and values to address environmental challenges. The second dimension is constructivism, which emphasizes the importance of building knowledge through practical experience and social interaction. Project-Based Learning (PBL), a constructivist approach, encourages students to learn by solving real-world problems within projects. John Dewey's pragmatic educational theory, emphasizing "learning by doing" and asserting a close link between education and real life, facilitates learning through experience and reflection. Work-Integrated Learning (WIL) is one of the modern applications of Dewey's pragmatic educational theory, combining classroom learning with practical work experience, helping students apply and deepen their knowledge in authentic work environments. Ultimately, the aim is to cultivate students' capacity for sustainable design actions and promote sustainable development.

Table 2 Content Analysis

	PBL Project-Based Learning	Work Integrated Learning (WIL)	Current Status of Environmental Awareness	ESD Sustainable Education Theory
PBL Project-Based Learning	1	.394**	.447**	.406**
Work Integrated Learning (WIL)	.394**	1	.870**	.707**
Current Status of Environmental Awareness	.447**	.870**	1	.916**
ESD Sustainable Education Theory	.406**	.707**	.916**	1

** Correlation is significant at the 0.01 level (2-tailed).

A correlation analysis revealed significant positive correlations between PBL project-based teaching, the integration of theory and practice, the current state of environmental awareness, and the theory of Education for Sustainable Development (ESD). The correlation coefficients were 0.394, 0.447, and 0.406, respectively. The integration of theory and practice had 0.870 and 0.707 correlations, respectively. The highest correlation was 0.916 between the current state of environmental awareness and the theory of ESD, indicating a strong positive relationship between the two. This suggests a positive association between PBL project-based teaching and environmental awareness enhancement.

2. Regarding the suitability and feasibility of a model to evaluate the enhancement of environmental awareness in interior design students through expert group discussions.

Figure 3: Model for Enhancing Environmental Awareness in Interior Design Students

This study proposes a model (SDCM) aimed at increasing environmental awareness among undergraduate students in the interior design field, with the goal of assessing educational practices and promoting students' holistic development. It includes six core dimensions: foundational knowledge, practical skills, innovative teaching methods, practice-oriented learning, teacher development, and student autonomy. The model encourages students to apply theory to real-world problems, fosters creativity, and supports personalized learning pathways.

Figure 4: Composition of Knowledge

Indoor design courses need to improve their theoretical content on environmental awareness, integrating interdisciplinary knowledge like environmental science and sustainable development. This will help students understand and apply environmentally friendly design principles in their practices. By incorporating case studies, lectures, and workshops, students can develop a comprehensive theoretical knowledge structure related to environmental protection. Additionally, we should update the course content to reflect current industry trends and technological advancements, ensuring students acquire the latest design concepts and innovative

technologies. This approach not only enhances the curriculum's modernity and practicality but also prepares students for the rapidly changing industry environment.

Figure 5: Composition of Skill

The curriculum aims to enhance students' practical abilities in environmentally friendly design through integrated concepts like 3F and 5R. In real-life environments, course projects apply these principles, along with energy-saving, water-saving, and material-saving measures. Skill training focuses on broadening students' capabilities through systematic activities and continuous assessments. Project training and competitions provide practical experience and stimulate innovation. Workshops and skill training courses offer in-depth learning of new technologies and trends, allowing students to update their knowledge base. Regular evaluation and feedback mechanisms help identify shortcomings and improve application abilities.

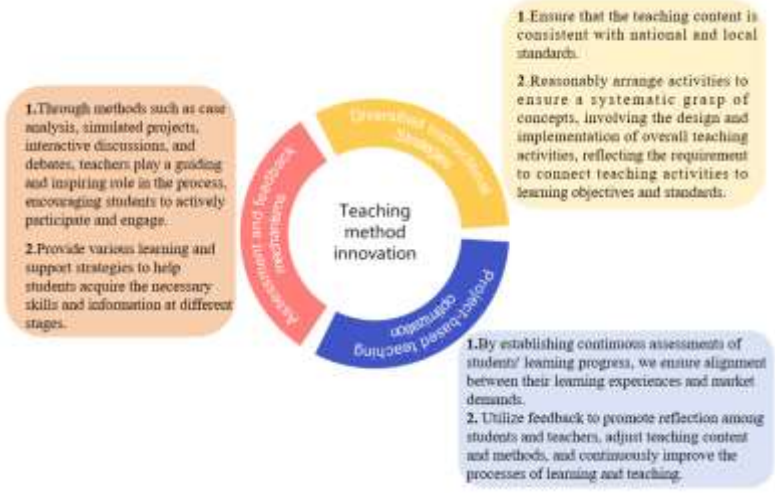

Figure 6: Innovative Teaching Methodology Diagram

Sustainable design teaching methods involve diverse approaches like case analysis, simulated projects, and interactive discussions. Teachers play a crucial role in guiding students and promoting deep learning and critical thinking. Curriculum design should include a solid foundation of basic knowledge, with practical application focusing on project-based learning. Support strategies should be personalized and specialized, offering opportunities like mentorship, industry internships, and research projects. Teachers should align teaching content with national and local standards, design activities based on learning objectives, and provide differentiated instruction. Continuous assessment is essential for monitoring students' progress and aligning their experiences with market demands. Feedback encourages reflection among students and teachers, allowing teachers to make necessary adjustments to their teaching methods.

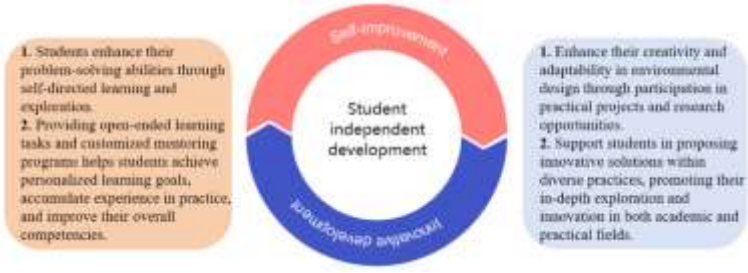

Figure 7: Diagram of Student Autonomous Development

The Chengdu Interior Design program focuses on student autonomous development to promote self-improvement and innovative growth. This approach enhances environmental awareness among undergraduate students by encouraging independent learning and exploration. Open-ended tasks and customized mentoring programs help students achieve personalized learning goals, enhancing their overall competencies. The program also cultivates students' innovative thinking, particularly in sustainable design and environmental awareness. In the field, they strengthen their creativity and adaptability by involving students in real projects, research opportunities, collaborations with enterprises, and community service activities. This approach not only enhances their professional capabilities but also fosters environmental awareness and social responsibility, preparing them to become active advocates for sustainable development in their future careers.

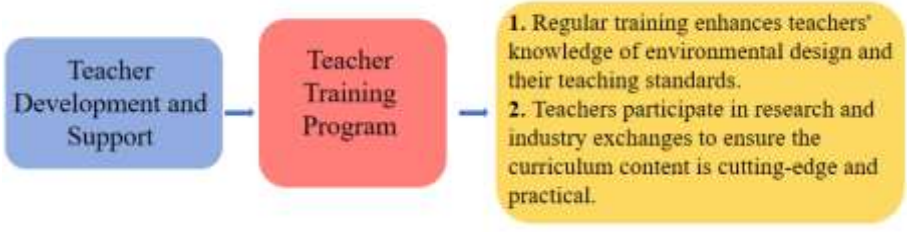

Figure 8: Teacher Development and Support Framework

Teacher development and support enhance educators' professional knowledge and teaching skills in the field of environmental design through regular training activities. It also encourages participation in scientific research and industry exchanges to ensure that curriculum content keeps up with the latest industry trends. A continuous professional development model enables teachers to update their teaching methods and course materials, adapting to the rapidly changing educational demands and environmental challenges, thereby fostering teachers' professional growth and enhancing their ability to meet the challenges of modern education.

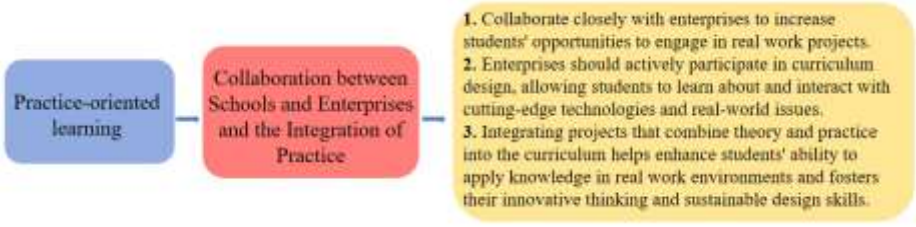

Figure 9: Practice-Oriented Learning Framework Diagram

Practice-oriented learning emphasizes the integration of academic knowledge with practical work experience, and school-enterprise collaboration is a core strategy to achieve this goal. By establishing partnerships with businesses, schools provide students with opportunities to engage in real work projects, enhancing their practical experience and exposing them to cutting-edge technologies and real-world challenges. Enterprises participate in course design and provide real case studies, assisting students in observational learning and hands-on practice, thereby improving their ability to apply classroom knowledge to actual work, particularly in the area of sustainable design.In real projects, students delve into every aspect of the project, experiencing the complete process from planning to evaluation, mastering professional skills, and cultivating critical thinking and problem-solving abilities. This practice-oriented teaching model also fosters students' communication skills and teamwork spirit, providing them with professional networks and employment opportunities. Through continuous feedback and assessment, schools and enterprises optimize their collaboration model, ensuring that educational content aligns with industry demands and cultivating more competitive professionals.

Assessment of the Model's Results

When considering all aspects, the following findings were observed: 1) The model name's appropriateness reached the highest level of 100%, while the feasibility assessment was 97%; 2) The knowledge of environmentally-friendly design achieved 87% appropriateness and 93% feasibility; 3) In the area of environmental design skills, both appropriateness and feasibility were rated at 93%; 4) In terms of innovative teaching methods, appropriateness and feasibility were also rated at 93%. 5) Practice-oriented learning reached the highest level, with both appropriateness and feasibility at 100%; 6) The appropriateness of teacher development and support was rated at 97%, with feasibility at 93%; 7) The appropriateness of student autonomous development was rated at 97%, with feasibility at 93%. Finally, experts recommended timely updates to theoretical knowledge to align with industry standards and to implement environmental knowledge based on the latest national environmental protection standards each

year. These components complement each other and collectively form an important foundation for providing comprehensive support in the field of sustainable development education.

6. Conclusion and Recommendations

The current indoor design curriculum lacks depth and breadth in environmental awareness theory, leaving students without relevant knowledge and skills. To enhance students' environmental awareness and sustainable design practice capabilities, interdisciplinary knowledge, practical application, effective teaching methods, and comprehensive assessment standards are crucial. This study should optimize the curriculum, introduce diverse teaching methods, strengthen school-enterprise cooperation, improve teacher training, and focus on students' personal development. Diverse teaching approaches, such as case analysis, simulation of real projects, interactive discussions, and debates, can stimulate interest and initiative in learning. Enhancing school-enterprise cooperation will provide students with more internship and practical opportunities, and we should enhance teacher training to guide them in their learning and practice. Students should focus on their own development, enhancing their awareness of environmental protection, proactively learning about environmental knowledge and skills, and improving their overall quality. Cultivating innovative thinking and problem-solving abilities while continuously accumulating experience in practice will prepare them for future career development. In the future, the interior design industry will place greater emphasis on eco-friendly design and sustainable development. Smart technology and sustainable practices will become a significant trend, with designers promoting the use of recyclable and renewable materials to reduce resource consumption and waste generation. Designers will collaborate closely with engineers, environmental scientists, and other professionals to develop innovative eco-friendly solutions. By fostering outstanding interior design talents with environmental awareness and capabilities, the industry can contribute to sustainable development goals and move towards a more eco-friendly, intelligent, healthy, and sustainable direction.

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