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Transferring COVID-19 Challenges into Learning Potentials: Online Workshops in Architectural Education

Aleksandra Milovanović , Miloš Kostić , Ana Zorić , Aleksandra Đorđević ,
Mladen Pešić , Jovana Bugarski , Dejan Todorović , Neda Sokolović  and
Andrej Josifovski 

Faculty of Architecture, University of Belgrade, 11000 Belgrade, Serbia; milos.kostic@arh.bg.ac.rs (M.K.); ana.zoric@arh.bg.ac.rs (A.Z.); aleksandra.dj@arh.bg.ac.rs (A.Đ.); mladen.pesic@arh.bg.ac.rs (M.P.); jovana.bugarski@arh.bg.ac.rs (J.B.); dejantodorovic@arh.bg.ac.rs (D.T.); neda.dzombic@arh.bg.ac.rs (N.S.); andrej@arh.bg.ac.rs (A.J.)

* Correspondence: alekmil@arh.bg.ac.rs

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Abstract: The paper addresses the shift in architectural education regarding the need to develop new approaches in teaching methodology, improve curricula, and make advancements in new learning arenas and digital environments. The research is based on the assumption that online workshops could offer a unique learning experience for students in higher education. Accordingly, workshops are considered an essential element in teaching emergency design. As a result, this can produce broader and more innovative solutions to COVID-19 challenges regarding social distancing, limited movements, regulated use of public space, and suspended daily activities. The theoretical notions of emergency design and education for sustainable design enabled the identification of research perspectives and spatial levels to be taken as a starting point of the workshop “COVID-19 Challenges: Architecture of Pandemic” that was conducted by the University of Belgrade—Faculty of Architecture in April 2020. The critical review of the workshop’s procedural and substantial aspects led to identifying four main COVID-19 design challenges perceived in performance, innovation, alteration, and inclusion. Additionally, the paper’s findings concern the identification of learning potentials and limitations arising from a current topic affecting global society, for which neither solutions nor adequate answers in the field of architecture and urbanism have been found.

Keywords: emergency architecture; workshops; COVID-19; education; teaching methods

1. Introduction

Architectural practice and education face numerous challenges, some of which are social transformation, climate change, globalization, urbanization, consequent depletion of existing environments, and growing pressure on public services, infrastructure, and housing. The new architectural and urban paradigms require students in higher education to be adequately informed and trained to react to these challenges. This setting enables the development of spatial scenarios and solutions in response to the contemporary sustainability goals defined within the 2030 Agenda for Sustainable Development [1]. The fundamental mission in the process of education is thus reflected in the permeation of two purposes: (1) to reach and enhance the development of inclusive, safe, resilient, and sustainable cities and human settlements (Sustainable Development Goal 11) and (2) to ensure inclusive and equitable quality education (Sustainable Development Goal 4) with the intention to educate future professionals about contemporary city problems and address them through design. The SDG Dhaka Declaration highlighted the unequivocal role of architects in achieving all seventeen

of the UN Sustainable Goals, pointing out the professional responsibility of architects to “contribute to the built environment and make choices that change the world for the better—through better buildings, settlements, landscape architecture and urban planning” [2]. As a response to the abovementioned challenges, the horizons of research and experimentation in architecture and urbanism are expanding rapidly while destabilizing our understanding of the expected impact and consequences on a global scale. Regarding pandemic conditions, when the world is facing a global crisis caused by COVID-19, it is more important than ever to re-examine existing approaches to the architectural education, content of existing curricula, and learning environments.

1.1. Motivation

Urban development is passing through a significant change causing transformation of architectural and urban design practice, hence, requiring a new profile of (1) an architect/urban designer who will be one of the pioneers in environmental change and (2) an architectural educator who will transfer scientific knowledge about sustainability into innovative curricula. The EDUCATE project (Environmental Design in University Curricula and Architectural Training in Europe), highlighted the fundamental challenge in education, perceived in need for life-long learning of both students and practitioners [3]. Following this line of reasoning, identified challenges require educators to promote a sustainable approach, design curricula which transcend the limits of disciplines and professions, and inspire students to approach design challenges and assignments in a creative and critically based manner. Based on the conclusions of the event dealing with the topic of establishing a common European higher architectural education area, organized by leading architectural education associations such as The European Association for Architectural Education (EAAE) and The European Network of Heads' of Schools of Architecture (ENHSA), three central factors that shape teaching structure and the environment in architectural education were highlighted [4]: (1) changes in architectural practice, (2) new attestations and views on architecture, and (3) new EU policies towards a cohesive European area of higher education. Therefore, it is necessary to understand and monitor changes in the field of architecture and urbanism through the work and missions of professional organizations and associations, perceive the perspectives of actual scientific research, and follow policies that will contribute to the quality of higher education. Global agendas and charters on architectural education create a specific framework that indicates the need for a knowledge-based economy and society aligned to tackle environmental challenges [5,6]. In this sense, (1) the new curricula should be designed to build the capacity of future professionals and broaden their professional competences and responsibilities, as well as improve their technical, technological, socio-humanistic, and artistic skills to design a built environment sensitive to social and environmental contexts; (2) the new methods of education and training for architects should bring flexibility in the curriculum development to respond to given demands and requirements; and (3) research by design approach should be encouraged to generate critical inquiry through design work.

1.2. Education, Sustainability, and Crisis Response

Current research in higher architectural education recognizes the concept of sustainability as a contemporary tool for delivery of environmental sensitivity and singles out the need for further integration and strengthening of this concept in existing curricula of architecture schools [7–13]. In recent decades, such tendencies have emerged on the basis of criticism singled out in the Brundtland Report that “education must become more capable and creative, skillful, productive, and better able to deal with day-to-day problems” [14]. Keeping in mind that the role of architecture is to think, design, and manage the built environment in a way that will satisfy the needs of future humanity, the connection between architecture and sustainability is unequivocally important. On this basis, several perspectives on the interrelation of architecture and sustainability have been challenged, including integration of social factors, culture, and technology with architecture [15], providing flexibility to adapt to local habits and needs through sustainable design which can be replicated by the local

community [16], and developing pop-up environments through temporary architecture [17]. Several concepts have been developed to link design and socially environmental changes, hence, strengthen the sustainable dimension of architecture through socially responsible design [18], design for social change [19], environmentally conscious design [20], and—currently the most important from the pandemic perspective—emergency design and humanitarian architecture [21].

Emergency design has been a part of the architecture schools' curricula for a long time, and as such, advocated for quick-built, resilient, and modular structures needed in times of crisis and emergency (earthquakes, floods, droughts, etc.). The conceptual framework for emergency design is conceived and challenged through the concepts of crisis architecture [22,23], emergency architecture [24], and humanitarian architecture [25], with their endeavors (1) to upgrade concepts both theoretically and methodologically as well as (2) to bridge the gap towards practice through generating innovative options in-between existing resources, actual needs, and expected results and putting the responsible design into practice. Until recently, the emergency design was associated mostly with natural disasters as short-term events that need immediate reactions in order to mitigate and adapt living environments to new circumstances. Having that in mind, leading values of new strategies and implementation principles of emergency design, especially in architecture and urbanism, should be directed towards the support of users' health and safety during the state of the pandemic.

Leading organizations in the field of architecture challenge the professional community to be at the forefront of their professional activities, looking for solutions and designs to overcome the impact of the pandemic through three parallel perspectives: (1) preparing to respond to future challenges and threats, (2) reacting through sustainable solutions during the pandemic, and (3) generating adaptive solutions for life and work after the pandemic. Design studies developed during the COVID-19 pandemic indicate that the profession is required to engage its creative skills and critical thinking to re-imagine how cities should transform and adapt in line with emergencies. The implementation of emergency solutions as a response to the pandemic is recognized on various spatial and programmatic levels: projects that strengthen the health system and expand existing health infrastructure capacities, alternate care sites [26–28], temporary and repurposed spaces for emergency services [29], a new culture of life in public spaces [30], new standards of green buildings in the fight against COVID-19 [31], recreating open spaces for leisure towards new opportunities after the pandemic [32], and conversion of existing typologies [33]. However, these studies and projects did not provide operational knowledge for emergency response, because (1) they are mainly related to the construction of a completely new spatial infrastructure or the general selection of facility types that do not correspond to the specificity and diversity of plausible emergencies, (2) nor have they been considered in relation to the context of architectural education.

1.3. Objectives and Paper Outline

This paper stresses the importance of building capacities of future professionals in the field of architecture and urbanism to face global challenges. With the aim of illustrating the dual direction of learning in the state of emergency two research questions arise: (1) How can we transfer challenges from the COVID-19 context towards creating design solutions for learning and applying the concept of emergency architecture? (2) How can we create a learning environment and teaching methodology in a new pandemic reality? In order to generate answers to the research questions, this paper outlines the potential of the online workshop as an extracurricular activity that could cope with the current challenges and provide answers to the emerging crisis.

Regarding the abovementioned research questions, the specific objectives of this paper are to identify conceptual pillars of online workshops in architectural education, to present how to transfer COVID-19 challenges into potentials in the procedural and substantial aspects of the workshop, and to identify design challenges in the context of the COVID-19 pandemic in relation to sustainability.

The first part of the paper will present the materials and methods applied in the research. The second part of the paper will present the workshop's role as an effective learning environment in the field of architecture, with special emphasis on its implementation in the online environment.

The third part of the paper will present the procedural and substantial aspects of the workshop, followed by the identification of four design challenges (performance, innovation, alteration, inclusion) that can contribute to the understanding of emergency architecture and become the basis for sustainable design of cities, in accordance with COVID-19 challenges. The discussion segment reviews the online learning potentials and limitations based on an experiential-based learning model. The conclusion summarizes the importance of creating new curricula and methodologies that follow the challenges posed by global society and crises.

2. Materials and Methods

Building on the existing practice of organizing workshops in times of emergency [34], constant endeavors to improve education processes through innovative curricular and extracurricular activities in architecture and urbanism at the University of Belgrade—Faculty of Architecture (UB—FA) [35–37], and integration of the SDGs in curricula [38–40], a group of teaching and research assistants (authors of the paper) initiated an online workshop aiming to address COVID-19 challenges. The online workshop was implemented by the UB—FA in April 2020. During this time, Serbia was in complete lockdown, recording its highest number of COVID-19 infected people to date [41], transferring all teaching to online learning environments (Figure 1). The workshop under the name of “COVID-19 Challenges: Architecture of Pandemic” was focused on the search for new, innovative typologies and architectural scenarios that will enable daily activities to be carried out safely and effectively even in the time of a pandemic. The four active days of the workshop, along with preceding workshop activities, were supervised by nine teaching and research assistants from the UB—FA.



Figure 1. Data from covid19.rs. Source: Institute of Public Health of Serbia “Milan Jovanovic Batut”, WHO.

The study involved three phases:

1. Workshop preparation: the preliminary research of learning priorities and research perspectives, defining objectives, assigning team members (tutors), preparing content, setting up the online learning environment through a digital platform, inviting critics, and screening participants;
2. Workshop implementation: introductory presentation, Pecha Kucha presentations, identification of thematic frameworks, research by virtual design studios, internal and external discussion, and daily reviews;
3. Workshop assessment and dissemination: the systematization and assessing the results and outcomes of the workshop through online publication and exhibition on a regional level,

identification and classification of design challenges in line with sustainability, and elaboration of online architectural workshop model values.

2.1. Workshop Preparation

In the preparatory phase of the workshop, preliminary research on learning priorities and research perspectives was conducted in order to identify an adequate model of education in the field of architecture that would enable the concept of emergency architecture to be implemented in teaching during a pandemic and develop direct experiential learning for students. The primary method for identifying priorities and perspectives involved content analysis of educational conventions, studies, charters, and concepts in the fields of architecture and urbanism related to emergency design for sustainable development. This research step resulted in (1) new priorities and research perspectives for experiential learning of emergency architecture as a theoretical background to support research findings and (2) the identification of an experience-based learning (EBL) model of learning as one of the ways to conduct a workshop in the field of architecture. In this sense, the main goal of the workshop was reflected in the creation of knowledge and design through the transformation of the pandemic experience and its impact on the transformation of the learning environment and content that was the subject of research and design during the workshop.

Registration for participation was conducted through an open call, disregarding study level, university, and country of origin. The workshop involved 98 students (85 women and 13 men) from different study levels (bachelor, masters, and Ph.D.), several study programs (architecture, urbanism, architectural technologies, integrated studies of architecture, interior architecture), two universities (UB—FA, University of Novi Sad—Faculty of Technical Sciences (UNS—FTS)), and 15 critics (teachers from the UB—FA from three departments: Department of Architecture, Department of Urbanism, and Department of Architectural Technologies). The workshop was organized on a voluntary basis and, as such, did not require any participation fees.

The workshop was organized using the online surrounding, perceived as a digital workspace and structured to enable communication through several channels—general, thematic groups, and student teams (Figure 2).

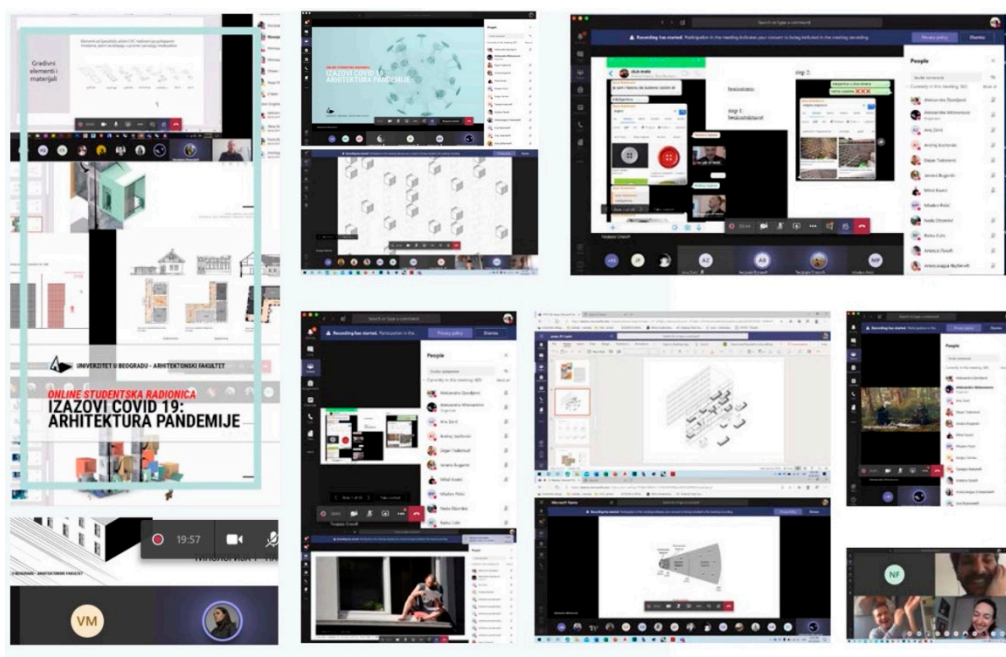


Figure 2. Workshop online working and learning environment.

2.2. Workshop Implementation

The workshop was organized into four phases (Figure 3). The initial workshop phase was held in the form of an introductory presentation, in which tutors from the UB—FA presented the topic and expected results of the workshop. In the second phase, students presented ideograms and an initial scope of action through Pecha Kucha presentations following recognized research and design perspectives related to COVID-19 challenges. This format kept presentations concise and fast-paced, enabling twenty-nine groups to present initial research questions and identify problems that could be addressed through additional research and design during the workshop. Based on the complementarity of certain aspects, the spatial level of activity, and the programmatic orientation of the ideas, the students were divided into six thematic fields, within which further work continued. Aside from the students and tutors, teachers of the UB—AF also participated as critics in each thematic field. The main focus of the third and the most dynamic phase of the workshop was the development of conceptual designs and studies through open discussions between students, tutors, and critics in all six thematic frameworks in the form of virtual design studios. Each day was divided into two sessions. In the first session, three tutors were assigned to work with students according to the thematic frameworks and corresponding department. The aim was to increase interdepartmental cooperation and provide various standpoints to students. The second session consisted of an overview of students’ work at the given moment, followed by a conversation with critics. During the fourth and final phase of the workshop, students worked independently to finalize their conceptual designs based on feedback from the daily reviews.

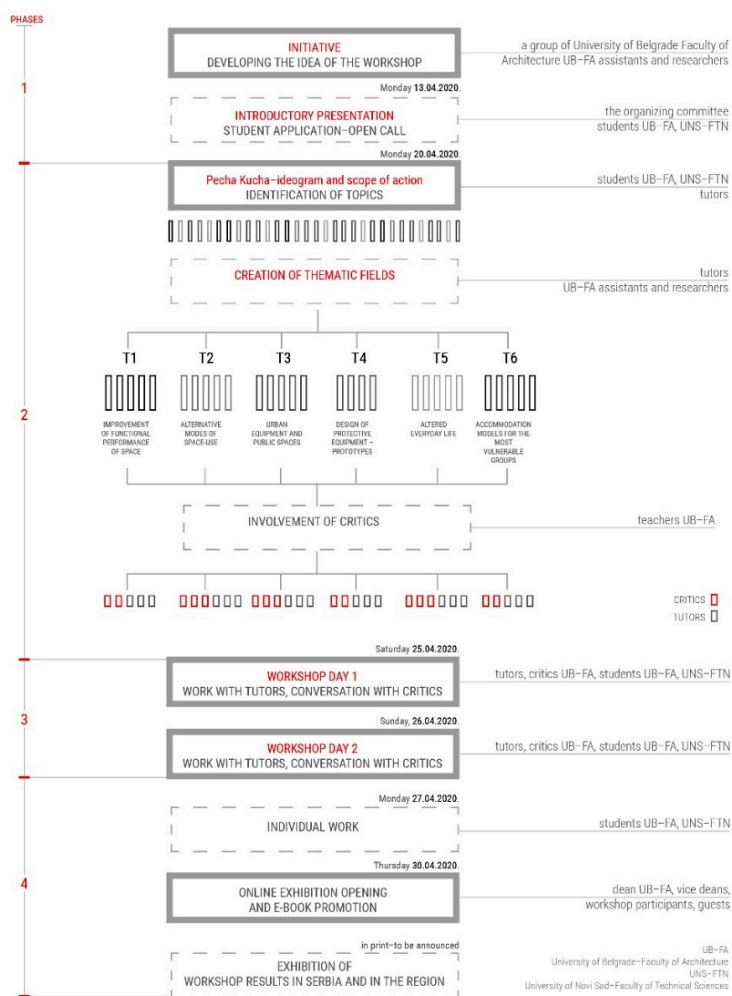


Figure 3. Workshop process diagram presenting the main methodological steps, actors involved, and results produced. UB—FA—University of Belgrade—Faculty of Architecture.

2.3. Workshop Assessment and Dissemination

In the workshop assessment and dissemination phase of the research, the results of the workshop were systematized in the form of 29 design proposals grouped into six thematic frameworks. In three days, the tutors prepared a bilingual e-book [42] in which the research perspectives of the workshop, thematic frameworks, comments, and reflections of the critics were explained, as well as the presentation of student works through textual explication and graphic presentation. In order to present the results of the workshop to the wider community, an online exhibition was organized and opened by the dean of the UB—FA accompanied by vice deans, other professors, and workshop participants.

The final step of the research relates to the identification of design challenges and the classification of design proposals in line with sustainability and emergency design. Criteria for identifying challenges were based on the formal and functional characteristics of the design, as well as the scale or spatial level for which the design offers a solution. On these grounds, four design challenges specific to the current pandemic context were identified. Having in mind the learning priorities and research perspectives identified in the preparatory phase of the workshop, as well as the potentials and limitations of the application of experience-based learning (EBL) model in the implementation and assessment phase of the workshop, the values of the emergency design workshop model were identified.

3. Results

3.1. Workshops in Architectural Education

If the architectural education's framework tends to grant the professional competencies and skills needed to face the changing world, then continuous redefining and upgrading of curricula and pedagogical approaches are some of the leading tasks of architectural educators in schools of architecture. This means that new curricula and teaching forms should be conceived in innovative ways so as to provide competencies for understanding individual and shared value systems and cultural differences. An extensive critical discussion on the New Priorities of the Schools of Architecture in the Era of Uncertainty was opened at the 13th Meeting of Heads of European Schools of Architecture [43]. Recognizing the global consequences for the development of contemporary cities, Von Meiss addressed the issues of "restructuring curricula, opening ways to deal with uncertainties of the future, questioning established professional images and values, inventing adequate 'university landscapes'" and developing appropriate teaching methods to enable our graduates to confront unexpected settings and problems, rather than merely comply with society's immediate demand for a well-performing competent "professional" [44] (p. 26). The following table shows the relationship between identified priorities for the further development of architectural education and how they can be addressed in concordance with COVID-19 challenges, with particular reference to their transfer into learning potentials in emergency architecture (Table 1).

Table 1. The relation between New Priorities of the Schools of Architecture in the Era of Uncertainty according to Von Meiss [44] and their actualization into learning potentials in emergency architecture.

Priority according to Von Meiss [44]	COVID-19: Transferring Priorities into the Education Environment
The new values from which the new priorities emerged	Learning priorities—following global and local challenges. New priorities in architectural education should correspond to various challenges that affect social, economic, and environmental development. Accordingly, it is necessary to look for relations between new values and subject areas that will enable the transfer of different knowledge into the design and vice versa. Environmental sustainability is a particularly important scientific and research focus within which topics of built and natural environment, society and economy, urban and rural development, and global and local challenges intersect through values and essential priorities.

Table 1. Cont.

Priority according to Von Meiss [44]	COVID-19: Transferring Priorities into the Education Environment
The impact of the context in which architectural education is offered to the formulation of these priorities	Learning environment—adaptation and improvement. The impact of the COVID-19 pandemic in the context of architectural education is pronounced more than ever, not only when it comes to the transition to distance learning, but also with the importance of transferring the challenges of the pandemic into a thematic framework of the curriculum. Given improvements could strengthen the capacity of future professionals as pioneers in the transformation of cities and urban environments.
The way that these priorities influence the competences of the graduates of architectural education institutions	Learning perspectives—challenge identification and proactive action. The thematic framework requires an urgent response and thinking in line with specific global or local changes, and, thus, it is necessary to consider learning environment adaptation strategies in curriculum content development. Therefore, specific priorities and challenges affect future professionals' competencies in a specific manner that include the introduction of extracurricular activities and effective models of learning and education based on research through design.
The new subject areas that these new priorities and objectives introduce in architectural curricula in order to assure the expected ideal architectural profiles	Learning profiles—introducing a multidisciplinary and multiscale approach. The complex challenges of COVID-19 relate both to the need to create new spatial conditions that will enable distance, and to completely change the circumstances of the relationship between people and their environment. Accordingly, enhancement of the capabilities, by including knowledge from other disciplines aside from the design domain, is significant for the identification of problems that could be overcome through the design process, all to build strong professional ethics in the education process.

When it comes to architectural education, studio-based teaching is the most common method characterized by a high level of communication, exchange of ideas, physical modeling, and drawing. Accordingly, the most common type of extracurricular and complementary activities to studio format is a workshop, commonly associated with exchanging information, options, and experiences of participants and is organized through group work [45]. Underlining the perspectives of comprehensive workshop design, Brooks-Harris and Stock-Ward [46] define the workshop as “a short-term learning experience that encourages active, experiential learning and uses a variety of learning activities to meet the needs of diverse ‘learners’”. Bearing in mind that a workshop is an organizational form that stimulates the learning process and represents a model that develops brainstorming and sharing ideas productively, the potential of a flexible and transformable learning environment is recognized [47]. In this sense, the role of the workshop in architectural education is to initiate creative thinking and critical knowledge, which could encourage students to approach contemporary challenges through design. The importance of the workshop is also reflected in its complementarity to the existing teaching structure and potential to network students horizontally and vertically, disregarding the level of studies and study programs. In this research, the importance of initiating and implementing student workshops in architectural education can be elaborated through three pillars that indicate the possibility of flexible application of different curriculum contents and effective transfer of regular learning activities into an online learning environment.

3.1.1. Pillar 1: Content

One of the fundamental challenges of contemporary architectural education is the loss of diversity of content, which leads to “homogenization in our behaviors and unification of the educational landscape” [48] (p. 65). This is primarily reflected in the insufficient transfer of both globally and locally specific challenges recognized on different spatial levels and time horizons into the curricular

and extracurricular activities. Curricula creation should be in line with new competencies for future professional activities, which, according to Foque [49], is based on five domains that should generate new competencies for future professionals in the field of architecture including professional attitude, transdisciplinary approach, global awareness and contextual thinking, research-based design and research by design, and leadership. Recognized domains can be achieved only if the content and educational assignments are problem-based and related to current challenges so that students are constantly building awareness of the cause and consequences of the city's transformation and future threats in achieving environmental sustainability.

3.1.2. Pillar 2: Teaching Methods and Learning Environment

The main characteristic of workshop involvement is certainly teamwork, specifically focused on collaborative practice and a think back approach. In this sense, one of the most important perspectives in creating a workshop learning environment is dialogical, which enables the variability of communication modes, including the one-to-one, one-to-many, many-to-one, and many-to-many relationships. The changed context caused by the COVID-19 pandemic directly affected the transformation of the learning environment, resulting in distance learning through various online applications and platforms as a part of imposed epidemiological measures. One of the indicative strategies listed in the Education 2030 Framework for Action aimed at implementing SDG 4 to ensure inclusive and equitable quality education and promote lifelong learning opportunities for 'all' refers to "development of policies and programs for the provision of quality distance learning in tertiary education, with appropriate financing and use of technology, including the Internet, massive open online courses and other modalities that meet accepted quality standards to improve access" [50]. Such circumstances create a challenge for architecture schools and teachers to adapt curricula and teaching approaches to the online environment and maintain all communication modes accordingly.

3.1.3. Pillar 3: Research

Having in mind the transdisciplinary nature of the architectural discipline which includes numerous modes of research, ranging from basic research, concept formulation, and concept proof, to its final development—the research for design, research into design, and research through design—are essential prerequisites for linking design to other disciplinary frameworks. In order to engage all the mentioned modes of research in line with the design process, it is necessary to strengthen the relationship between research and teaching and promote a flexible, creative learning environment. Therefore, architectural education should apply the transformational character of knowledge by upgrading transferable skills of students to understand the process of design, communicate complex ideas through different modes, initiate collaboration and teamwork, and present design ideas through different methods and techniques. Within actual research that tests learning models for extracurricular activities, two central models are recognized: (1) transformative model—based on strong cognitive and affective dimensions between creativity and transformative learning [51] and (2) reflective model—based on the idea of developing greater awareness among individuals about the importance of facing the challenges of 21st-century sustainability [52].

By identifying the three central pillars of architectural workshops that include (1) content through engaging thematic frameworks that deals with real problems, (2) teaching methods and learning environments in order to achieve a high degree of involvement of self and increase learner control to the real environment, and (3) research through transformative and reflective learning, the potential of implementing an EBL model in the context of an online architectural workshop has been recognized. The learning impact of the EBL model within the domain of architectural education has already been recognized in a number of current studies [53–56] examining the relationship of this model with design-based courses and studio learning environments. In order to apply this model in the context of online architectural education in a time of the pandemic, the following table provides an overview of five influential approaches to the EBL model with their essential elements defined in relation to the

learning environment, learning skills, learning context, and learning activities (Table 2). In accordance with the identified components of experiential learning, the challenge for the implementation of this model was transferred within the COVID-19 Challenges: Architecture of Pandemic Workshop.

Table 2. The relation between elements of experience-based learning according to references [57–61] and their actualization into online workshop COVID-19 Challenges: Architecture of Pandemic.

Authors	Elements of EBL	Goals within Online Architectural Workshop
Relation with the learning environment		
Boud and Pascoe [57]	degree of learner control to the real environment	Creating an online learning environment that allows different communication modes (individually, group, and both) and their effective transition so as to achieve a high degree of involvement of self and increase learner control to the real environment.
	degree of correspondence of the learning environment	
	degree of involvement of self	
Relation with learning skills		
Kolb [58]	active involvement in the experience	Encouraging the immediate experience of students to recognize the impulses for reaction in the space through the identification of problems and changes during the COVID-19 state of emergency. Engaging a problem-defining and problem-solving approach through the development of critical thinking and dealing with real problems.
	reflect on the experience	
	use analytical skills to conceptualize the experience	
	decision making and problem-solving skills in order to use the new ideas gained from the experience	
Relation with learning skills		
Pfeiffer and Jones [59]	experience the activity	Critical review of (1) students' own knowledge and (2) examples of good practice and their adequacy in relation to the context of the new pandemic reality with a high degree of discussion on two levels—internal observation and external sharing of results.
	share the results, reactions, and observations publicly	
	a process by discussing, looking at the experience; analyze, reflect	
	generalize to connect the experience to real-world examples	
Relation with learning skills		
	apply what was learned to a similar or different situation; practice	
Relation with the learning context		
Weil and McGill [60]	gaining access to educational institutions, employment, and professional bodies	Strengthening professional ethics, social solidarity, and socially responsible approach through emergency design education and direct discussion with critics, teachers from educational institutions in the field of architecture and urbanism.
	catalyzing change in education	
	education for consciousness-raising, community action, and social change	
	personal growth and development to increase self-awareness and group effectiveness	
Relation with reflection associated with learning activities		
Boud and Walker [61]	preparation for experiential events, where it is important to focus on the learner, the learning milieu, and the skills and strategies employed in reflection	Conceptualization of workshop activities within the online learning environment through three phases: (1) introduction to the workshop and opening of research questions, (2) action during the workshop, (3) research through design and discussion at the general level, preparation of results for public presentation with discussion
	reflection during an experiential activity, with its phases of noticing and intervening	
	reflection after the event, involving the individual in returning to experience, attending to feelings, and re-evaluating the experience	

3.2. Online Workshop—COVID-19 Challenges: Architecture of Pandemic

3.2.1. Workshop—Procedural Aspect

Living and studying in a time of pandemics created a situation in which students are both witnesses to and agents of change. This situation emphasized the need to make a greater effort in order to cope with given challenges in a sustainable manner. The cause for workshop initiation was found in professional responsibility, a wish to contribute to the overall critical debate on how cities should function, and the will to continue the UB—FA endeavor to provide a range of extracurricular activities due to their recognized importance in architectural education. Following Kolb's line of reasoning and cycle of experiential learning [58], the online environment enabled the realization of the three essential parts: (1) concrete experience, (2) reflective observation, and (3) abstract conceptualization (Figure 4). Having this in mind, the first step was an initial presentation, done by workshop tutors, which highlighted COVID-19 challenges and provoked students to elaborate on some problems as well as to identify other ones from personal experience. In the second step, Pecha Kucha was used as a presentation model in order to enable concise and focused reflections. Students were asked to independently define a problem scope and prepare the ideogram, symbolizing the initial idea that arose from reflective thinking. The step of abstract conceptualization was implemented through research by design methods (aiming to generate new insights, knowledge, and products through design), online simulations of round tables with critics, and wrap-up sessions.

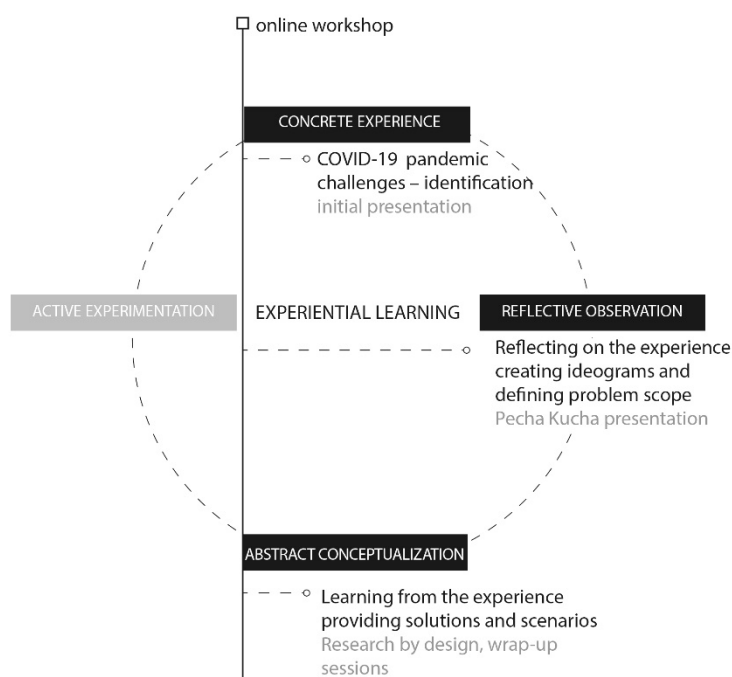


Figure 4. The relationship between Kolb's experiential learning theory and online workshop in question.

3.2.2. Workshop—Substantial Aspect

The workshop content was developed according to new perspectives (fields) of architectural activity in the pandemic-caused conditions. These perspectives included so-called “new normality” (circumstances that have been changed in the state of emergency, specific needs and problems related to entirely new living conditions), pandemic reality (previous experiences traced during the outbreak of major epidemics that have brought similar changes throughout the history), and spatial distance (the relation between spatial distancing and social solidarity and the harmonization of spatial and sociological levels).

Based on reflective observation, during the workshop students initiated a range of topics that were grouped into six thematic frameworks within which project designs were developed. The visual representation of projects is presented in Figure 5, followed by a textual explanation of each thematic framework.

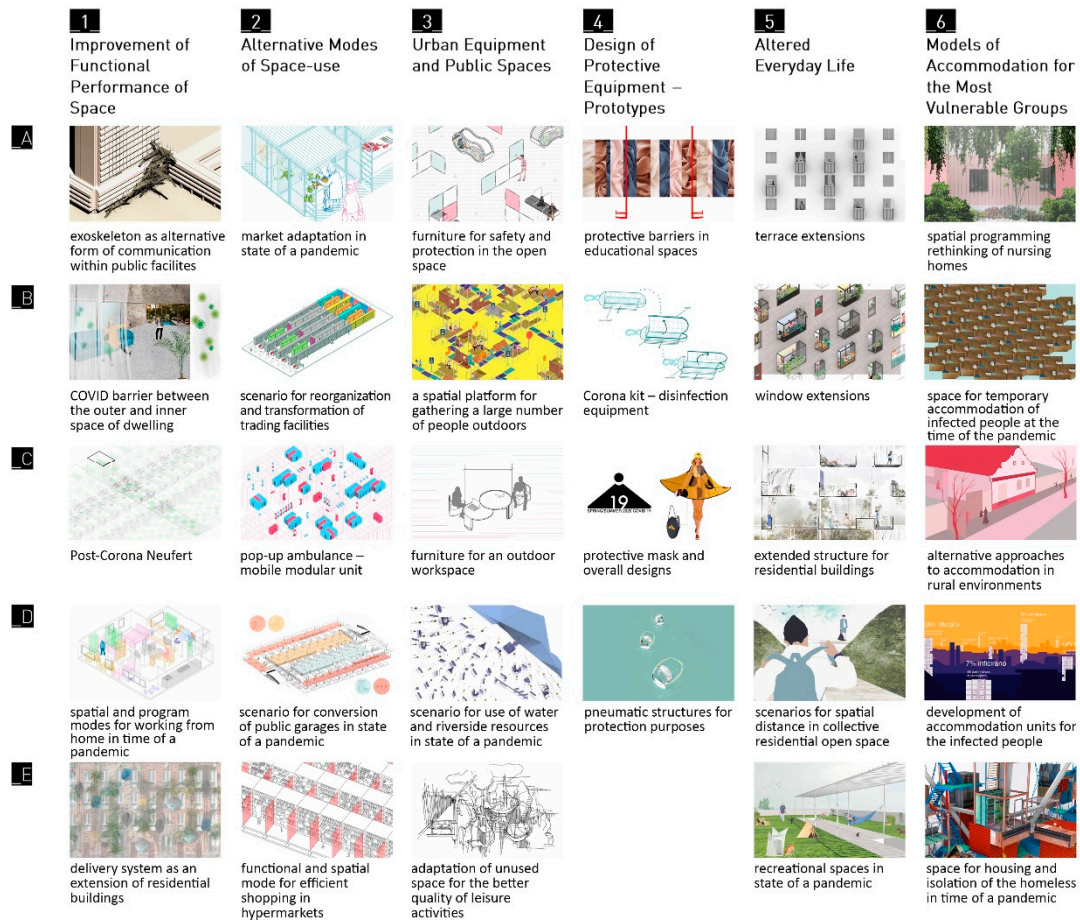


Figure 5. Illustration of topics and projects produced during the workshop.

Improvement of functional performance of space (T1)—the thematic framework aimed to explore the opportunities for enhancing communication, establishing safe spatial distances, and improving delivery and transportation mechanisms. This framework also included problematization (critical thinking) of the modules and standards in the housing design.

Alternative modes of space-use (T2)—the thematic framework represented rethinking and reorganizing of spaces of collective everyday activities and gathering, such as trade facilities and open market systems, and reuse of distinct open public spaces in the time of emergency.

Urban equipment and public spaces (T3)—projects within this framework suggested mapping and adapting underused space for the better quality of leisure activities, outdoor work, and living space, as well as rethinking the design of open public space and its elements concerning security barriers.

Design of protective equipment (T4)—ideas within this framework are primarily related to the creation of prototypes and patents of protective gear that can be used during the pandemic. That included the design of different spatial barriers, protective masks, and pneumatic structures used for protection purposes, as well as the design of different everyday things that can be carried as a “Corona kit” or disinfection equipment.

Altered everyday life (T5)—proposed ideas are reconsidering relations between outdoor and indoor spaces within spatial restrictions caused by the pandemic situation and the establishment of

new normality. The projects explore the possibilities of supplementing everyday living spaces and functions with elements of nature, open space, or hobby space.

Accommodation models for the most vulnerable groups (T6)—projects within this framework explore the possibilities of improving the space for the most endangered groups of people (elderly and infected) and finding new spatial capacities for accommodation within urban and rural environments.

3.3. Identification of Design Challenges

The following section will be organized following four identified design challenges while outlining how those challenges were transferred to potentials within the workshop.

3.3.1. Design Challenge 1: Performance

This challenge provides a critical reflection on the notion of sustainable improvement of functional performances of space in the light of the emergency design. It problematizes how the concept of performance on the general level resonates with debates on sustainable development and how the improvement of functional performance could be connected to changing environments, both during the epidemic situations and after the emergency is over. Performance in the light of emergency design and the present-day pandemic situation could be conceptualized as a possibility of restructuring existing spaces to cope with new challenges. In this case, workshop participants proposed creative architectural ideas in order to meet future demands and challenges. Assessment of new functional performance of existing spaces and objects is aligned with social impacts, ecological issues, and technological innovation in order to fulfill temporary accommodation needs in diverse roles both in emergency and non-emergency situations.

The value of these projects is in performance-oriented architectural design and optimization in the context of fragmented narratives. The purpose of examining functional performances is to assess a desirable future state for all users both in public and private spaces. Exoskeleton structures were developed with the idea to improve communication and establish spatial distances in public buildings and to establish new ways and mechanisms of delivery, transportation, and waste disposal in high-rise buildings. In this case, research and design perspectives are aligned with the idea of using existing spatial structures while changing their functional characteristics. The technology to support adaptive building systems and improvement of the functionality of space are both available and dependable.

The second set of research and design proposals concerns the creation of Post-Corona Neufert, which rethinks design modules in line with spacing, the development scenarios of space-use in housing by different groups, and the redefinition of windshields and entry lots in residential areas. In this part, the interscale approach is evident as a new design philosophy and comprehensive evolution of performance-oriented architectural design. In the scope of this group, COVID-19 brought both challenges and opportunities as possible progressions of architectural developments that will create visions that could be easily incorporated to become reality.

3.3.2. Design Challenge 2: Innovation

The challenge of innovation is recognized in the processes of creative thoughts or new imaginations, resulting in new ideas in the form of a device or method. Innovation is also considered as a virtue of finding solutions that are better than existing ones, which meet new requirements or emerging market demand while saturating them through the provision of the custom-designed product, process, or behavioral model. While researching the problems caused by the COVID-19 pandemic and the potentials of solving them through sustainable design principles, two main problems were emphasized: (1) the impossibility of safe use of public and leisure spaces—addressed through rethinking urban equipment and installation of temporary structures and (2) the lack of adequate personal protective equipment necessary for performing usual daily activities—addressed through rethinking the means for personal protection.

Innovative ways of rethinking everyday life, heavily influenced by the pandemic, were expressed in the workshop topic Urban equipment and public spaces aimed to redefine the existing patterns of activities in public space and adapt their regimes of use to the new conditions of pandemic and post-pandemic reality. Within this thematic framework, it is possible to notice two central aspirations, as well as their transitional forms: (1) the design of new urban equipment allowing safe conduct of common social and leisure activities in the public space, as well as (2) proposals for innovative strategies directed towards activating or reactivating public spaces. Student designs within the first category primarily relied on designing new or updating existing urban equipment and outdoor furniture while also proposing temporary structures for equipping inactive or under-equipped public spaces. The principle of innovation is more obvious in the second category of works that focused more precisely on redefining social patterns aiming to provide new ways of conducting established social activities. These activities are within the scope of new normality and emphasize the importance of mental health, which is severely affected by the new social distancing circumstances. Thus, through several projects, students proposed new models of activities, a set of rules for safer group gatherings, and new epicenters in the city, as well as created a complex network and a new landscape of activities integrated into the existing city dynamics.

As a response to the lack of adequate personalized protective equipment for long-term use student teams within the topic of Design of protective equipment—prototypes offered design solutions in several different directions and across several different scales: (1) personalized protective equipment—a scale of a human body, (2) protective partition elements—a scale of the interior space, and (3) a pneumatic bubble structure—a scale of an architectural prototype. The most innovative projects in this topic go beyond the architectural discourse boundaries while borrowing the principles and mechanisms from the related creative disciplines. The principles of innovative methodological exchange can be noticed in the Covidcoat project. Despite the fact that its clear architectural starting point was reflected through the dimensioning of personal space, the project is constantly oscillating between the creative processes of fashion and industrial design. In addition, all of the proposed solutions rely heavily on the principles of sustainability, reusing, and recycling, while not only regarding the innovation challenges and market demands saturation, but also providing schemes for easy production and wide availability of the final product.

3.3.3. Design Challenge 3: Alteration

Considering the original meaning of the term, alteration is seen as a change in appearance, character, or structure. Everyday life in the city is accompanied by a constant need for change—dynamics contribute to the quality of life. It is manifested at the level of the social life of the individual and the community, based on the constant communication and interaction of space and people through work and leisure activities. In the context of a COVID-19 pandemic, the alteration is manifested through the adaptation to safe living conditions, based on the establishment of the physical distance, the use of limited space resources, and constant vigilance in daily behavior and actions. Such conditions impose a large number of restrictions that make it challenging to establish daily activities and achieve the expected quality of life.

Alteration arose as a result of the methodological process during the workshop. Initially, students identified elements of everyday life, needs, and equivalent activities that were difficult to carry out due to the pandemic. They then defined spaces in which these activities could take place according to the changed conditions. As spatial and programmatic constraints during the pandemic can be potential causes of stress, anti-social behavior, and endangered psycho-physical health, the aim of the research within this thematic framework was to find alternative solutions to achieve adequate living comfort. In addition, the changed course of everyday activities required the adaptation of the space to new functions and priorities, examining the potentials of its transformability. The projects explored spatial-programmatic constellations that enable expected quality of life and conducting of everyday activities, offering new options for the sustainable use of available spaces. The projects

included interventions at various spatial levels—from urban districts and entire areas of the city, through individual architectural structures, housing, and working interior spaces, to the level of detail and design of everyday objects.

The main goal of the projects was to enable activities that meet different everyday needs through the adaptive use or conversion of different spatial units. Accordingly, projects can be classified into two specific groups. The first group includes projects dealing with adaptation of existing housing areas to meet the need for staying in the open air. Projects within this group examined the possibilities of balcony extensions, the transformation of room interior, and reorganization in order to provide space for recreation. The second group consists of projects that explore the way of articulating the space of everyday collective use in limited conditions, and the identification of spaces adaptable to temporary uses during the pandemic period. Those projects include the reorganization of green markets and commercial facilities, the creation of a new typology of supermarkets, and the creation of mobile primary health care units, as well as the reuse and adaptation of garages and outdoor parking spaces. Among other topics, students emphasized the necessity for the affirmation of new functions of underused spaces, an addition to everyday individual spaces, activation of unused peripheral zones of the city, open public spaces, and natural resources.

3.3.4. Design Challenge 4: Inclusion

Even though inclusion and diversity are at risk in any crisis, they could also be perceived as elements of critical importance for city resilience, recovery, and general well-being. In an emergency, strategies and programs intended for the most vulnerable groups in society are often put on hold due to financial pressures and social uncertainties. However, the COVID-19 pandemic specifically produced particular challenges that needed to be addressed on a different level and scale. With that in mind, the challenges of social stigmatization, lack of health protection, total restriction of social contact, and inadequate conditions in temporary hospitals that the homeless, older people, and infected people face were identified during the initial presentations.

Aiming to resolve the problem of accommodation of vulnerable groups or infected people, projects strived to achieve economic, social, and environmental sustainability through using existing spatial resources, envisioning civic economy initiatives, and using recycled materials and upcycling processes, thus, reducing the pressure on the health system and raising awareness of the local community in the long run. Having that in mind, solutions were conceptualized on four levels. The first, city-level, included the transformation of abandoned rural areas and villages into accommodation facilities for patients that require isolation and not hospitalization. The feasibility of this solution is perceived in the initial investment for housing adaptation and planned local food production, which will enable the use of these areas for different purposes after the pandemic (rural tourism, social housing, marginalized groups, and refugee accommodation). The second level proposed densification on the district level, imposing either the extension of existing spatial capacities of health amenities to accommodate infected people or temporary adaptation of brownfield locations through the installation of specific structural systems. The third scale focused on thinking at the building level, seeking to find structures that could provide pleasant living conditions and safe communal areas for the vulnerable groups both in the state of emergency and following the pandemic. Even though these spaces have the highest infection risk, they are marked as essential spaces in the given typology regarding their role for the social life and mental health of the elderly. The critical thinking on the fourth scale—the unit level—was inspired by the measures imposed by the Serbian government concerning the transformation of non-health amenities into temporary hospitals that were negatively received by the public due to the numerous problems and unsystematic approach to building adaptation. Accordingly, projects touched the issues of lack of intimacy, overcrowded rooms, lack of doors, the inadequate appearance of a room, and lack of hygiene facilities through the development of minimal, flexible units.

4. Discussion

The workshop resulted in a variety of outcomes, perceived as learning potentials and limitations during the pandemic. Following the steps of experiential learning methodology, potentials and limitations were divided into four groups. They go beyond the existing state of the art by transposing experiences from the online workshop held in the time of the pandemic.

The first group is related to the initial experience and identification of COVID-19 pandemic challenges, which corresponds to the first step of experiential learning—concrete experience. In this learning phase, the experience is mostly related to the direct experience of living and studying in the time of pandemics:

- Proactive attitude in time of pandemics initiated cooperation between faculty members from various departments (architecture, urbanism, architectural technologies) and initiated adaptation of traditional workshop techniques to the online environment;
- The online workshop enabled students to be exposed and educated about acute problems in society and initiated critical thinking about imposed measures;
- The use of a digital environment allowed the unlimited number of participants regardless of students' current location and spatial capacity of the higher education facility;
- The online learning environment created linkages and initiated collaboration between students from different study levels, study programs, and schools of architecture; and
- Online workspace broadened communication modes (student to student, tutor to student, tutor to critic, critic to student, tutor to tutor, critic to critic), initiated dynamic discussion, and enabled different communication channels to be followed simultaneously.

The second group is related to the first reactions and reflective observations on the architecture of pandemics, highlighted as a workshop topic, as well as to simultaneous adaptation to new working conditions and formation of the new learning methodology, which corresponds to the second step of experiential learning. This learning phase reflects experience in defining problem scope, but also working experience gained within a new learning environment, both for students and tutors, perceivable in five central potentials:

- The form of Pecha Kucha presentation was proven to be beneficial for gaining the insight into a variety of COVID-19 challenges and getting an impression of students' initial reflections;
- Learning in a time of pandemics and specific problem-solving methodology triggered rapid response and solutions that can be implemented quickly;
- The application of research by design methodology allowed COVID-19 challenges to be addressed, despite spatial scale or initial (starting) thematic scope;
- Constant documenting and recording increased options for archiving workshop flow and work materials and enhanced visibility of workshop process and results (social media, website, online magazines); and
- Regular reporting on workshop activities contributed to the constant awareness building among future professionals and the wider public (share the results, reactions, and observations publicly).

The third group of results relies on the third phase of experiential learning—abstract conceptualization and refers to concluding and learning from experience—providing solutions and scenarios, including the research by design method. It is related to the identification of ideas for further research and the expansion of a professional perspective in emergency architecture. This phase is characterized by the introduction to group techniques of wrap-up sessions and online simulations of a studio-based environment and “round tables” that resulted in a set of new opportunities:

- A variety of topics created links between design and knowledge from various disciplines (fashion design, sociology, psychology, ecology, urban economy);

- Identification of new design challenges broadened the professional context of the architecture and opened up a debate about possible solutions in emergency architecture;
- The creation of a new theoretical and methodological approach to the emergency design enabled the implementation and testing of an integrated design approach that includes dimensional, environment–behavior, functional, security, materialization, and construction design perspectives;
- The development of specific workshop methodologies and new communication modes enable the re-application of the methodology to different topics in the future; and
- The involvement of teachers as critics instead of mentors provided an additional perspective to the learning process.

The fourth group of potentials and limitations is related to summarizing and confirming the results and ideas further application and implementation, which corresponds to the fourth step of experiential learning—active experimentation, planning or trying out what was learned:

- The wide spectrum of identified design ideas highlighted the opportunities for further research on different scales, typological frameworks, and timeframes—before the pandemic, during the pandemic, and after the pandemic;
- Broad dissemination activities (e-book, online exhibition, and planned exhibition that will be presented in the regional centers) opened up opportunities for cooperation with institutions outside the faculty and broadened the spectrum of collaboration with architectural offices, professional bodies, and enterprises;
- The online environment reduced the possibilities for learning by doing, and, thus, constricted the chances for closing the cycle of experiential-based learning;
- The online workshop revealed limitations for application of tools and techniques essential for architectural education (lack of physical modeling, patent and material testing); and
- The uncertainty of the duration of the pandemic and society’s incapability to cope with problems revealed the necessity to think about new forms of workshops and possible cooperation to apply what was learned directly.

5. Conclusions

The concluding remarks were developed according to the initial research questions outlined at the beginning of this paper: (1) How can we transfer challenges from the COVID-19 context towards creating design solutions for learning and applying the concept of emergency architecture? (2) How can we create a learning environment and teaching methodology in a new pandemic reality?

The answer to the first question was found in the application of research by design methodology and a problem-based approach that allowed bridging the gap between general concepts and real needs at a specific spatial scale and according to environmental circumstances. Accordingly, a high level of social responsibility and a personal endeavor to be socially engaged, expressed by both students and teachers for the duration of the pandemic, enabled identification of design challenges (performance, innovation, alteration, and inclusion), witnessed the importance of dealing with these topics, and emphasized numerous possibilities of design responses to create a more sustainable environment.

The second question was answered through the educators’ constant awareness and endeavor to be informed about essential global topics as well as to convey the profound insights from research and practice to education in emergency architecture. The new, yet familiar online environment enabled real-time action, rapidly made initial organizational steps possible, and enabled savings in spatial and financial resources.

However, it is crucial to consider these results in the context of the research limitations, perceivable on two levels: study and workshop limitations.

Study limitations:

This research has the character of a pilot study, and, thus, its importance could be found in the fact that it was developed in parallel with the pandemic. The intention was to open up discussion as

soon as possible and to identify the initial potentials and limitations of online workshops in emergency architecture education. However, more extensive research and a higher number of workshops are needed in the future to enable the comparison of different findings according to various educational contexts, cultures, and study programs.

Workshop limitations:

Even though the workshop in question was open to everyone, language barriers and technical requirements (licenses and software availability) were identified as the main limitations to having a greater number of participants from the region. The inclusion of students from the region would have added additional study value, especially since it could have allowed a broader diversity of perspectives and contextual circumstances. Additionally, the workshop would benefit from a variety of critics regarding their expertise and sector of engagement (private, public, and civil), which could provide in-depth critiques and assure better applicability in a real environment.

The results of the online student workshop “Challenges of COVID-19: A Pandemic Architecture” can be recognized on two levels. The first level is reflected in the professional contribution coinciding with the challenges of COVID-19 in the form of 29 conceptual designs and studies that offer answers to different spatial and program matters. The pandemic architecture thematic and research framework formed a scope within which students were encouraged and empowered to seek, in both process- and problem-oriented manners, the answers to contemporary societal challenges. In that order, the disciplinary framework of architecture and urbanism is once again illuminated as a symbiosis of technical, technological, socio-humanistic, and artistic aspects. The second level of contribution is reflected in the developed model and methodological framework of online learning, which can serve as a model for the realization of similar teaching and extracurricular activities in the future. Based on our results, future research should focus on enabling active experimentation in times of pandemics, thus, closing the cycle of experiential learning, while using the advantages of an online environment to gain valuable insights that could enrich the learning experience.

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