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PETITE TIMBER STRUCTURES IN/AND ARCHITECTURAL DESIGN EDUCATION

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ABSTRACT

The aim of this paper is to present a recent educational experience developed through the ongoing pedagogical process at the Faculty of Architecture in Skopje, exploring the advantages of informal tools of education, with particular focus on the learning-by-building method of learning architectural design.

The main goal of the teaching experience explored in the paper was to get architecture students acquainted with the great potentials of timber as architectural building material. The paper specifically focuses on presenting four case studies, documenting the development of different timber structures of high architectural quality, designed and built by architecture students. Each architectural structure was realized within the educational, pedagogical, social, cultural and representational framework of the International Summer School of Architecture, an architectural workshop that for 30 consecutive years has been organized by the Faculty of Architecture at Ss. Cyril and Methodius University in Skopje.

The International Summer School of Architecture was established in 1992, and has since then been a place for teaching and learning architecture for more than 500 domestic and international students and more than 100 architects and teachers from all around the world. In the 30 years of its existence the International Summer School of Architecture has shown the ability to transform and adapt its format to numerous pedagogical viewpoints and concepts, from highly theoretical to applicative ones. As many as four International Summer School sessions have been realized exploring the learning-by-building methodology, as result of which several timber structures were designed and built on various locations by the students and their tutors.

The collection of timber structures presented in the paper represents not only a valuable portfolio of the International Summer School of Architecture of the Faculty of Architecture in Skopje, but a significant source of knowledge for studying architecture design methodologies, processes and strategies, as well as engineering and construction techniques and their role in the architectural design education on university level.

Keywords: architectural design education, learning tools, learning-by-building method, timber.

1. INTRODUCTION

Contemporary architectural design education faces many challenges as the world we are living in is a subject of constant change and transition – economic, social, technological, environmental etc. Educational institutions are under continuous pressure to react more responsively to those evolving and transforming conditions in order to provide their students with fresh knowledge, qualifications and training which they are required to have in order to enter the competitive professional field. Consequently, apart from rethinking the existing ones, schools of architecture are required to explore and find novel ways of teaching and training their students.

Based on the participants' personal involvement and experience in architectural design education, the paper presents the advantages of informal tools of education in architecture, with focus on the learning-by-building method of learning. As a result of this experience, participating students gained valuable professional and personal knowledge in architectural design, with a direct effect on their education process. By discussing the specific results from four architectural workshops focused on using timber as building material, the authors are presenting the qualities of this learning practice.

2. MATERIAL AND METHODS

2.1. Crisis of practical training of architecture students

In its 72 years old educational and pedagogical mission, the Faculty of Architecture within the "Ss. Cyril and Methodius" University in Skopje provides its students with a high quality study program based on theoretical and practical knowledge in the fields of architectural design, architectural constructions and modern building technologies, urban planning and design, as well as history and theory of architecture and arts, qualifying its students to gain high professionalism and professional competencies in accordance with current European standards.

Graduates of the Faculty of Architecture in Skopje are professionally entitled 'engineer-architect', which reflects the pedagogical profile of both the Faculty and its study curriculum, aiming at a strong and coherent integration of engineering and architectural knowledge. Nevertheless, in the last few decades of its pedagogical history, similarly to the tendencies in other European schools, architectural education and training at the Faculty of Architecture in Skopje was increasingly becoming distant from practical application of architectural skills, weakening thus the connections between training, practice and the act of building. Although students are taught about the logic and properties of structures, construction materials and building techniques (as architectural construction and engineering subjects are widely present in the educational curriculum), students are noticeably missing the practical aspects of building process.

Architectural schools are also object of increased criticism coming from the practicing architectural offices and companies which are engaged in designing and building construction facilities and works in construction. The latter are generally accusing the academic institutions of being unable to meet the demands of the profession they are supposed to serve, referring particularly to the inability of recent graduates to be quickly involved in the practical process of production/construction of architectural space. The critiques extend to the inadequate performance of the graduates when asked to closely collaborate with other professionals such as civil engineers, mechanical engineers, electrical engineers, supervisors, contractors etc.

What can be done in regards to this problem? Which should be the new priorities of architecture education in our days? How should schools of architecture respond and in which ways? Which are the new tools, methods, processes for teaching architecture?

2.2. Learning architecture by practicing architecture: educational tools and methods

Many times in history, the nature of the profession of architecture, the profile of the architect and consequently the architectural education, has undergone number of changes, responding to the necessity to redefine their (new) role within the changing economic, social, political, environmental and technological contexts of the world at the time. Consequently, the schools of architecture are here to constantly reform the educational process by improving the structure of their academic curricula, to reconsider the importance of particular subject areas and, equally important – to update their teaching and knowledge sharing methods.

2.2.1. New tools of learning architecture

For decades, the Design Studio represents the main educational tool in formal education and training of architects. It is focused on giving the students the possibility to experience the application of the design process (Salama, 1995). As described by Schön (Schön, 1995), the form of Design Studio is a small class of 10-15 students dedicated to solving a single (or multiple) project-based

problem/s, where each of the students resolves it in his own way. The proposed solutions to the design problems are later collectively reviewed and evaluated by a design jury. The Design Studio is basically a situated learning environment (Kurt, 2021) and corresponds to the most common form of working environments to be later found in the professional design practice offices, simulating the environment and the working conditions within which the professional architecture projects are realized.

Schools of architecture have lately been exploring many new ways of training, aimed at broadening student's perspectives and design skills so that they could gain the necessary practical skills based on direct experience. As a result, the informal learning is becoming a more and more popular and common form of learning practice, in the ongoing effort of the schools of architecture to react more responsively to actual topics and themes. Informal learning explores various educational methods and formats, such as workshops, seminars, conferences etc.

Workshops are the most common formats of informal education among both schools of architecture and their students. According to Brooks-Harris, workshops can be defined as "an educational meeting where a small group explore some subject, develop a skill or technique, carry out a creative project, etc." (Borroks-Harris & Stock-Ward, 1999).

In regards to the educational experience, the Workshops are similar to the Design Studios, as both are envisaged as creative educational environments, appropriate for learning, thinking, experimenting…, as well as exchanging knowledge, information and competences among the participants. Workshops are the closest form of teaching in regards to Hassanpour's description of architecture education, being process oriented rather than product-oriented discipline (Hassanpour, 2013).

Content wise, workshops usually reflect actual topics and emergent themes. Usually being optional, but also an obligatory activity within the formal study curriculums of many architectural schools, their representation in architectural programmes has increased rapidly over the past decade and workshops are nowadays one of most popular new tools in the education process of architects. Workshop's main pedagogical advantage relative to Design Studio is allowing students to work in a more self-confident and flexible environment. Since workshops are usually attended on a voluntary basis, students are therefore more active, which indicates a higher level of learning (Martin & Balla, 1990). Timewise, the workshops last much less than Design Studios, but are therefore way more intensive.

The International Summer School of Architecture, organized by the Faculty of Architecture at Ss. Cyril and Methodius University in Skopje, was established in 1992 and has since then been a place for teaching and learning architecture for more than 500 domestic and international students and more than 100 architects and teachers from all over the world. In the 30 years of its existence the International Summer School of Architecture has shown the ability to transform and adapt its format to numerous pedagogical viewpoints and concepts proposed by the guest tutors, from highly theoretical to deeply applicative.

2.2.2. Learning-by-building as method of learning architecture

The so called "learning-by-building" method of learning architecture (also known as "learning-by-doing" or "design-build") is an alternative to the conventional methods of education and lies on the boundary between theory and practice. It refers to a learning system where the physical construction process of a building or a structure is being an integral part of the design process, meaning that during the educational experience the students both design and build actual building structures. In that sense, it is considered to be a learning method based on the "power of activity" (Erdman et al., 2002), ending with a physical structure as a result of the design process.

In learning-by-building projects, "students create the design artefacts typical of any studio course: hand sketches, physical scale models, digital models, technical drawings, occupation drawings, etc. But they also follow the full arc of project delivery including navigating client relations, working with engineers, developing construction documents and detail drawings, securing building permits, tackling project management and budgeting (even fundraising), and finally assembling the full-scale structure on a 'real' construction site." (Nicholas & Oak, 2020, p.36) The specific architectural design objectives of the learning-by-building method are to introduce the students to unmediated understanding of the relation between: the location, the program, the architectural form, the structure, the material, the production (fabrication).

The teachers have particularly important role in the learning-by-building method of design education as they represent not only a knowledge resource for students, but their role is to provide an experienced guidance through both the design and the construction process, helping students improve their practical skills. In that sense, their "role as 'teachers' is transformed into 'mentors', and teaching is made a function of learning, rather than the other way around." (Skotte, 2013).

The learning-by-building method constitutes an important part of architecture education in terms of exposing students to alternative practice possibilities. The essential part of learning-by-building method is the aspect of collaborative learning, which refers to a study environment where students and teachers of different backgrounds are situated in order to create, share and discuss their thoughts, their ideas, their skills, their approaches and so on. In conjunction with the collaborative learning, fieldwork is another tool of the learning-by-building method and refers to an "outdoor" teaching environment where the project site is simultaneously the learning site, the working site, the building site..., a place of direct learning and experience.

As Tolya Stonorov would conclude, the importance of the learning-by-building experience, "of understanding material relationships at a one-to-one scale is invaluable. Hands-on learning through the act of building what you design, translates theories and ideas into real world experience." (Stonorov, 2018).

2.3. Timber as building material

Timber is building material that has been used in architecture for thousands of years and is still well represented in today's architecture construction industry. The reasons for this are many and they are related to the advantages of timber as building material. It is easy to handle and to be transported, it is cheaper than most of the other structural materials, it can be easily cultivated and it is easy to work with, it performs well structurally, it is renewable etc.

The increase in the use of timber is fundamental in the context of reduction of human's carbon footprint. Namely, one of the most important challenges of the 21st century is certainly related to the changing conditions of our natural environment, particularly the global climate crisis. Within the collective efforts to fight the problem of global climate change, architecture schools are once more places of critical societal importance as they are expected to provide the expertise necessary to educate and train the new generation of architects, designers and engineers to have greater awareness of their responsibilities in saving the future of our planet. Students of architecture should learn how to design a new generation of buildings that would be made from renewable and/or reusable resources and with lowest possible carbon emission in their technological processing, significantly contributing to the goal of sustainable future.

3. RESULTS AND DISCUSSION

The paper will specifically elaborate the educational results from four different sessions of the International Summer School of Architecture organized by the Faculty of Architecture Skopje. The paper will present 4 different sessions of the Summer School, each as a separate case study. The sessions that are presented have in common the method of architectural learning – learning-by-building, as well as the aim – to encourage students to develop their architectural designs using timber as building material, critically evaluating its properties when used as construction material. On all of the presented Summer School sessions the common design tasks were exploring the relation between the place (location/site) and the build structure, as well as simplicity of form and functionality of construction details. Each of the case studies will be presented by the location, the design problem, the learning process and the outcome.

3.1. Case study 1 - 15th session of the International Summer School of Architecture

The architectural workshop at the 15th session of the International Summer School of Architecture took place at the premises of the St. Joachim Osogovski Monastery near Kriva Palanka. The topic of the workshop entitled "Process" was set by the world-renowned Croatian architect and professor Hrvoje Njiric, who was the session's guest tutor. The workshop lasted for 7 days and 25 students (17

from the Faculty of Architecture Skopje and 8 foreign students) were led by the pedagogical team of 7 tutors from the Faculty of Architecture in Skopje.

The learning process was following a set of predefined steps. First, the students were given the task to analyze and find 2 socially agreeable spots in Kriva Palanka for a new architectural intervention, then they had to propose a suitable (missing) main program for it, and two temporary (occasional) ones as a hybrid condition. The further steps of the process were to establish a relation of the immediate urban environment to the proposal, to define the structure and the process of its implementation. In this phase of the process the students had to make a choice of suitable (second hand) materials for the architectural structure, and cultivate the everydayness as an overall appearance. The final steps of the process included building a 1/10 – 1/20 scale model and preparation of a public presentation.

The first 4 steps of the Process were conducted by smaller teams of students. After numerous consultations, presentations and desk critiques the pedagogical team decided to select two of the many sites proposed by the students as most suitable for an architectural intervention, and to fuse the groups of students into two bigger teams, each continuing work on one of the two selected sites.

The first site was located in the Roma neighborhood of Kriva Palanka, next to an open-air atmospheric water canal, dividing the neighborhood into two separate parts. The program for this site was developed from the interviews conducted by the students, attentive observation and analysis of the people in the neighborhood - a place where some of the open-air activities of the people in the neighborhood will continue, but in an updated environment and improved conditions. The second site was located in the center of the city, in the small park next to Kriva Reka. This site was chosen because of a very specific local phenomenon - people turning their back to the river. The small accessible wooden platform (a belvedere) also served as a commercial billboard, and space for small gatherings.

The final steps of the design process were developing and defining a structure for the building. After a very intensive work the complete designs of the two structures were finished in 4 days. A mid-term presentation was organized and all the visitors from the local community and from the Faculty of Architecture were very pleased with the results of the intensive work of the students and the pedagogical team. After the presentation, a long and loud discussion followed resulting in a very brave "ad hoc" decision made by the organizers of the Summer School. We decided to use the remaining 4-5 days of the session in the effort to actually turn this architectural design workshop into a learning-by-building workshop for the first time in the history of the Summer School. With an extreme level of excitement and with a huge support from the students we managed to solve all the unanticipated problems on the go, as we encountered them, compensating with a very strict work ethic, discipline and enthusiasm.

Although the projects were designed carefully and the required material was accounted with a great precision, huge amount of adaptation was inevitable due to the limitations of the local market. Some materials needed for the structure, or in most cases, the quantity of certain materials, simply could not be found in Kriva Palanka. The designs went through a process of constant adaptation according to the constantly changing conditions on site. At the end we managed to build both structures in 4 days and leave them as a gift to be used by the citizens of Kriva Palanka.

3.2. Case study 2 - 20th session of the International Summer School of Architecture

The architectural workshop of the 20th anniversary Session of the International Summer School of Architecture entitled "Invisible labyrinths" was led by the world-renowned Russian architect and artist Alexander Brodsky. In 7 days, 30 students in total (23 from the Faculty of Architecture Skopje and 7 foreign students) led by the pedagogical team from the Faculty of Architecture Skopje designed and built 2 structures: one for watching and enjoying the sunrise, and one for watching enjoying the sunset. After our first experience with Design build workshops (case study 1) and the lessons learned there, our second attempt went much smoother due to the extensive preparation (tools acquisition, market research for availability of materials…) we did prior to the actual Summer School.

Figure 1. *Students and tutors constructing the timber pavilions on sites 1 and 2, Kriva Palanka*

The workshop began by analyzing and documenting the approximate surroundings of the monastery complex in search of the most suitable location for these two structures with a very specific function. The orientation, the topography and the accessibility of the sites were all taken into consideration in the process of selecting the two most suitable sites. Only after the two appropriate sites were located, did the design of the structures begin. The designs were gradually developed by the students under the tutorship of the pedagogical team from the Faculty of Architecture Skopje. The materials for building the structures (mainly timber) were purchased entirely from local suppliers.

For the first site, intended for watching and enjoying the sunset, the students designed and built a wooden wall with an integrated bench and an eave, carefully positioned on site to provide the best vistas and a unique experience for observing and enjoying sunsets. For the second site, the student design consisted of four cascade-like positioned wooden benches placed on the ground, following the natural topography of the site, with three rows of mattresses in-between them. Because the scale of the architectural interventions was dimensioned to match the time frame, number and capability of students and the cost and availability of tools and building materials, the erection of the two structures went smoothly without any major problems or setbacks.

Figure 2. *Students constructing and enjoying the timber structures dedicated to sunrise and sunset*

3.3. Case study 3 - 23rd session of the International Summer School of Architecture

The 23rd session of the Summer School was entitled "Chapel for nature". This architectural workshop was tutored by the renowned Finnish architect and Professor at the University of Trondheim Norway - Sami Rintala. Using the “learning-by-building” methodology used on two of the previous sessions of the Summer School, the architecture students got the opportunity to be involved in all the phases of architectural design - from conceptualizing and designing to actual building.

A group of 26 students from the Faculty of Architecture in Skopje, as well as 10 foreign students studying in various European schools of architecture coming from different countries from around the world, and 3 tutors from the Faculty of Architecture in Skopje, during the period of seven days of intensive education, work and socio-cultural program, designed and built a ‘Chapel for Nature’ – “a small room for a small group of people to come together and focus/ respect/ praise the beauty of nature.” (Rintala, 2014). The Chapel was not intended to have any direct religious connotation. It was designed as a universal ‘classroom’ social in character but spiritual in atmosphere; very simple yet extremely complex. The main focus was in framing the views, the natural light, the orientation and positioning in the landscape, the use of material resulting in a small filtering space where man and nature are in balance.

The final composition of the Chapel was designed to evolve along two topographic, landscape, organizational and symbolic intersecting axes, one parallel and the other perpendicular to the existing pathway leading to the nearby village. In formal terms, the chapel consisted of seven wooden walls (six made by the six teams of students and one made by the teachers) positioned between several existing natural elements of the site (trees, rocks ...). Made entirely by primitive hand tools, the seven walls of the chapel defined a place in nature where visitors could sit down, relax, talk, meditate and enjoy the beautiful view, the lush vegetation and pleasant microclimate.

The intensive agenda and timetable, the multilayered didactic plan, as well as the thoughtful and well-organized work offered the participating students not only the opportunity to gain the skills of observing and imagining, the methods of designing and constructing, but also the opportunity of participating in lively discussions, articulating critical reflections of the role of contemporary architecture built from natural materials and made using traditional building techniques. By attending the Summer School, the students got an exceptional opportunity to work alongside and learn from a world-renowned architect with a striking personality and an outstanding professional and teacher.

The mutual satisfaction from the results was partially disrupt by the fact that only few days after the completion of the chapel it became a constant target of (un)known thieves, that by stealing the construction material, bit by bit, destroyed the structure. This process of deconstruction of the built structure is mirror reflection of the current cultural climate among the local population. The lack of basic value criteria and sense for the common good is obvious. These attributes are not necessarily related to material poverty. But, despite the bitter aftertaste, in the long run, the 23rd Summer School of Architecture was a successful continuation of the cooperation of the Faculty of Architecture and the local community in Kriva Palanka.

Figure 3. *Chapel for Nature, the timber pavilion in the process of construction and finished*

3.4. Case study 4 - 28th session of the International Summer School of Architecture

The architectural workshop at the 28th session of the International Summer School of Architecture entitled "Configuration" was led by the Irish architects Dougal Sheridan and Deirdre McMenamin from the architectural studio LID Architecture. In 8 days, 23 students in total (18 from the Faculty of Architecture Skopje and 5 foreign students) led by a pedagogical team consisting of tutors from the Faculty of Architecture Skopje, built a wooden platform for social gatherings next to Kalin hotel in the village of Lazaropole.

First, during the spring of 2019, the architect Dougal Sheridan, alongside professors from the Faculty of Architecture Skopje, visited and documented the site for the architectural intervention in the village of Lazaropole. After going back to Ireland, he and his design partner, the architect Deirdre McMenamin designed the platform, and sent the design technical drawings to the professors from the Faculty of Architecture Skopje in order to acquire the required tools, materials and logistical support needed for having the whole structure built in 8 days. All the timber materials needed for the building of the wooden structure were acquired locally.

The designed architectural structure consisted of a platform, stairs, table and a canopy made entirely from modular timber elements. The structure was designed to be site specific, responding to multiple contextual influences. The first night, at the beginning of the Summer School, during the introductory lecture, the guest architects presented the designed structure to the students and divided them into two teams: one responsible for the platform, and the other responsible for the canopy.

The next morning, while the first team of students and tutors were preparing the building site for the architectural intervention, the second team of students and tutors were dispersed in the village in order to document and draw a plan of the whole village. The detailed map of the village was then hand drawn on the canopy in order to add another level of communication and interaction of the locals with the structure.

The process of building the structure started by slowly and carefully cutting the timber to dimensions and assembling the modular elements. Further down the process of building, as the structure begun to appear and "grow" on site, the students were getting more skilled and more comfortable using the tools and building the structure. Although always being under the supervising eyes of the tutors, the students gradually began to need less guidance for finalizing the project. After the structure was completed, the Faculty of Architecture organized a ceremony of presenting the diplomas for the participants of the Summer School session on the platform under the canopy, followed by a farewell party.

a)

b)

c)

Figure 4. (a;b;c) *The timber configuration in the process of construction and finished*

4. CONLUSIONS

In the midst of so many challenges that architectural design education faces today, the lack of practical experience and direct application of architectural skills by the graduate students is a concerning one. Educational institutions should therefore react more responsively so as to provide their students with appropriate knowledge and qualifications. In order to do that, the former must explore and find novel ways of teaching and training their students.

The potentials of workshops as an informal tool in architectural design education, as well as the learning-by-building method of learning have been discussed. The findings of this work support the

conclusion that the open format of the workshops offers a variety of learning experiences, where over a short period of time students can intensively learn, research, gain knowledge and competences, experiment, meet different actors, exchange their ideas etc.

Based on the direct experience form four different sessions of the International Summer School of Architecture, it can be concluded that learning-by-building method offers a variety of advantages. Firstly, it empowers architecture students to get in touch with the direct practice of building, working on real topics and with real design constraints. Secondly, students are able to obtain valuable professional and personal knowledge in architectural design with a direct influence on their education process.

Timber as building material is easy to find on the market, it is cheaper than other building materials, it is structural, it is easy to work with and simple to transport, it is renewable, and therefore it is the most suitable building material to be used in the learning-by-building study workshops. Using timber as building material, students can experiment with various construction methods and techniques without major difficulties, integrating its material properties into design ideas and thus empower the final results.

Learning-by-building method should take a greater part in the architectural design education. By its integration into the formal curriculum of architecture schools, it will certainly provide a more creative and motivated environment for the students.

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