Navigating the Complexities: A Systematic Literature Review on the Challengers of Implementing Sustainable Interior Architecture Education

FUTURE CITIES AND ENVIRONMENT

REVIEW

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ABSTRACT

The global discourse on sustainability has heightened the importance of integrating sustainable design principles into interior architecture education. However, the implementation of such education faces complex challenges. This investigation draws upon Scopus-indexed papers published within the timeframe spanning from 2009 to 2023. Through a comprehensive analysis of these scholarly sources which contributed from 32 referred journals, this study examines these challenges, aiming to provide insights and strategies for effective implementation of Sustainable Interior Architecture Education. A primary challenge is the lack of a structured approach, leading to fragmented learning experiences for students. The wide-ranging concepts within sustainable design, coupled with resistance to change and limited resources, further complicate integration efforts. Additionally, there is a lack of awareness among educators and students about the significance of sustainability in interior architecture, hindering motivation and understanding of sustainable practices. Evaluation methods also prove challenging, as traditional approaches may not adequately assess sustainable design principles. Pedagogical challenges arise from balancing fundamental design skills with sustainability teachings. Industry alignment and cultural variations further impact the implementation process. Addressing these challenges requires collaboration between educational institutions, industry stakeholders, and policymakers.

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INTRODUCTION

The global discourse on sustainability has intensified in recent years, significantly influencing various professional fields, including interior architecture. Sustainable interior architecture education has emerged as a crucial response to the pressing environmental and societal challenges of our time (Akadiri et al., 2012). As the demand for professionals capable of designing aesthetically pleasing and environmentally responsible interior spaces continues to grow, educational institutions are increasingly compelled to integrate sustainable design principles into their curricula. However, the successful implementation of sustainable interior architecture education is a complex and multifaceted endeavor, fraught with numerous challenges that require careful consideration.

One of the primary challenges is the lack of a structured and effective approach. Institutions often struggle to develop cohesive curricula that seamlessly integrate sustainability principles across all levels of education. This lack of structure can lead to fragmented learning experiences for students, where sustainable thinking is not consistently reinforced or applied comprehensively (Boarin & Martinez-Molina, 2022). Additionally, the fragmented nature of sustainable thinking within the field further complicates the integration process. Sustainable design encompasses a wide range of concepts, from energy efficiency and renewable materials to social and cultural considerations (Özkan & Gokdag-Ersozoglu, 2021). Educators and students alike may find it challenging to grasp the full scope of sustainability, leading to a disjointed understanding that hinders effective implementation (Magdalena, 2017). Furthermore, resistance to change is another significant barrier. Both educators and students may be accustomed to traditional design practices and reluctant to adopt new methodologies that prioritize sustainability (Awang et al., 2020). Limited resources pose a substantial obstacle as well. Implementing a comprehensive sustainable interior architecture curriculum requires investment in new materials, technologies, and training for educators (Boarin et al., 2020). Many institutions, particularly those with constrained budgets, may find it difficult to allocate the necessary resources to support these initiatives.

Additionally, there is often a lack of awareness among both educators and students about the importance of sustainability in interior architecture. This lack of awareness can result in a lack of motivation to pursue sustainable practices and a failure to recognize the broader environmental and societal impacts of their work (Özkan & Gokdag-Ersozoglu, 2021). Evaluation and assessment methods also present challenges. Traditional evaluation techniques may not adequately capture the effectiveness of sustainable design principles. Developing new assessment methods that accurately measure students' understanding and application of sustainability is essential for ensuring that educational objectives are met (Kineber et al., 2023). Pedagogical challenges further complicate the integration of sustainability into interior architecture education. Instructors must balance the need to teach fundamental design skills with the imperative to incorporate sustainability. Industry alignment is another critical factor (Celadyn, 2020). The interior architecture industry must support and value sustainable practices for educational initiatives to be successful Celadyn, 2020). Finally, cultural and regional variations can impact the implementation of sustainable interior architecture education. Different regions may have unique environmental challenges, regulatory frameworks, and cultural attitudes towards sustainability (Pektaş et al., 2015). Educational institutions must tailor their approaches to these local contexts to ensure relevance and effectiveness.

This paper aims to identify and analyze the critical factors impeding the implementation of sustainable interior architecture education. By examining these challenges, we seek to provide a structured framework that encompasses the various obstacles, offering valuable insights into strategies and solutions necessary to overcome these challenges effectively. This analysis is essential for advancing sustainable interior architecture education and ultimately contributing to a more sustainable and resilient built environment.

LITERATURE REVIEW

The challenging factors of implementation of sustainable interior architectural education are tabulated and shown in Table 1. In this study, there are total of 32 scholars being referred. In general, the key elements for sustainable interior architectural education can be categorized into ten (10) key factors after referring to the journals including lack of a structured and effective approach, fragmented nature of sustainable thinking, resistance to change, limited resources, lack of awareness, evaluation and assessment methods, complexity of sustainable concepts, pedagogical challenges, industry alignment and cultural and regional variation as shown in Table 1, by accumulating ticks via referring journals.

METHODOLOGY

This study employs a rigorous systematic literature review process to thoroughly and objectively analyse the existing body of knowledge regarding the challenging factors in implementing sustainable interior architectural education. By adhering to a well-defined methodology, the goal is to identify the key elements of sustainable interior architectural education as outlined in relevant studies from various sources. This systematic approach helps minimize bias, ensures transparency, and

NO.	AUTHORS (YEAR)	KEY FACTORS									
		LACK OF A STRUCTURED & EFFECTIVE APPROACH	FRAGMENTED NATURE OF SUSTAINABLE THINKING	RESISTANCE TO CHANGE	LIMITED RESOURCES	LACK OF AWARENESS	EVALUATION & ASSESSMENT METHODS	COMPLEXITY OF SUSTAINABLE CONCEPTS	PEDAGOGICAL CHALLENGES	INDUSTRY ALIGNMENT	CULTURAL AND REGIONAL VARIATIONS
1.	Paola Boarin et.al (2022)	*									
2.	Mojtaba Ashour et.al (2022)	*									
3.	Umut Tuğlu Karslı (2013)	*							*		
4.	Rahaf Aloudeh et.al (2022)	*									
5.	Simay Özkan et.al (2021)		*			*				*	
6.	Arita Hanim Awang et al (2020)		*	*		*	*		*		
7.	Jaye Ellis (2009)		*								
8.	Rasha Mahmoud Ali El- Zeiny (2012)			*							
9.	Michelle Hankinson (2013)			*	*	*					
10.	Nahia Idoiaga Mondragon (2023)			*							
11.	D.D. Warrick (2023)			*							
12.	Basak Gucyeter (2016)				*			*			
13.	Paola Boarin et al (2020)				*						
14.	Muhammad Azzam Ismail et al (2017)				*						
15.	Mojtaba Ashou et al (2022)				*						
16.	Donia M. Bettaieb (2020)					*					
17.	Ahmed Farouk Kineber et al (2023)					*	*				
18.	Camille de Gaulmynn et al (2019)						*				
19.	Kamal Eldin Mohamed et al (2018)						*	*			
20.	Marriott, Christine A (2012)				*		*				
21.	Meltem Gürel (2010)						*	*	*		
22.	Ali Basim Alfuraty (2020)							*			
23.	Shu Fen Chou (2023)							*			
24.	Magdalena Celadyn (2020)							*	*	*	
25.	Ján Legény et al (2019)								*		
26.	Petros Lapithis et al (2020)									*	
27.	Sarah Rahman et al (2022)									*	
28.	T.M.I. Affandi et al (2022)									*	
29.	Şule Taşlı Pektaş et al (2015)										*
30.	Usha Iyer-Raniga (2017)										*
31.	Che Ibrahim et al (2022)										*
32.	Alex Opoku (2015)										*
Total times referred		**4**	**3**	**5**	**6**	**5**	**5**	**6**	**5**	**6**	**4**

Table 1 Challenging factors of implementation of sustainable interior architectural education.

establishes a strong foundation for the research findings (Snyder, H., 2019). Through this systematic review, the study aims to provide a comprehensive overview of the current research landscape, pinpoint knowledge gaps, highlight trends, and extract meaningful insights that enhance our understanding of the key elements of sustainable interior architectural education.

The research methodology adopted for the present of research work is presented in Figure 1. In the initial phase, an exhaustive literature review is carried out to extract the key elements for sustainable interior architectural education. Further with the systematic literature review process where there (3) filters have been set. There are:

a) Filter 1 – Database selection for collection the journal. Where in this research, the Scopus journal has been chosen.
b) Filter 2 – Selection of keyword. The keywords used are: 'challenging factors' and 'sustainable' and 'interior architectural education'
c) Filter 3 – Time period inclusion between year 2009 to 2023.

A systematic review was conducted using a combination of the keywords highlighted above. The challenging factors in implementing sustainable interior architectural education were tabulated based on scholars, and the frequency of references to these attributes was also tabulated. In the final stage, the findings regarding the challenging factors in implementing sustainable interior architectural education were presented in the form of an infographic using a sunburst chart. Referring to Figure 2, the number of journals used for this research is shown. A total of 32 journals were used in this study. The highest number of journals came from the year 2022 (8 journals), followed by 2020 (5 journals).

RESULTS AND DISCUSSION

RESULTS

Based on Table 1, the ranking on times referred for challenging factors in implementing sustainable interior architectural education rank based on the Table 2 below and further reflected on Figure 3 Spider-web tabulation numbers of times referred challenging factors in implementing sustainable interior architectural education.

The ranking on ten (10) challenging factors in implementing sustainable interior architectural education has been rank based on numbers of times referred and highlighted by the thirty-two (32) scholars. The first rank are Limited Resources, Complexity of Sustainable Concepts and Industry Alignment. Second rank are Resistance to Change, Lack of Awareness, Pedagogical Challenges and Evaluation & Assessment Methods follow by third rank which are Lack of A Structured & Effective Approach and Cultural and Regional Variations. The fourth rank is Fragmented Nature of Sustainable Thinking.

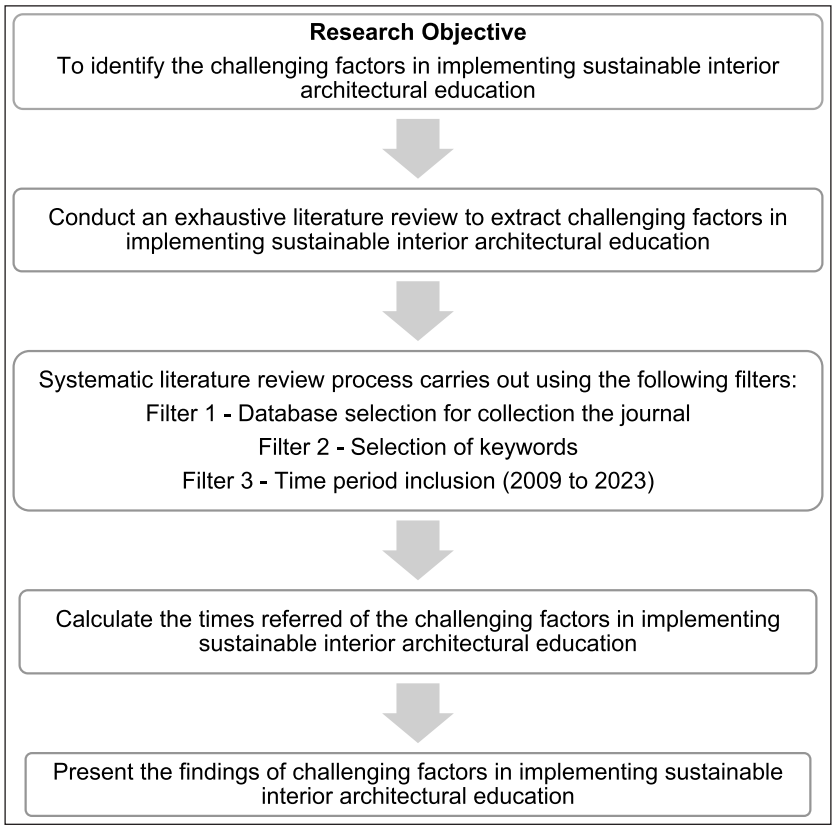

Figure 1 Research methodology.

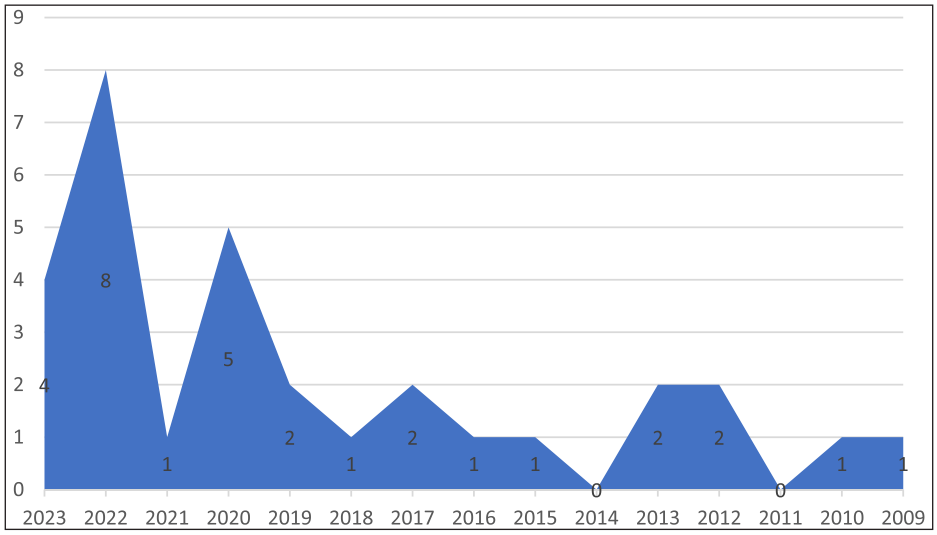

Figure 2 Number of journals referred according to year.

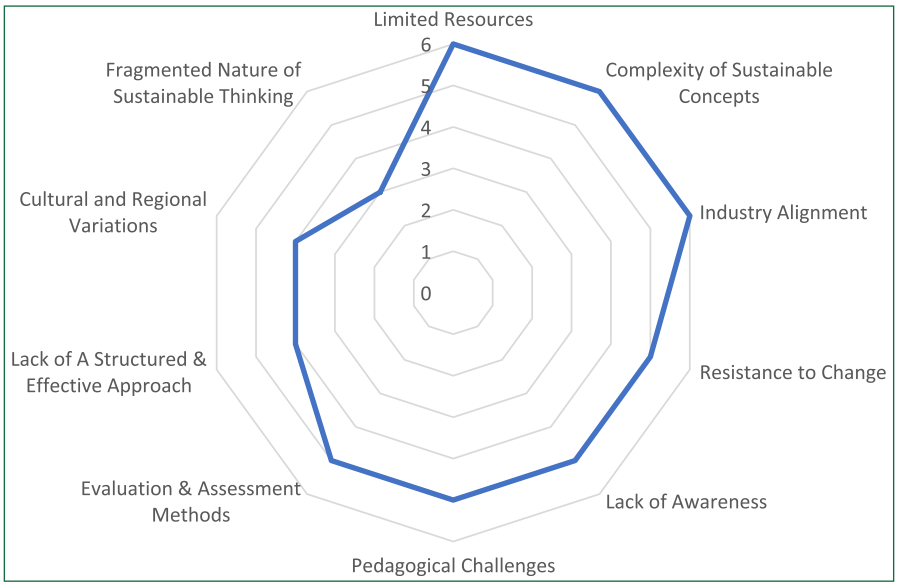

Figure 3 Spider-web tabulation numbers of times referred challenging factors in implementing sustainable interior architectural education.

NO.	CHALLENGING FACTORS IN IMPLEMENTING SUSTAINABLE INTERIOR ARCHITECTURAL EDUCATION	TOTAL TIMES REFERRED	RANKING
1.	Limited Resources	6	1
2.	Complexity of Sustainable Concepts	6	1
3.	Industry Alignment	6	1
4.	Resistance to Change	5	2
5.	Lack of Awareness	5	2
6.	Pedagogical Challenges	5	2
7.	Evaluation & Assessment Methods	5	2
8.	Lack of A Structured & Effective Approach	4	3
9.	Cultural and Regional Variations	4	3
10.	Fragmented Nature of Sustainable Thinking	3	4

Table 2 The ranking based on total times referred for key elements for sustainable interior architectural education.

DISCUSSION

Limited Resources

Integrating sustainability into interior architecture education is crucial for fostering environmentally conscious design practices. However, the lack of resources poses a significant barrier to its effective implementation. Financial constraints, inadequate infrastructure, and limited access to sustainable building materials are primary challenges (Gucyeter, 2016; Boarin et al., 2020). These resource limitations not only affect course materials and faculty expertise but also restrict the availability of sustainable design studios and research opportunities (Ismail et al., 2017). Addressing these issues through increased resource allocation—such as enhanced funding for faculty training and updated course content—is vital for advancing sustainable interior architecture education (Ashour et al., 2022). Without sufficient resources, institutions risk falling short in preparing future interior architects for the demands of sustainable design industries.

Complexity of Sustainable Concept

Incorporating sustainability into interior architecture education is crucial for addressing contemporary environmental and societal challenges, but the complexity of sustainable concepts presents significant hurdles. These concepts are multifaceted, involving ecological, social, and economic dimensions that require an interdisciplinary approach (Magdalena, 2017). Students often struggle with understanding how to integrate sustainability into their design projects due to its abstract nature, which can limit their engagement and application of these principles (Mohamed, 2022; Gürel, 2010). Furthermore, the rapidly evolving standards in sustainable design necessitate continuous updates to curricula and teaching methods, making it challenging for educators to stay current (Alfuraty, 2020). Balancing design priorities, such as energy efficiency, material selection, and human well-being, can overwhelm students without a structured, coordinated teaching approach (Chou, 2023). Hands-on learning experiences, which are often essential for students to fully grasp sustainability principles, require innovative educational strategies (Celadyn, 2020). Thus, overcoming the complexity of sustainable concepts through interdisciplinary collaboration and dynamic teaching methods is vital to preparing students for integrating sustainability into their future design practice.

Industry Alignment

Integrating sustainability into interior architecture education requires alignment with industry practices to ensure graduates are equipped to meet professional standards. However, achieving this alignment is complex due to rapidly evolving industry expectations and the challenge of keeping curricula up-to-date (Celadyn, 2020; Güre, 2010). While graduates need practical, industry-relevant skills, curricular revisions often lag behind industry demands, posing difficulties for educators (Celadyn, 2020). The disparity between academic priorities and the fast-paced changes in the industry further complicates the alignment process (Özkan & Gokdag-Ersozoglu, 2021). Addressing this gap requires continuous curriculum updates, faculty training, and closer collaboration between academia and practitioners (Lapithis & Kazamia, 2020; Rahman et al., 2022). Establishing strong industry partnerships is crucial for ensuring graduates are prepared to contribute effectively to sustainable design practices. Overcoming the challenges of curriculum adaptation and the dynamic nature of sustainability practices is essential for fostering industry-aligned education in sustainable interior architecture (Affandi et al., 2022).

Resistance to Change

Resistance to change within academic institutions and the design industry is a significant obstacle to integrating sustainability into interior architecture education. This resistance can manifest at both institutional and individual levels, with faculty members, administrators, and even students reluctant to adopt new approaches and perspectives (El-Zeiny, 2012; Awang et al., 2020). Entrenched pedagogical practices and reluctance to revise curricula hinder the effective incorporation of sustainability principles into education (Warrick, 2023). Overcoming this challenge requires fostering interdisciplinary collaboration, adaptability, and cultural sensitivity within academic institutions (Shu, 2023). Faculty development and institutional support are key to addressing resistance and creating a culture of sustainability in interior architecture programs (Mondragon, 2023). Implementing these changes is essential for preparing students to meet the evolving demands of a sustainable design industry.

Lack of Awareness

A lack of awareness is a significant challenge in integrating sustainability into interior architecture education. Both students and faculty often fail to recognize the ecological and social implications of their design choices, which can hinder the adoption of sustainable practices (Bettaieb, 2020; Awang et al., 2020). This limited awareness results in a lack of motivation and commitment to sustainability education, impeding the development of a sustainability-focused mindset (Kineber et al., 2023). Additionally, minimal exposure to sustainability concepts can foster resistance to change and reduce interest in integrating sustainability into curricula (Özkan & Gokdag-Ersozoglu, 2021). Raising awareness among students, faculty, and institutions is essential for promoting the urgency of

sustainable design practices. Educational initiatives and campaigns are critical for fostering a culture of sustainability, ensuring that future interior architects are motivated to embrace environmentally responsible design practices.

Pedagogical Challenges

Pedagogical challenges play a significant role in hindering the effective implementation of sustainable interior architecture education (Karslı, 2013). The multidisciplinary nature of sustainability demands interdisciplinary approaches, which educators may find difficult to incorporate comprehensively (Gürel, 2010). Implementing experiential and project-based learning—essential for teaching sustainability—often clashes with traditional curricula, making it harder to balance established design principles with new sustainability concepts (Celadyn, 2020; Awang et al., 2020). Furthermore, faculty members may lack the readiness or expertise to integrate sustainability effectively, requiring additional training (Legény et al., 2019). Developing courses that convey sustainability principles without compromising the rigor of architectural education is a key pedagogical hurdle (Karslı, 2013). To address these challenges, interdisciplinary approaches, experiential learning, and faculty development are essential for preparing students to embrace sustainability in their future design practices.

Evaluation & Assessment Methods

Effectively integrating sustainability into interior architecture education requires robust evaluation and assessment methods that measure both understanding and practical application of sustainable design principles. However, traditional assessment strategies often fall short in capturing the interdisciplinary and holistic nature of sustainability (de Gaulmynn & Dupre, 2019). Innovative methods are needed that go beyond theoretical knowledge, focusing on practical competencies in sustainable design (Özkan & Gokdag-Ersozoglu, 2021). The lack of appropriate tools and faculty training further complicates this evaluation process (Kineber et al., 2023). Performance-based assessments, where students apply sustainable principles in real-world scenarios, offer a more comprehensive evaluation of practical skills but are more complex to design and implement (Mohamed & Ozkan, 2018). Traditional methods, like exams and essays, are insufficient for evaluating the practical application of sustainability concepts, highlighting the need for authentic assessments that reflect real-world challenges (Marriott, 2012). In conclusion, developing innovative and interdisciplinary assessment strategies is critical to ensuring that students graduate with the skills needed for sustainable and responsible design practices.

Lack of A Structured & Effective Approach

Integrating sustainability into interior architecture education is crucial for addressing environmental and societal challenges within the design field. However, a significant obstacle is the lack of a structured and effective approach to incorporating sustainability into educational programs. Without clear frameworks and strategies, effective implementation becomes difficult (Boarin & Martinez-Molina, 2022). The absence of standardized methods can lead to inconsistencies in students' exposure to sustainability concepts, highlighting the need for uniformity and structured educational experiences (Ashour et al., 2022; Karslı, 2013). This issue is particularly pronounced in regions like the Middle East, where cultural and institutional barriers further hinder sustainability integration, reinforcing the need for structured approaches (Aloudeh, Elmardi, & Sheta, 2022). To ensure the successful teaching of sustainable interior architecture, it is essential to have well-defined frameworks, clear learning objectives, and effective pedagogical strategies (Boarin & Martinez-Molina, 2022). In summary, the lack of a structured and effective approach remains a critical challenge in sustainable interior architecture education. Establishing standardized frameworks and teaching methods is essential to prepare interior architects for the evolving demands of sustainable and responsible design.

Cultural & Regional Variations

The globalization of sustainable interior architecture education presents educators with a dynamic landscape marked by diverse cultural and regional variations (Pektaş et al., 2015). These differences introduce complexity and challenges in applying sustainable design principles within educational contexts. Variations in cultural and regional perspectives can lead to different interpretations of sustainability and its significance, requiring educators to thoughtfully consider these differences when developing curricula and teaching methodologies (Pektaş et al., 2015). Adapting sustainable design principles to fit local contexts is crucial, as educators must be sensitive to cultural values and needs (Iyer-Raniga & Dalton, 2017). The impact of these variations on sustainability education emphasizes the necessity for educators to incorporate local cultural perspectives into their teaching of sustainable interior architecture (Ibrahim et al., 2022). Tailoring sustainability curricula to align with local values and priorities is essential for effective education (Opoku, 2015). Cultural and regional variations pose significant challenges to implementing sustainable interior architecture education, highlighting the need for educators to be culturally aware and adaptable in their approaches. By contextualizing sustainability principles, educators can ensure that graduates are equipped to apply sustainable design practices effectively within their specific cultural and regional environments. Addressing these challenges is vital for preparing interior architects to navigate the diverse global landscape of sustainable design.

Fragmented Nature of Sustainable Thinking

The fragmented nature of sustainable thinking poses significant challenges that necessitate multidisciplinary collaboration, the integration of diverse perspectives, adaptability to evolving standards, consideration of local contexts, and a commitment to seamless sustainability integration throughout the design process (Trott et al., 2020). Sustainable interior architecture education is essential in preparing future designers to make informed, ethical, and holistic design choices that contribute to a more sustainable and resilient built environment. This fragmentation is evident in how sustainability topics are often dispersed across various courses, resulting in a lack of cohesive framework. Such disjointed treatment of sustainability impedes students' ability to develop a comprehensive understanding of sustainable design principles, limiting effective integration into the curriculum (Özkan & Gokdag-Ersozoglu, 2021). When sustainability topics are approached in isolation, students are left with a fragmented understanding, which hinders their development of a holistic perspective on sustainability (Awang et al., 2020). Furthermore, sustainability-related content is frequently introduced as separate modules or elective courses rather than being seamlessly woven throughout the curriculum. This fragmented approach can lead to disjointed learning experiences and restrict students' capacity to apply sustainable principles cohesively in their design work (Ellis, 2009). There is an urgent need for a more integrated approach to sustainability education, creating a unified framework that connects sustainability concepts across different courses. This cohesive strategy is vital for ensuring that interior architecture students cultivate a holistic and comprehensive understanding of sustainable design principles.

CONCLUSION

In conclusion, the discourse on sustainability has significantly impacted the field of interior architecture, leading to a growing demand for professionals skilled in sustainable design principles. However, the successful implementation of sustainable interior architecture education faces several challenges that require careful consideration. One of the primary challenges is the lack of a structured and effective approach. Institutions often struggle to develop cohesive curricula that seamlessly integrate sustainability principles across all levels of education. This lack of structure can lead to fragmented learning experiences for students, where sustainable thinking is not consistently reinforced or applied comprehensively. Furthermore, the fragmented nature of sustainable thinking within the field further complicates the integration process. Sustainable design encompasses a wide range of concepts, from energy efficiency and renewable materials to social and cultural considerations. Educators and students alike may find it challenging to grasp the full scope of sustainability, leading to a disjointed understanding that hinders effective implementation. Resistance to change is another significant barrier. Both educators and students may be accustomed to traditional design practices and reluctant to adopt new methodologies that prioritize sustainability. Limited resources pose a substantial obstacle as well. Implementing a comprehensive sustainable interior architecture curriculum requires investment in new materials, technologies, and training for educators. Moreover, there is often a lack of awareness among both educators and students about the importance of sustainability in interior architecture. This lack of awareness can result in a lack of motivation to pursue sustainable practices and a failure to recognize the broader environmental and societal impacts of their work. Evaluation and assessment methods also present challenges. Traditional evaluation techniques may not adequately capture the effectiveness of sustainable design principles. Pedagogical challenges further complicate the integration of sustainability into interior architecture education. Instructors must balance the need to teach fundamental design skills with the imperative to incorporate sustainability. Industry alignment is another critical factor. The interior architecture industry must support and value sustainable practices for educational initiatives to be successful. Finally, cultural and regional variations can impact the implementation of sustainable interior architecture education. In conclusion, addressing these challenges requires a concerted effort from educational institutions, industry stakeholders, and policymakers. By developing a structured framework that encompasses the various obstacles, we can overcome these challenges and advance sustainable interior architecture education. This, in turn, will contribute to a more sustainable and resilient built environment for future generations.

COMPETING INTERESTS

The authors have no competing interests to declare.

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