

A design studio-modelled module of the course in building structures for interior architecture students

Magdalena Celadyn & Anna Michalek

Jan Matejko Academy of Fine Arts in Kraków
Kraków, Poland

ABSTRACT: In this article, the authors discuss a modification proposed for the course in building structure for second-year undergraduate students of interior architecture at a university in Poland. The proposed adjustment concerned setting up a design studio-modelled, problem- and project-based structural design module, which was to supplement the preceding lectures. The main objective of this practical module was to enable students to make a structurally informed interior architectural design, and to explore the range of integration of architectural design and engineering aspects of designing interiors' components in a search for their formal and aesthetic integrity. The inquiry on the effects of this learning scheme was based on the qualitative evaluation of the students' design projects, and the effects of a survey among students concerning the structural design component of the course in building structures. The results confirmed the effectiveness of this model in the context of understanding the interconnectedness of structural and architectural aspects in the creation of interiors.

INTRODUCTION

Problems with identifying the domain of the discipline of interior architecture have been indicated by educators and theorists for years now. It is even difficult to define precisely interior architecture specificity since *it touches and comprises so many other disciplines* [1]. Still, designers mostly give their attention to the formal and aesthetic aspects of the process of designing interiors, and concentrate on a multidimensional *study of space* undertaken mainly from the perspective of humanistic disciplines. The duality and complexity of the field of designing interiors, emphasised commonly by many scholars and educators, as well as practitioners, illustrates this statement:

Interior architecture/design has always lacked identity and has had difficulty positioning itself as it is often divided between technology, science, art and production [2].

Interior architecture, situated between architecture and interior design, is a discipline of the *transformation of given space* [3], and a process that involves *manipulation of the three-dimensional volume, placement of specific elements, and treatment of surfaces* [4]. This alteration of existing space, defined frequently as a basic activity assigned to the interior architecture discipline, often deals with environmental, servicing, as well as structural problems [4], and encompasses various design interventions. These range from the structural remodelling and refurbishing of existing buildings to the incorporation of sizeable spatial objects formally joined with buildings.

Responsible management of a given internal space, particularly involving interference into the building structural scheme, as well as the introduction of objects that make up multifunctional and structurally developed interior components, is a demanding issue. It requires, from the prospective of the interior architect, equal expertise in humanistic and aesthetic disciplines, behavioural psychology, semiology or art history, along with basic knowledge of building construction, building physics, material science, building technology, as well as structures. Data acquired from these technical disciplines, and then properly applied, condition an informed interior architectural design, while meeting the demand for a comprehensive and interdisciplinary approach to the design of the built environment.

This article discusses the effectiveness of the adjustment in the two-semester course in building structures delivered to second-year undergraduate interior architecture students in the Faculty of Interior Design of the Academy of Fine Arts in Kraków, Poland. The modification concerned the introduction of a design studio-modelled and project-based structural design module into the course in building structures, to complement the earlier-delivered conventional lecture-based module. The inquiry on the effects of the concept was based on a qualitative evaluation of the students' design projects, as well as on their responses to a survey on the structural design component of the course in building structures analysed as a driver to get an understanding of structural aspects in designing of interiors and their components.

TECHNICAL COURSES IN THE INTERIOR ARCHITECTURE CURRICULA

The curricula of interior architecture offered by Polish educational institutions, partly due to the tradition-derived affiliation of the faculties of interior architecture to academies of fine arts, comprise courses on painting, sculpture, history of art, history of architecture, theory of design, psychology with elements of perception, semiology, as well as interior architectural design. The teaching scheme is built around the core courses on interior architectural design executed within design studios that occupy the central place in this centralised model. This teaching programme is based on a hierarchical scheme with the predominant place reserved for design studios where interior architectural projects are developed.

The authors argue that the positioning of technical courses in the teaching programme, that encompass building construction, building structures, as well as technology of building materials remains, is inadequate to contemporary expectations from the perspective of the interior architecture design field and the profession. The placement of technical courses is in accordance with the official regulations accepted in 2007 by the Polish Ministry of Higher Education. This document defines the education standards for interior architecture and formulates the content of the interior design teaching programme. The range and placing of the specific courses shown indirectly in the classification of the European Credit Transfer and Accumulation System (ECTS), are strictly related to the class hours assigned to subjects and the amount of time that students are supposed to spend on self-study throughout each semester. This taxonomy confirms ultimately the current approach by higher education institutions to technical aspects of the discipline and profession of interior designing.

The interdisciplinary design approach to the design process requires from various professionals involved, including architects and interior architects *to have the core of practical knowledge* [5] to enable co-operation in search of the optimal proposals. Although there is similarity between the range and content of courses offered to prospective architects and interior architects, the time ratio dedicated to technical subjects remains the main difference between these teaching frameworks. The approach to the discipline of interior architecture, visible in the teaching model currently offered in most Polish academies of fine arts, is focused on the contextual exploration of space and its visual refinement, strongly supported by its *philosophical interpretation* [2]. This does not restrict the examination of the space phenomenon exclusively to the physical place delineated by the building, but frequently involves examining of the space's symbolic or abstract aspects. The emphasis on the questions of space-creativity research in the teaching process results in a reserved tactic as to the adjustment in the teaching scheme or the employment of unconventional learning methods applied to technical subjects.

There is no doubt that *technical subjects are bound to designs*, therefore, architecture or interior architectural teaching programmes should *enhance the body of knowledge passed on to students, related to building technologies, the role of which is constantly increasing* [6]. Given the promotion of the integrative design process and transfer of knowledge within the contemporary teaching framework, it is reasonable to assume that, just like in the case of the learning process of the architecture student, accordingly the interior architecture student should be provided with an overall information *about the beauty of construction, how the construction lives and how it resists the pressure of gravity* [7], and *without needing to count it exactly* [7], and this should come in the course in building structures. This presumed analogy in the design methodology for architecture and interior architecture signifies that an inner spatial object becomes exemplary only when this object and its structure *create a homogeneous unit, structure is not an obstacle to perceive the work and the architectonic shape creates a logical structural solution* [7]. Therefore, a constitutive interior component (e.g. an interior staircase spanning functionally differing levels within one specific floor, a light exhibition pavilion and covered passageways) should be developed similarly as a complex architectural object.

DESIGN STUDIO-MODELLED STRUCTURAL DESIGN MODULE

The opinion that *architects are seen virtually as artists and their professional qualities are assessed, usually on the basis of their aesthetical achievements* [4], seems to be true in the case of interior architects' involvement in the space creation as well. Since the value of the technical performance of the interior space and its constitutive components becomes a significant element of the qualitative and quantitative evaluation of the built environment, the structural and materials-related aspects of interior architectural design require from interior architects the basic knowledge of the technical aspects of spatial objects that fill the interior.

The design studio is considered the prototype of design education [8]. This teaching model, having been commonly present in the design discipline-oriented higher education institutions, provides students with a learning environment, where they work on individual design projects *while tutors move from student to student, offering formative feedback on the projects and reviewing the work in progress as illustrated by a set of architectural drawings and models* [9]. Although this definition of the design studio is made in the context of architecture education, it is applicable in interior architecture alike. This specific learning environment does allow students to *apply knowledge attained from coursework to a specific project* [10]. This teaching formula facilitates developing design proposals by students in tutorial conversation with their instructors [11], while employing the design scheme based on a repeated cycle of production, reflection and assessment of the value of submitted design proposals [2]. The above-mentioned design-related activities concern research on the consistency of materialistic and formal aspects of the designed objects, which remains

a relevant factor for the quality of design. This problem refers to designing interiors, being equally important as in the case of architectural object, where *architecture cannot possess structure in a false form and building structure cannot absorb architecture in a spiritless concept* [12].

The design studio-oriented structural design module of the course in building structures, featuring the *non-hierarchical learning* [13] scheme, allows interior architecture students work individually or depending on the time schedule in two-three person teams on a project, and then to discuss their design proposals with the tutor. This project-based module enables interior architecture students to build their *structural sensitivity*, as well as exercising *ability to analyse, design, build and express structural choices* [14], as a substantial element of interior architectural design. In particular, this teaching mode, linking the lecture-based segment with the problem- and project-based module, assists to investigate the potential of interior architectural design strategies. The exemplary design strategies encompass the following:

- Design for the equivalence of the structural, formal and aesthetic aspects of interior components featuring multifunctional objects, to emphasise the *interconnection of technical and artistic disciplines* [13];
- Design for the exposition of the structural elements and systems employed to form interior objects, to consider them as valuable architectural details;
- Design for the effective management of resources through the conscious assignment of various complementing functions to the structural elements.

CASE STUDY

The course in building structures provided for second-year undergraduate students of the Faculty of Interior Design at the Academy of Fine Arts in Kraków is delivered through two consecutive semesters. This course comprises a series of introductory lectures conducted throughout one semester within the conventional lecture-based module, and finished with a drawing-based exercise as a tool to verify the students' understanding of presented issues. The module is followed by project-based and design studio-modelled classes realised in the subsequent semester. This compound learning scheme was planned to prevent the course from becoming only a type of the *simplified civil engineering module with a focus on basic statics* [14]. It was intended to offer the interior architecture students more engaging and stimulating a building structure-learning model. This teaching framework was to enhance the consideration of the technical characteristics of spatial objects featuring interior components, while searching for their formal identity and artistic expression. The ultimate aim of this concept was to examine the design studio-modelled structure course as a tool for conscious integration of interior architectural design with its engineering aspects.

In the academic year 2021/22, in the structural design module, projects were developed by a group of 20 students. Due to the limited amount of time dedicated to class in this semester (two academic hours weekly), and a number of students attending the course, students worked in teams discussing among themselves the problems related to the projects. Their assignment concerned a project of the spatially developed stairs placed within an existing exhibition centre. They were accessible to the public circulating between the main exhibition hall on the ground level and the adjacent mezzanine situated along the main axis. The subject of this practical module was chosen intentionally, as stairs, apart from being a constitutive interior component that responds directly to the functional requirements, give the interior architect opportunity to create them as *a three-dimensional set piece that encapsulates and embellishes the aesthetic intention* [5] of the areas connected by them. This interior component, usually being formally exposed in the interior space, while spanning different areas, needs to demonstrate its own *aesthetic coherence* alike [5].

Students were to develop this spatial object/interior component exclusively with steel products, from the main load-bearing structural elements, through a secondary structure up to the elements assuring proper and safe operating and making finishes. Students were encouraged to explore various structural systems and elements, as well as to work with a wide assortment of available steel building products (e.g. structural sections, bars, steel cables, platform gratings, perforated metal panels, expanded metal meshes). The preliminary conditions concerning strictly defined materials specification, apparently seen as constraints and making significant limitations in the design process, were introduced by the tutor deliberately to stimulate students' creativity. It was supposed to be accomplished through the intense analysis of building materials strength parameters and their physical characteristics, conscious exploration of the available assortment of building products, as well as through the investigation of their impact on the object's formal appearance and its ability to evoke aesthetic experiences.

The project design started with free-hand preliminary conceptual drawings to analyse first proposals with regard to the efficient fulfilment of functional obligations, accomplishment of the building code requirements and respect for the existing spatial context. This design phase included approximate calculations employing the structural principles. Working physical models were used to enable the simulation of spatial relationships and exploration of formal solutions, visualise the form, as well as to identify the possible weaknesses or errors in the assumptions concerning basic structure-related proposals. This phase was followed by further analysis and gradual building of interior architectural objects with the aid of computer software. The final results were displayed in the composite drawing boards that combined plans, sections, computer generated axonometric views of the designed objects (Figure 1). These were accompanied, depending on the degree of individual involvement of students, by photographs of the manually made or 3D printed physical models.

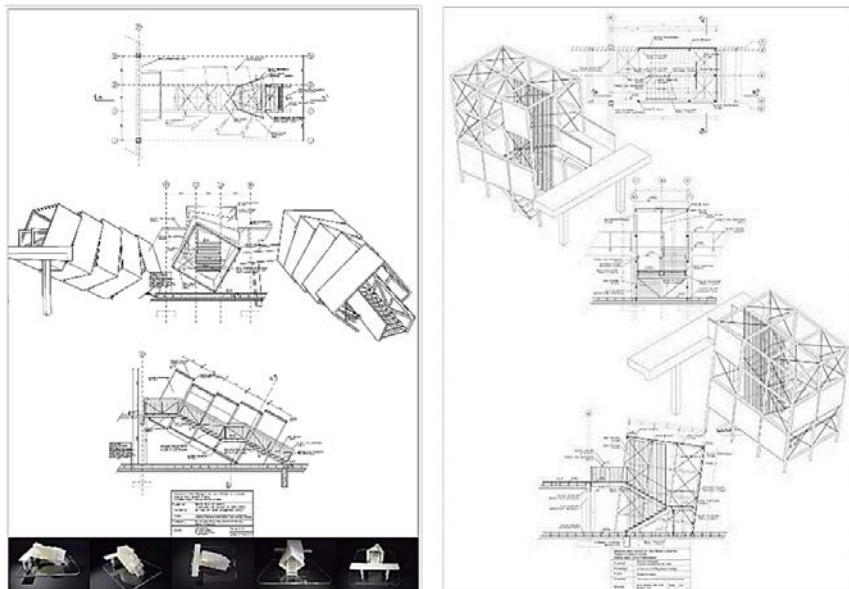


Figure 1: Composite drawing boards with projects of spatial structures featuring interior stairs (authors: K. Wasiluk, D. Suchy, L. Alrae, D. Wyrebska, E. Lembicz, M. and Swidnicka, supervisor: M. Celadyn, source: Archive of the Faculty of Interior Design, *Jan Matejko* Academy of Fine Arts in Kraków).

The methodology of design comprised elements related directly to the structural design problems (i.e. analysis of various structural schemes to respond to design problems, inquiry on selecting of appropriate building products, verifying suitability of the applied structural scheme, verifying structural viability of the proposed solutions made with physical models), as well as questions associated with architectural design (e.g. testing the accuracy of the scale and proportions of each parts of objects, inquiry on the resources efficiency accomplished with the reduction in finishes and its effect in the considerable exposure of structural elements).

The main objectives of this structural design module's methodology included the following:

- 1) Making *structurally informed choices* [14], meaning engagement in the understanding of structure-related problems and their further inventive reprocessing;
- 2) Considering the interior constitutive component as both an architectural object and a structural system, based on an examination of the range of integration of architectural design and engineering aspects in designing interiors components, in a search for their formal and aesthetic integrity.

The detailed objectives of the project designed within the practical module encompassed the following:

- Examination of the structural scheme as a substantial factor to impact the formal appearance of spatial objects/interior components;
- Development of interior components as spatial objects revealing the presence and interdependency of the structural elements and systems;
- Search for the architectural details of high aesthetic value as being derived directly from the applied structural solutions.

An integral element of the structural design module was an anonymised inquiry conducted among students attending the course in building structures. Participants were provided with an open-ended questionnaire to evaluate their experience of attending the design-studio modelled structural design module. The survey was to reveal students' opinions on the learning framework, and to suggest directions for future adjustments in the teaching framework. Students were asked several questions starting from their presumptions concerning the character of the course. Then, they were invited to assess the way this two-module course in building structure had been conducted. Finally, the students were questioned on their reflections on the supporting role of building structures in generating multifunctional interior components as architectural objects of a high spatial, formal and aesthetic qualities.

DISCUSSION

Students attending the structural design module showed engagement in analysing the value of the physical appearance of the developed objects, while working on appropriate structural proposals. The results of the design projects developed within the module confirmed their interest in considering the necessity of the integration of structural issues and interior architectural design questions in designing objects featuring interior components, as well as in interventions concerning refurbishment or adaptation of existing buildings. Out of the 20 students enrolled in the course, 16 participated in this survey. The majority of students contributing to the inquiry agreed that the proposed design studio-modelled structural

design class allowed them to verify in practice the information they were provided with during the lecture-based theoretical module of the course. They positively assessed the subject of the project as being adequate to the area of interest of interior architecture. The opinions enclosed in the survey confirmed the students' commitment to consider more consciously the structural questions, while working on architectural objects featuring interior components.

The practical outcome of the introduction of the discussed teaching concept was an amendment concerning the building structure course's hourly load per semester. The recommendation by the tutor concerning this issue was addressed to the Faculty's authorities. This request was supported by the satisfactory results of design projects made within the discussed practical module, as well as the results of the students' inquiry on this matter. The positive reaction of the authorities to this proposal permitted to double the number of academic hours assigned to the project-oriented component of the course. This allowed students in the academic year 2023/24 to work individually on their design projects realised within the structural design module. Their enthusiastic reaction to the opportunity to make projects independently proved their attachment to the idea of the interior architect as an autonomous creator and desire to take full responsibility for the final result.

In consequence of the modification in timetable, students gained more time to engage in the preliminary phase of the project concerning the examination of the efficiency of the proposed structural configuration, as well as its impact on the visual appearance of the object. At the preliminary design stage, students were able to more precisely identify the appropriate structural systems for specific objects and to analyse the meaning of integrating structural, functional and formal issues in design. These instructive design techniques included sketches to examine the relation to the proposed structural systems, free-hand conceptual drawings to study the interior component proportion (Figure 2), and physical working models to verify the overall structural concept in relation to the appearance of the designed architectural objects (Figure 3).

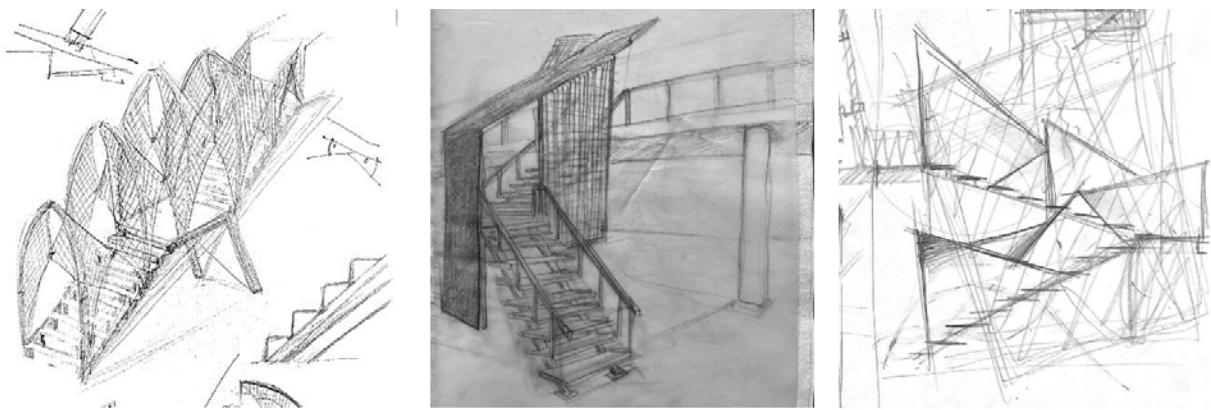


Figure 2: Free-hand conceptual drawings of spatial objects featuring interior stairs and a connecting passageway (authors: M. Bielak, K. Gubała and S. Krasnovyd, supervisor: M. Celadyn, source: Archive of the Faculty of Interior Design, *Jan Matejko* Academy of Fine Arts in Kraków).

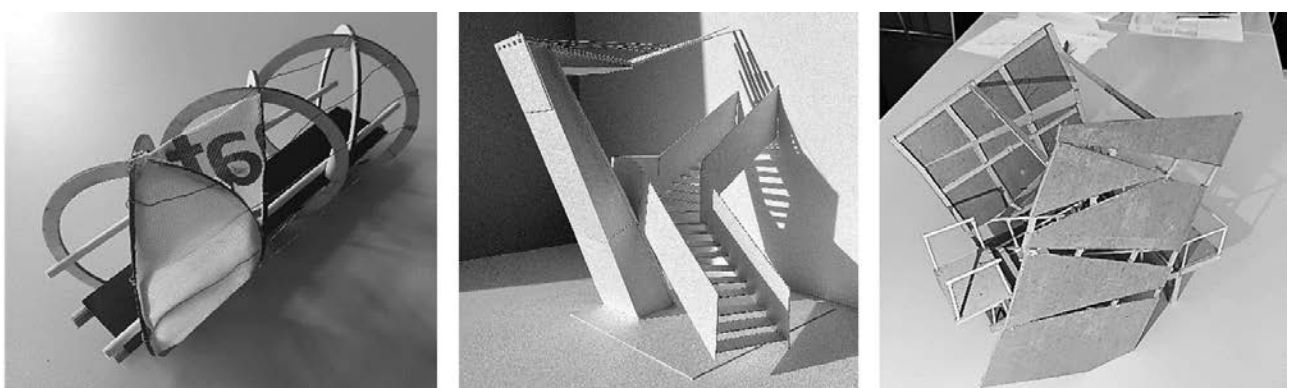


Figure 3: Physical working models of spatial objects featuring interior stairs and a connecting passageway (authors: L. Pilecki, K. Gubała, S. Krasnovyd, supervisor: M. Celadyn, source: Archive of the Faculty of Interior Design, *Jan Matejko* Academy of Fine Arts in Kraków).

Students working within this structural design module were provided with necessary data, including functional requirements, spatial organisation and the physical context of designed objects, along with the basic knowledge of the structural aspects acquired from the theoretical lecture-based module. This provided a basis for developing interior architectural design endorsed with the engineering design thinking. Nevertheless, further adjustment of the currently practised and based on the central positioning of architectural design studio learning scheme, to an *integrative and cross learning space at different scales where students are endowed with the necessary knowledge (instrumental, creative, social and technical)* [15], would really become an innovative proposal for the interior architecture teaching framework.

This scheme of the collaborative design process would contribute to the outcomes being more comprehensive and justified in a reasoned manner.

CONCLUSIONS

The study investigated the employment of a design studio-modelled and project-based module of the building structures course teaching in the interior architecture education framework. The teaching concept analysed in this article was conceived to challenge the conventional interior architecture teaching model with the dominant position of interior architecture within the design studio and representatives of other disciplines, seldom involved into the design process, appointed as sub-consultants to add their opinions and remarks without a significant shared contribution to the final project solution.

The enclosure of the design studio-modelled and project-based module of the building structures course into the interior architecture teaching scheme, according to the authors, is to endorse the perception of the structural systems and elements as factors contributing to the interior architectural design. This was confirmed by the results of the open-ended questionnaire on students' assumptions about the building structures course delivery mode, its impact on formal and aesthetic qualities of designed interior spaces and their components, and the teaching scheme applied to its realisation. Students appreciated that the subject of the design project, scale of the object and the design problem were instructive for them, giving an area for experiments with form and exploring the interconnectedness of formal, functional, structural, as well as aesthetical aspects.

Further recommendations on the enclosure of technical problems into the interior architectural teaching framework, should consider the integration of architectural design and structural design modules to teach prospective interior architects to practice interdisciplinarity within the design process. The ministerial educational standards concerning the teaching courses of interior architecture define the interdisciplinary character of the interior architectural design field, and indicate the necessity for the holistic approach to interior design decision-making process, as the most important issue at the present time. The accomplishment of these requirements would be possible through the collaboration of interior architectural design and structural design modules on projects, as a supportive learning mode. The application of this concept could allow students to gain confidence on the necessity for cohesive examining of the structural, functional and formal requirements, as well as the influence of this complex approach on the interior architectural object's aesthetic values.

REFERENCES

1. Klingenberg, E.S., 4 dimensions of interior architecture. 20 January 2024,; https://www.academia.edu/556845/4_Dimensions_of_interior_architecture
2. Perolini, P.S., Interior spaces and the layers of meaning. *Design Principles and Practices: an Inter. J.*, 5, 6, 163-174 (2011).
3. Brooker, G. and Stone, S., *From Organisation to Decoration*. In: Thinking inside the Box: a Reader in Interior Design for the 21st Century. London: Middlesex University Press (2007).
4. Brooker, G. and Stone, S., *Form and Structure in Interior Architecture*. London, New York: Bloomsbury Publishing Plc. (2016).
5. Plunkett, D., *Construction and Detailing for Interior Design*. London: Laurence King Publishing (2010).
6. Celadyn, W., Architectural education to improve technical detailing in professional practice. *Global J. of Engng. Educ.*, 22, 1, 57-63 (2020).
7. Ilkovič, J., Ilkovičová, L. and Špaček, R., To think in architecture, to feel in structure: *Teaching Structural Design in the Faculty of Architecture*. *Global J. of Engng. Educ.*, 16, 2, 59-65 (2014).
8. Wang, J., *Challenging ICT Applications in Architecture, Engineering, and Industrial Design Education*. Engineering Science Reference (2012).
9. Avsec, S., Jagiełło-Kowalczyk, M. and Markiewicz, P., Engineering thinking to enhance architectural design. *World Trans. on Engng. and Technol. Educ.*, 16, 2, 134-139 (2018).
10. Gurel, M.Ö., Explorations in teaching sustainable design: a studio experience in interior design/architecture. *Inter. J. of Art & Design Educ.*, 29, 2, 184-199 (2010).
11. Wilkinson, N. and Salama, A.M.A., *Design Studio Pedagogy: Horizons for the Future*. Gateshead: The Urban International Press (2007).
12. Ilkovičová, L. and Ilkovič, J., Basics of building structure in architectonic education. *Global J. of Engng. Educ.*, 21, 2, 150-156 (2019).
13. Ilkovičová, L., Ilkovič, J., and de Oliveira, M.B., Interdisciplinary education in the architectural design of engineering structures. *Global J. of Engng. Educ.*, 24, 3, 171-178 (2022).
14. Herr, C.M., Qualitative structural design education in large cohorts of undergraduate architecture students. *Global J. of Engng. Educ.*, 15, 2, 96-102 (2013).
15. Masdeu, M. and Fuses, J., The design studio as a new integrative and experimental learning space: the pedagogical value of implementing BIM, parametric design and digital fabrication in architectural education. *Athens: ATINER'S Conf. Paper Series*, No: ARC2017-2317 (2017).