

Interior architectural design for pro-environmental behaviour

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ABSTRACT: In the article, the author addresses the development and assessment of a methodology for interior architectural design, to stimulate pro-environmental behaviour among end-users of interior spaces. This research study is a part of the author's goal to improve conventional interior architectural design educational programmes, as executed in the majority of interior design departments. Integrative design workshops were developed for students to enable them to design innovative solutions for interior components as educatory instruments that encourage end-users' pro-environmental behaviour. The author discusses the integrated students' workshops and the findings of a survey conducted among the participants on the educatory role of environmentally sustainable interiors, to confirm their potential in changing users' behaviour.

INTRODUCTION

Exploration of the connections between humans and the environment in interior design courses is required by the Polish Ministry of Higher Education and applies to faculties of interior design. These requirements, as well as an interdisciplinary interior design and a holistic approach are essential features in the sustainable design of interiors.

As Nichols and Hearty opine, interior design provides an excellent platform for environmental sustainability education [1]. However, this requires some modifications of existing interior design educational programmes. These changes proffer sustainability and the environmental context of inner space design as important determinants [2].

Adjustments to the architectural design curriculum, recommended by the author, concerned the integration of sustainability issues across different courses [3-6]. These modifications were:

- 1) inclusion of design tools for multi-criterial environmental evaluation of interior design [4];
- 2) interdisciplinary students-practitioners-consultants workshops;
- 3) students' sustainability design projects entered into architectural competitions [6];
- 4) graphic design tools to visualise sustainability features of internal spaces [5].

As regards the suggested structural changes within the existing teaching framework, the proposals were based on the innovative concept of a cohesive educational programme and were informed by the *environment-effectiveness-oriented* [3] compulsory subject Building Construction, as well as the elective lecture course Environmental Architectural Design, with environment-related integrative design workshops.

It is necessary to include environmental issues into interior architectural teaching in the comprehensive exercise of *design for behaviour change* [7], to address the social sphere of sustainable architectural design. This includes students' design projects to build environmental awareness.

SUSTAINABILITY WITHIN INTERIOR DESIGN CURRICULA

The present interior design education provides students neither with systematised knowledge on sustainability nor with appropriate competencies to form interiors of high environmental performance. Students are taught sustainable design techniques, e.g. constitutive interior components, passive design [2] and eco-efficient building materials. However, this is not the result of a cohesive educational model.

Existing interior design teaching, with design studios traditionally positioned at the centre, provides students with opportunities to address sustainability, but the concentration is on selected and separated aspects, and thus promotes

a *fragmented and disconnected knowledge on environmental sustainability in interior design* [6]. The methodology of sustainable interior design is in the course Environmentally Sustainable Architectural Design. Since this is an elective course, the majority of students lack insight into environmental sustainability in interior architecture design. Questions regarding sustainability in interior design are seen as separate concerns by students who do not appreciate the relevance of sustainability to their discipline.

To increase environmental awareness and a holistic approach to sustainability in teaching, interior architecture requires modifications and the inclusion of innovative learning in some courses. One proposal is for integrative design workshops for interior design students that concentrate on eco-education.

BUILDING ENVIRONMENTAL AWARENESS

As Sorrento indicates, when referring to sustainable interior architectural design ...*client education is a major part of the interior designer's job description* [8]. *How to make the most of the interiors' sustainable design elements* is becoming indispensable to assuring high environmental performance for interiors [8]. The clients' notions should be precise and extended, depending on the functions of the spaces. This classification of interior spaces should include occasional visitors, tenants, occupants and end-users. The last category refers to the group having sustainable usage of interior spaces. This category can be also defined as those exposed to the design of the *near environment*, as McClure and Bartuska call the internal spaces of buildings [9]. This definition reflects the meaning that interiors remain in constant mediation with their occupants, who are affected emotionally, physically and intellectually.

According to Shin and Bhamra, *design for sustainable behaviour* has been getting more attention in the past 20 years [10]. The major objective is to reduce the negative impact on the natural environment caused by the conduct of buildings' users. The interactive design of services and products is to persuade the occupants to behave in a more environmentally responsible way. The creation of an eco-feedback mechanism between the product and its user should be applied to the design of interior components, seen as complex products assuring the interior's functionality and users' psycho-physical comfort.

Stern defines the environmentally significant users' conduct, referring this term to natural surroundings, as conduct undertaken with the intention to *change the environment* [11]. This change is usually understood as a set of measures introduced to *benefit* the environment. The impact of human behaviour on the natural setting can be assessed with reference to the interior spaces and their components. This is defined as: stimulation of changes of users' attitudes and habits that should be accompanied by designers' intention to teach the occupants to accept and use appropriately the introduced innovations.

Higher education offers the interior architect an opportunity to explore designs that modulate the end-users' conduct. It seems a place to study environmental issues since students can learn informally apart from the scheduled classes and through different forms of learning. Study spaces with buildings' interior components is an educational instrument for the endorsement of environmental awareness among users, as well as to influence conduct toward more sustainable practices.

As Lilley opines ...*The intentionality of the designer is an important concern as this, coupled to an assessment of the severity of the consequences of product use or misuse, will inform the selection of a strategy* [12]. This opinion, addressing the behavioural outcomes of the interventions undertaken by designers throughout the product design, remains equally important when referring to the shaping of the constitutive components of the learning environment.

METHODOLOGY

The study reported in this article was aimed at providing students with the ability to develop innovative design solutions for interior components that encourage end-users' pro-environmental behaviour. To accomplish this, students were to explore the human-related aspects of interior architectural design, technical solutions or materials specification that condition indoor environments.

The objective was to provide students with integrative design workshops, to inform designs for behaviour change. Students were to improve their abilities to:

- 1) develop sustainable and integrative interior architectural designs;
- 2) consider the ecological, economic and social dimensions of a sustainable indoor environment;
- 3) study the effectiveness of resources and waste management in creating sustainable interiors.

The objectives explored the interaction between users and their surroundings, viz.:

- 1) interior components to endorse occupants' environmental awareness;
- 2) the users' interest in the environmental context of the interior components' appearance;
- 3) stimulation of end-users' pro-environmental behaviour.

The study on the significance of the appearance of the interiors modulating users' attitudes toward environmental issues was conducted within the integrative design workshops organised by the author. Students were to apply the knowledge acquired from the lecture courses on Construction Building and Environmentally Sustainable Architectural Design to their design projects, both delivered by the author. The integrative design workshop was a continuation of the pilot workshop from the preceding academic year [6]. That initial teaching formula was based on the development of Building Construction semester projects as entries to the architectural competition on the sustainable built environment. The innovative approach allowed students to build on knowledge grounded on environmental sustainability and to improve their abilities to creatively implement these into interior architectural design.

A survey was conducted among students in this class, prior to their enrolment in the integrative design workshop. In the survey, based on an open-ended questionnaire, students were asked to identify students' environment-related attitudes. Participating students were questioned, through a questionnaire, on their pro-environmental attitudes to interior design. Finally, they were asked to assess the stimulation of users' attitudes, their effect on users, as well as on interiors and their eco-aesthetics.

CASE STUDY

A group of ten students, from the total 28 enrolled in third-year undergraduate interior design, developed their semester design projects within the project-learning module of the Building Construction course at *Jan Matejko* Academy of Fine Arts in Kraków, Poland. These students previously attended the Environmentally Sustainable Architectural Design elective lecture course. This theoretical course was focused on the fundamentals of environmental sustainability design, as well as design methods, techniques and tools.

The subject of students' design projects was the development of a *learning neighbourhood* located between two selected adjacent classrooms within a refurbished building, situated on the academy campus [13]. This space was assigned to the Interior Design Faculty students, as well as to outside visitors and faculty guests. The *study space* was intended as a multifunctional area within the university facility and part of the *learning landscape* dedicated to individual conceptual studies, group study, designing, networking, co-creating, workshops, multi-media presentations, discussions and other related informal learning activities undertaken by the students apart from their scheduled classes [14].

To address various forms of activities within the study space, the students were to develop the space as a flexible, adaptable place. They were allowed to remodel significantly the existing spatial layout and to remove existing partition walls, while proposing solutions to reintroduce the reclaimed building materials and products into the new structures and reduce the amount of resources used.

Other design decisions had to be investigated within the environmental context. The development of the interior and its constitutive components in compliance with environmental sustainability guidelines is the main interior architectural design determinant. This would ensure students had the appropriate abilities to create interior spaces of high environmental standard. The study space was meant to offer users the possibility to investigate environmental issues through unconventional technical solutions, materials selection or spatial organisation. To respond to the users' needs and expectations, students were to model project attributes on the *activity based workplaces* employed in offices. The study space includes individual workstations, multifunctional circulation areas, rooms assigned to informal meetings and shared by different groups, standing workstations, places for multimedia presentations and multifunctional interior components.

The design concept recognised the occupants' activities as the leading design determinant. This guided the study space design project to facilitate different forms of learning activities conducted by students themselves or with the participation of invited academics, as well as welcomed professionals.

Research methods to guide students' decisions comprised literature reviews on the contemporary models of modern learning spaces within selected higher education facilities and analyses of case studies discussed within the lecture course. Students were engaged in the design on the basis of weekly seminars conducted by the author. They were asked to present the progress in their design projects through oral and multimedia presentations. Class discussions gave the students opportunity to consult with other participants on their proposals. These replaced the conventional individual critique of the projects. The students were encouraged to apply different modes of presentation for their design projects.

These methods comprised:

- 1) conceptual sketches, schemes and diagrams to illustrate spatial organisation;
- 2) perspective drawings;
- 3) building drawings;
- 4) visuals or resources drawings [5].

All these graphic instruments were to illustrate the relationship between different functional areas and to explain the environmental context of interior components, which encourage occupants to introduce sustainable practices into their activities.

The major objective of this design process was to provide students with the theoretical knowledge on sustainability considerations, to encourage them to employ sustainable interior design thinking, as well as to apply the appropriate design tools. Students were to develop innovative and sustainable interior design interventions into the refurbished and remodelled internal space, to provide users with a high-quality learning environment and to *encourage desired circular behaviours* through the design [15]. The human-centred strategy of optimisation of indoor environment parameters by the students was focused on the search for design techniques to provide users with optical, acoustic, as well as psycho-physical comfort.

DISCUSSION

The students proposed novel solutions to provide the end-users (i.e. faculty students, outside visitors, students of other faculties) with a study space of high environmental standard. The innovative design techniques comprised the following:

- Learning space layout and interior components enabling undisturbed daylight transmission.
- *Study capsules* to provide users of the open space with private learning space.
- Finishing interior components in bright colours to promote deeper penetration of daylight coming from the glazed external wall of the adjacent circulation area.
- Interior components formed as acoustic buffers to reduce the sound transmission and assure an appropriate level of speech privacy.
- Selection of sound-absorbing finishing building materials to improve acoustic comfort through the reduction in reverberation time.
- Interior components formed as visual buffers adjusted to the occupants' sitting position and introduced to avoid distractions.
- Selection of building materials with reduced content of harmful chemical substances.
- Exercise of biophilia concept through the integration of biological walls with the structure of selected interior components, and the control of inner air relative humidity and temperature (Figure 1).



Figure 1: Biophilia concept through the integration of biological walls, with the structure of individual study-spaces (authors: A. Burzec, A. Łapa and W. Żądło; supervisor: M. Celadyn) (source: Archive of the Faculty of Interior Design, *Jan Matejko* Academy of Fine Arts in Kraków).

As for sustainability, the students introduced original design proposals to allow occupants to understand their environmentally oriented features, to accept them and to properly use these innovations within closed spaces. They addressed mainly the problems of efficient consumption of resources, through selection of the components' structure and reduction in finishing, minimising the use of different types of material and making connections visible and accessible.

As well, effective management of resources was assisted by the insertion of graphic information on the life cycle of acquired materials or materials' certificates as integral elements of components. Among innovative concepts to actively promote the environment and endorse occupants' awareness were proposals to leave some spaces to be organised by the occupants with the usage of reclaimed furnishing or equipment, according to the designers' suggestions.

Other proposals enclosed some spaces for the organisation of open workshops on the reprocessing and adaptive reuse of post-construction or post-consumption waste within interiors. Students showed creativity in their search for unconventional techniques by which to affect users' emotional, as well as cognitive, reaction.



Figure 2: Resources efficiency design strategy accomplished through the dematerialisation of interior components and multifunctionality of interior structures (authors: W. Wawro and K. Garus; supervisor: M. Celadyn) (source: Archive of the Faculty of Interior Design, *Jan Matejko* Academy of Fine Arts in Kraków).

The design techniques developed by the interior architectural design students to enhance occupants' sustainability awareness and to stimulate their environmental attitudes through the structure and finishing of components, comprised the following:

- 1) Selection of appropriate certified building materials, with the use of graphic tools.
- 2) Interior components multifunctionality for the management of resources (Figure 2).
- 3) Selection of building materials of limited processing and finishing to reduce the use of resources.
- 4) Exploitation of *truth windows* in interior components to provide users with information on the physical characteristics of building materials, or to explain their role.
- 5) Ecologic infographics integral to the interior components and their appearance.
- 6) Exploration of the concept of biophilia.

The findings of the survey section of this study revealed the students' interest:

- 1) Professional design methods and tools, e.g. environmental preference method (EPM), green building materials certification systems for interior components.
- 2) Integration of sustainable features into interior components.
- 3) Adoption of an environmental perspective into the creation of inner spaces and their components, in searching for design solutions.

The results of design projects developed within the workshop, as well as opinions from the survey, confirmed the students' commitment to considering the environmental issues while forming interiors, and their positive reflections on the interior architects' active role in the stimulation of pro-environmental behaviour among occupants of buildings.

CONCLUSIONS

Integrative design workshops for interior design students were demonstrative in inspiring research-through-design and a driver for developing innovative design solutions. The main objective of these integrative design workshops was to shape interior components that function as educational tools. Students established links between the theoretical knowledge of sustainability in interior design, with its practical implementation through unconventional technical solutions.

These workshops reinforced the relevance of sustainable interior architectural design by:

- systemic incorporation of environmental considerations;
- developing the building occupants' awareness of the impact of behaviour on the health of the natural environment and that of the building;
- shaping interior components as determinants of the building users' environmentally responsible conduct.

These support architectural design in the creation of an environmentally aware built environment.

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