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# Environmentally Responsible Interior Design Education using Multi-Criteria Evaluation

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# تعليم التصميم الداخلي المسؤول بيئيًا باستخدام تقييم متعدد المعايير

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**Abstract**

This article examines challenges related to the changing interior design education methodologies as they relate to the implementation of a sustainable design strategy in the built environment. Students will be able to incorporate sustainability imperatives into their future professional practice and comprehend the relevance of a holistic approach to the current interior design process. The high performance of the space must be supported by a reduction in negative environmental effects and optimization of interior quality parameters that influence the well-being and contentment of the space's occupants. The methodology used a literature review for data collection, observation and discussion of articles to obtain the final results. The newest innovative and inspiring approach to contemporary education in this discipline is the incorporation of a set of determinants present in leading multi-criteria evaluation systems into the interior design teaching model, which would enable the verification of environmental issues concerning designed interiors during the programming, concept, and working drawings design phase. This would increase students' awareness of environmental issues and their relevance to their future professional practice.
This paper explored and identified selection criteria for sustainable interior products and materials. It proposed five criteria covering designer and lecturer selection, healthier environment, reduced consumption, sustainable design components, and efficient design resource management. These criteria can effectively support responsible design education and interior designers in specifying and selecting sustainable design solutions.

**Keywords**: environmentally responsible interior design, sustainable interior design, environmental activation of interior elements, indoor environment quality, interior design.


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**الملخص**

واجه التصميم تحديات مختلفة منها التحديات المتعلقة بمنهجيات تعليم التصميم الداخلي للطلاب من حيث صلتها بتنفيذ استراتيجية التصميم المستدام في البيئة المبنية. لذلك ينبغي على الطالب بمساعده من المدرس أن يتمكن من دمج متطلبات الاستدامة إلى ممارساتهم المهنية في المستقبل وإدراك أهمية الشمولية في نهج عملية التصميم الداخلي الحالية. كما يجب تمكينه من استغلال المساحة عن طريق تقليل التأثيرات البيئية السلبية وتحسين معايير الجودة الداخلية التي تؤثر على رفاهية المستفيدين من الفراغ الداخلي. تعتمد المنهجية المستخدمة على مراجعة الأدبيات لجمع البيانات والملاحظة ومناقشة المقالات للحصول على النتائج النهائية. الغرض من هذه المقالة دراسة النهج الجديد الذي يعتبر نهجا أكثر إبداعًا وإلهامًا للتعليم المعاصر في التخصص من خلال دمج مجموعة من المحددات الموجودة في أنظمة التقييم متعددة المعايير الرائدة في نموذج تدريس التصميم الداخلي، مما سيمكن من التحقق من القضايا البيئية المتعلقة بالتصميمات الداخلية المصممة أثناء البرمجة والفكرة ومرحلة تصميم الرسومات التنفيذية. سيؤدي ذلك إلى زيادة وعي الطلاب بالقضايا البيئية وصلتها بممارساتهم المهنية المستقبلية. توصلت الدراسة إلى نتائج منها استكشاف وتحديد معايير الاختيار للمنتجات والمواد الداخلية المستدامة. اعتماد خمسة معايير أساسية وهي اختيار المصمم والمحاضر، وبيئة صحية، وخفض الاستهلاك، ومكونات التصميم المستدام، وإدارة موارد التصميم الفعالة، بحيث يمكن لهذه المعايير أن تدعم بشكل فعال تعليم التصميم المسؤول ومصممي الديكور الداخلي في تحديد واختيار حلول التصميم المستدامة.

**الكلمات المفتاحية:** التصميم الداخلي المسؤول بيئيًا، التصميم الداخلي المستدام، التنشيط البيئي للعناصر الداخلية، جودة البيئة الداخلية، التصميم الداخلي.

## 1. Introduction

The environmental responsibility of the interior design profession has been explored by researchers, architecture critics, and academics since the 1990s (Jones, 2008; Pilatowicz, 2015; Winchip, 2011). The increasing recognition of environmentally-sustainable design has imposed on designers the necessity for a comprehensive and informed approach toward the interior design process (Jones, 2008; Moxon, 2012; Raymond & Cunliffe, 2000; Bonda, & Sosnowchik, 2014). The notion of environmental responsibility in interior design can be interpreted as comprising the issues of an object's ecological effectiveness, the economic consequences and implications of the building spaces' energy performance, and complementing social system's considerations related to the inner space quality parameters and their influence on the occupants' psychological and physical comfort. The constant interconnectedness and interdependence of these three systems are major factors affecting the stability of the human ecosystem model and should be the subject of continuous investigation of environmentally-responsible interior designers (Jones, 2008) when searching for the optimization of the functionality and quality of inner spaces (Moxon, 2012; Celadyn, 2018).

Internships, cooperatives, and job shadowing are work experiences in which students gain professional experience while having their academic training. These experiences can be taken for course credits, formalized with required learning outcomes, or arranged outside of the curriculum. It has been established by scholars that learning in the classroom along with learning through professional practice aids in making stronger connections between education and practice (Black, 2000). Firms, students, and academic programs mutually benefit from these experiences (Cook, Parker, & Pettijohn, 2004). The Potential employers have students with fresh ideas and approaches, while students gain professional experience with the opportunity for employment, and academic programs gain recognition among the field of practicing designers (Black, 2000). Also, academic programs can use internships within the curriculum to supplement student-learning outcomes, which can contribute to addressing the Council of interior design accreditation standards in addition to other broader university accreditation standards (Black, 2000). Being aware of what students are doing in the field assists faculty to cope up with practice, which allows for course updating and curriculum revisions (Watson, Guerin, & Ginthner, 2003).

Internships often pair student learning and professional work experience within an academic framework in interior design education. Some of the curriculums develop formal learning outcomes through assignments and agreements with the internship provider. This ensures that student interns receive some exposure to the skills needed to succeed in the field of interior design, such as communication and business practices which have been identified as fundamental skills often developed in a professional work setting (Gale, Ph, Carolina, & Duffey, 2017; Blossom, Matthews, & Gibson, 2002; Tew, 1992).

The world has limited resources and has experienced steady population growth for centuries. Recently, climate change concerns have grown tremendously across the globe alongside scientific evidence on the effects of greenhouse gases on the environment (Bluyssen, 2013). An awareness of the importance of sustainable practices is needed as the situation leads to a negative future for our environmental resources (Jones, 2008). Conserving environmental resources has social, cultural, physical, and economic impacts, including the ability to sustain lifestyle requirements, healthy economy, reduced global warming, and decreased toxic gas emissions (Tucker, 2014). This has led to dialogues with the aim of saving our planet by controlling consumption and sustaining natural resources (Llop, M. & Ponce-Alifonso, 2015; Rashdan & Ashour, 2017).

Thamrin, Wardani, Hasudungan, & Sitindjak, (2019) Said the interior design is a

discipline that is very close to the complexities and basic needs of human life. It is a discipline that requires deep empathetic studies and human-centred approaches in the design process in order to be able to devise beneficial solutions that can improve human life and built environment. Learning and practice of interior design intersect with the scope of other disciplines apart from architecture and engineering, such as humanities and social sciences (Cys, 2009). The multidisciplinary nature of interior design, that requires subsequent connections to other fields of knowledge, means that interior design practitioners are aware of many disciplines of knowledge and would ideally have the multi-perceptive ability to solve the complexities of human life in connection to their living environment. Unfortunately, the interpretation and practice of interior design observed today have often been limited to decoration or styling of interior properties (Smith, 2004). This tendency usually accommodates the tastes of the upper class rather than the deep social issues and cultural values of daily humble communities or the general society as a whole. Furthermore, only the upper class can afford to hire interior designers to satisfy their personal tastes for high-end living, working and recreational spaces. The majority of interior design students decide to pursue interior design education for its marketable and profitable purposes rather than looking at interior design as a field of opportunity to practice social work due to contributing in the socio-economical welfare of their communities. Design is often regarded as a luxury as it is addressing the desires of specified elite economic groups, and is frequently generated by marketing forces towards these elite users (Kroeker & Singh, 2007).

**2. Selection Criteria for Sustainable Interior Design Solutions**

Sustainable design solutions differ from conventional design solutions by supporting healthy environments as well as rationalizing resource and energy consumption (Yu, C., 2015). Responsible interior design solutions should present a logical and sequential process for creating healthy, functional, comfortable, and sustainable interiors without compromising aesthetic factors, while meeting the clients' needs, budget, schedule, and design vision (Ceschin, F. & Idil, G, 2016). Designers should articulate sustainability in all aspects of their design solutions and ensure healthier indoor air quality by choosing materials and construction methods that prevent indoor air pollution, harmful chemical reactions, and gas emissions (Loftness, V., Hakkinen, B., Adan, O. & Nevalainen, 2007). Designers should be mindful about providing ecologically intelligent solutions for energy efficiency that can reduce the rate of energy and water consumption while providing a comfortable space (Ruegemer, 2010). They should encourage the use of durable products that do not require an inordinate amount of maintenance and replacement (Spiegel, R. & Meadows, D., 2010). Designers should support the reduction of construction waste to lessen pollution and environmental damage (Osmani, M., Glass, J. & Price, 2008). They should ensure that specified solutions and materials are from local or international certified sources (Rashdan & Ashour, 2017). Thus, interior designers need a clear selection criterion for sustainable items to achieve integrity in their design solutions (Bluyssen, 2013). They also need benchmarks for high-performance sustainable interior design solutions.

**3. Indoor air quality performance**

People spend an average of 90% of their time indoors; thus, indoor air can be a greater health hazard for building occupants than outdoor air (Jones, 2008). Indoor environmental quality refers to all the factors that contribute to how occupants experience interact and are affected by the built environment (Yu, C., 2015). These factors include Indoor Air Quality (IAO), lighting and day lighting, connection to nature, thermal comfort and control, and electromagnetic fields (Bluyssen, 2013). The objective of this criterion is to identify assessment tools that can be used by interior designers to measure

the IAQ of any building against government guidelines that establish baseline efficiency for air purification and filtration systems. IAQ assessment covers microbial contaminants (e.g., mold, bacteria, dust, and particulates), chemicals (e.g., carbon monoxide and radon), allergens, fibers (asbestos), and any mass or energy stressor that can affect the occupants' heath (Nehr, S., Hösen, E. & Tanabe, 2017). Interior designers can use tools such as the indoor air quality building education and assessment model for the design and construction phase. Although, it is challenging to measure the toxicity of a building's interiors and its environmental impacts as there are some methods to determine IAQ. Interior designers with the help of scientists can collect and analyse air samples and use computer software simulating the airflow inside buildings. Smart IAQ devices are effective technical tools for collecting and analysing data about the unwanted components of indoor air (Rashdan, 2016). This analysis can lead to an understanding of the sources of the contaminants and guide designers in developing strategies for removing the unwanted air elements and determining the balance required for ventilation and filtration for the effective exchange of indoor air (Rashdan & Ashour, 2017).

**4. The Importance of Motivation in Learning**

The meaning of 'to be motivated' relates to be 'moved to do something'. So, when someone is 'energized' or 'activated', he can be considered as 'motivated' (Chang, Hu, Chiang, & Lugmayr, 2019). This is related to optimal learning outcomes. To be motivated in learning is highly correlated with learning effectiveness. A strong motivation allows people to focus on tasks for a long time, and easily being immersed into the flow of experience. Factors underlying motivation are attitudes and goals giving raise to action it concerns the explanation of actions underlying the motivation. As pointed out by Ryan and Deci (2000), the orientation of motivation concerns the underlying motivation can be diveded into intrinsic and extrinsic types. Both have an important impact on learning. Stating an example, a student can be highly motivated to do homework out of curiosity and interest or alternatively because he or she wants to procure the approval of a teacher or parent. A student could be motivated to learn a new set of skills according to understanding their potential utility, value or alternatively because learning the skills will yield a good grade and the privileges of a good grade offers (Ryan & Deci, 2000]. Much internal motivation is driven by external motivation. For example, the content of the textbook itself is interesting and thus arouses the interest of learners' internal learning and the motivation of active learning. The performance created through the learning process refers to the benefits created by the learner's internal and external motivations. Motivation impacts students' behaviour, and with increasing motivation the learning performs increases. Both personal and environmental factors (input facets)influence the level of effort, behaviour, performance, and teach outcomes (output facets)that learners are willing to take. The better results learners achieve, the stronger the motivation to continue and this phenomenon is called the "virtuous circle of learning" (Zheng, H.W., Chen, S.T., & Fan, 2019).

**5. Keller's Attention–Relevance–Confidence–Satisfaction (ARCS)Motivational Learning Design Theory**

John Keller proposed the Attention–Relevance–Confidence–Satisfaction (ARCS)motivation design model in Keller (1987), which was divided into four factors relevant to improve the learning effectiveness of students. ARCS emphasizes that the motivation of learners must be matched with the use of these four factors in order to improve students' learning performance. Instructional design and improvement of teaching materials are the most important factors that determine students' motivation and interest in learning. The good teaching content design can arouse students' attention and interest, it let learners have confidence in the topics and content of learning and help students build their own learning ability, and allow students to gain satisfaction after

learning. The ARCS model can be used to verify whether the design of teaching materials effectively stimulates students' motivation and learning effectiveness (Keller, 2010; Keller, 1987). According to Keller's (2010)research on motivation theory in learning psychology, teaching and learning processes can be divided into two major facets: input and output. The input facets include personal factors and environmental factors; where the output facet is the learner's effort, performance, and learning outcomes. Personal factors include learning motivation, interest in learning, personal learning ability, knowledge, and skills already possessed. Environmental factors include the strengthening of learning motivation, teaching design, and teaching methods management. When students pay attention to studying, they will be influenced by factors such as interesting content, learning mood and environmental atmosphere (Chang et al., 2019; Keller, 2010).

**6. Classification of Interior Design Students**

More studies have commented upon the importance of self-determination theory in instilling students with confidence in their capabilities and galvanizing them to perform at the same level of creative output as their talented counterparts (Deci et al. 1991). Furthermore, the learning disabilities faced by students might overcome with self-determination teaching models and skill instructions (Field, Sarver & Shaw, 2003). Therefore, it is relevant to question the selection of gifted students in the field of interior design and investigate the induction of non-gifted into interior design programs, who possess the passion and determination to improve their abilities to flourish. Several interior design programs accept applicants without any restrictions nor selection criteria (Robins, 2016).

The matter of open acceptance depicts clarifying that majority of the non-gifted students can gain admission in interior design fields, resulting in students with learning disabilities due to the lack of their abilities in succeeding in the art of interior design (Piotrowski, 2011). Therefore, arguments discuss the pursuit of this field is best for students with the creative potential and skills needed to succeed in this field. Educators of the interior design field should be aware of the cognitive, social, and emotional responses of the gifted students when engaged in an art program (Sevinç & Kanli, 2019). Some instructors may not have the pedagogical expertise for offering the types of learning activities required for high achievers (Mackey & Wright, 2016). Educators should emphasize on improving student competence using insights, knowledge, learning, and skills dispositions. Precisely, an instructor needs to be aware of substantial differences among the students and to react to them by using a wide variety of teaching strategies applicable at small groups, individual levels, and whole class. The learning procedures should continuously be under modifications, the products from efforts of students, and curriculum content (Tortop, 2013). It is of significant interest that university instructors should be capable of treating gifted students appropriately, such as being open-minded, having high level of capacity in teaching, and developing a better relationship with their communities. The competent for managing emotions of students, making knowledge applicable, creating a sense of responsibility, being warm and accessible, adopting high expectations for the students, and encouraging students to be active during lectures (Benny & Blonder, 2016). Gifted students might prefer some proficiencies of their instructors to others; for instance, they will seek personal characteristics over intellectual characteristics. The selection was highly evident among young students when gender was not a predictive factor for the preference of students (Laine & Tirri, 2016). Also, the gifted students perceive high-qualified instructors as active facilitators for achieving high academic performance. One of the significant identified problems is the flawed understanding or incomplete knowledge of instructors toward gifted students (Elsayed,

Elsamanoudy, & Abdelaziz, 2020).

**7. Integrated Design Teams in Students Projects**

The demands regarding broader participation of interior designers in the architectural design process and their influence on building's a high performance and optimisation of indoor environment quality require an adjustment to the educational model. This improvement may be accomplished with the involvement of interior design students in the conscious collaborative environment in interior design process. To accomplish this goal, the educators included these engagment with interior design teaching, will need to change their own and their students' attitudes by encouraging them to participate in the integrative design process, while working on their projects (Sorrento, 2007).

The students may get their experience of partnership in the design process through systematically organised workshops involving students with different specialties. These education formulae which being introductory to the fully understanding of the significance of the integrated design process in the creation of sustainable built environment by students, and it may contribute to their experience and knowledge to inform project and successful execution of sustainable design strategies in the future design practice executed with the emphasis on environmental sustainability (Bonda, P. & Sosnowchik, 2007).

A broader perspective to the sustainability-focused design studios model may be obtained through the introduction on a large scale of a service-based learning concept, with interior design students working on their projects in inter disciplinary teams comprising students and practitioners. These joint teams who is working on practical projects instead of hypothetical ones may include educators of interior design students and the students of related specialties (e.g. structure, heating, cooling, ventilation, installation)(Celadyn, 2017).

These groups should be comprised of invited experts and practitioners from different disciplinary backgrounds, including architects, structural engineers, building physics engineers, facility managers, as well as professionals involved in the design process and responsible for the verification of the holistic approach to being green, and reviewing students' project documentation, specually the independent and licensed assessors and accredited consultants on green building (Celadyn, 2017).

The series of organised inter-disciplinary student workshops enable the transfer of knowledge between students involved in the design process, since the knowledge necessary for executing eco-designs responsibly belongs to many team partners (Yeang, K., 2009). Students' eco-charrettes facilitate their recognition of sustainability as an indispensable aspect of design. These teaching tools permit students to participate in interdisciplinary teams as co-educators to each other. The integrative design teams including professionals give the students opportunities to address real-world expectations and demands and allowing them to complete their future architectural projects in compliance with environmental concerns.

**8. Resource Efficiency in the Interior Design Teaching Framework**

Sustainability objectives of resource efficiency and waste management in interior design are within the existing curriculum, but it is similar to other sustainability concerns (e.g. improvement of indoor environmental quality with appropriate spatial arrangement of interior components or specification of building materials without volatile organic compounds). The idea of control of resource consumption regarding completion of the interior are viewed by students as being separate issues.

At present, the existing interior design teaching framework, only offers the students a facultative lecture course on Environmentally Sustainable Architectural Design, which

discusses the impact of the sustainability paradigm on the integrative interior design process. This does require modifications to provide students with a comprehensive approach to sustainability requirements (Celadyn, 2019).

**9. Conclusion**

The recognition of whole-building certification systems is becoming a professional obligation in the purview of interior design. It is the consequence of designers' awareness of the complexity of sustainability problem and the related necessity of application of new methods and design-tools, as well as the result of observing restrictive requirements established by governmental institutions. Such expectations are also expressed by conscious developers and owners who are striving for high-performance green designs. Green building rating systems included in higher education interior design studio methodology may be helpful in the identification of sustainability problems and the further execution of inner space project conformity with the requirements of environmental responsibility. The interior design students learn to comply with certain rules of sustainability by following the guidance formulated in the certification schemes, being an additional, expanded sustainability-conscious decision-making tool.

It is important to consider their implementation, as sustainability problems are still insufficiently recognised by interior designers and are commonly treated by them as separate issues (e.g. content of recycled building materials specified in project furnishings or finishing), without comprehensive connection with the evidence delivered by other professionals involved in the design process (Pilatowicz, 1994). Their acceptance is necessary, because interior designers make a substantial contribution to the final solutions regarding the quality of indoor environment and its performance.

When it comes to indicating the most valuable aspect of the implementation of rating systems into the teaching methods, it seems that it may increase among students their critical approach towards the existing education programme, and to arouse their greater interest in environmental responsibility; thus, encouraging them to request an even more sophisticated discussion within institutions of higher education (Zaretsky, 2011).

Multi-criterial environmental evaluation introduced into the programme curriculum as an education instrument may be seen from the perspective of inter-disciplinary architectural design process. It may be seen as an objective design tool indicating to the students the necessity of cooperation between different specialities and the importance of integrated design process with a view to the development of environmentally responsible interior design.

The implementation of these evaluation schemes into the programme curriculum may facilitate the selection of adjusted and environmentally responsible decisions and accomplishment of sustainability strategies in the professional interior design practice, as well as encourage students to achieve green building consultants' credentials by themselves.

This paper explored and identified selection criteria for sustainable interior products and materials. It proposed five criteria as following:

1. Designer and lecturer selection
2. Healthier environment
3. Reduced consumption
4. Sustainable design components
5. Efficient design resource management

These criteria can effectively support responsible design education and interior designers in specifying and selecting sustainable design solutions. Interior designers should have a complete understanding of these selection criteria to fully incorporate them into their project specifications.

**10. Recommendations**

Based on current study, it is an advantage to trace interior design education that is capable of documented and make reference for future generation. This study also giving the recommendations for designers, architect, interior design teachers, and students as following:

1. Efficient management of interior components related to their multi-functionality.
2. Resource management optimization due to the components' adaptability and applied structural and technical solutions.
3. Reclaiming of dismantled or removed components and their parts from refurbished spaces and their implementation into new structures as a design imperative to be considered within the environmentally-responsible design process.
4. Increase in the environmental consciousness of the interiors' occupants through the understanding of interior component roles in shaping the quality of the indoor environment and their impact on natural surroundings.
5. Educators of the interior design field must embrace teaching strategies dealing with the students' classification.
6. Enhancement of ventilation systems through the properly executed space layout and space dividers' configuration.
7. Enhancement the relationship between the student, the practitioner, and the academic institution within this unique partnership to increase students skills in interior design.
8. Design educators should nurture students' visualization capacity for their success in education in a way that the students' development of spatial ability also enhances design performance.
9. Further expected studies to identify other factors of how to deal with interior design education is necessary.
10. It suggests, as well, that future research broadens the scope of the study into cross-country and cultural comparisons to understand better the best ways to support the interior design students.

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