

An evaluation of online architectural design studios during COVID-19 outbreak

Online studios during COVID-19 outbreak

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Abstract

Purpose – While the COVID-19 outbreak affects all aspects of life in the world, there is also a global impact in the field of education. Within the scope of the measures to control the epidemic, distance education was started shortly after the starting of the spring semester in all primary and secondary schools and universities. In this process, architectural design courses, which are one of the most fundamental courses of architectural education, started to be held in online studios. The purpose of this paper is to investigate the evaluations of architecture students about the online design studio courses carried out during the COVID-19 outbreak.

Design/methodology/approach – This research used a qualitative approach to evaluate the ideas of first, second, third and fourth grade students of architectural design studios in the host university. A questionnaire was directed to students in order to see their opinions about the online design studio education.

Findings – Results shows that students think the most prominent benefit of online studios appears in the use of digital tools. Another important result is that if they are equipped with the necessary tools and given the chance to realize themselves, students can work efficiently even in the distance education process.

Originality/value – This study is important in terms of learning the expectations of students from the online process and to identify important issues that should be considered for the next semesters. In addition, this study will serve as a basis for comparative evaluation of architectural education during and after the epidemic. In this context, the study will shed light on future academic research.

Keywords Architectural education, Design studio, Online education, COVID-19, Pandemic

Paper type Research paper

1. Introduction

The new type of coronavirus (COVID-19) which emerged at the end of December 2019 in Wuhan city of China, spread rapidly all over the world and became a global threat. World Health Organization declared the COVID-19 outbreak as a pandemic on March 11, 2020 (WHO, 2020a). The epidemic, which affects the whole world and brings life to a halt, has made it necessary to take some precautions in all areas of life. In order to reduce the effect of the virus spread by droplet transfer, various measures were taken, such as staying away from crowds, following the minimum 1.5-m distance rule and avoiding social contact. Also, in order to tackle the virus, public spaces such as malls, libraries, cafes, bars and restaurants were closed in a short time. Curfews were imposed in countries where the number of cases increased. The fact that the epidemic creates an indefinite state of emergency in all countries and in all areas of life has also created the need for a measure in the field of education. As a part of physical distancing rules to prevent transmission, most governments around the world have decided to temporarily close the primary, secondary schools and universities. As of mid-April, 1.5 billion children and youth were affected by school closures in 195 countries, from pre-primary to higher education (UNESCO, 2020). In the continuation of this process, with the principle that education is a fundamental human right (UN, 1948), in order to compensate and maintain the education interrupted due to the pandemic, emergency distance



education practices have been implemented in many countries. In Turkey, after the first case was confirmed on March 11, authorities decided to close all schools and universities to prevent the spread of the virus as of March 16 (YOK, 2020). According to the decision taken by Council of Higher Education (YOK), it was decided to use distance education methods as an emergency model to carry out educational activities without interruption in universities.

Each branch of science has different characteristics, requirements and a specific educational philosophy that it is based on. In the COVID-19 pandemic, thus each practice had its own difficulties and adaptation problems during the transition to online education in universities. For online education to be meaningful and purposeful, it must integrate the cognitive, affective and systemic and be underpinned by relevant interactions (Juwah, 2006). The transition to online education has created even more specific problems, especially in branches of science that require gathering, common working space and equipment usage. Architecture is one of the distinctive subjects where the practice of learning is held in an experience-oriented studio environment. Moreover, studios are interactive spaces. Students use studios not only as a lecture space, but as a multi-dimensional area where they spend their daily time, develop their design work, communicate, discuss and share with their friends. It is possible to say that the studio environment develops a sense of belonging to the architectural profession in students. For all these reasons, an architectural design education far from the studio environment has been one of the main concerns in architecture schools during the pandemic process.

Compared to other courses, the most fundamental course in architectural education is undoubtedly architectural design studio courses. For this reason, it has been the most important issue for both lecturers and students in the transition to online education. Particularly, the adaptation of the students to the new online studio system under various constraints and difficulties brought by the pandemic conditions and their views on this process have been intriguing. According to this, the goal of this paper is to highlight the main results of the survey that investigates the ideas and evaluations of architecture students about the design studio courses carried out with distance education methods during the COVID-19 outbreak. The survey includes a series of questions aimed at investigating the architectural department students' views on design education in physical studio and virtual studio environments, their assessment of the technological tools and educational methods used, their changing habits and routines and how they cope with the difficulties they face in the distance education process. The research is also important in terms of comparing the opinions of students at different grade levels regarding online studio education during the pandemic process. In addition to these, it is aimed that this study will serve as a basis for the planning and studies regarding future architectural education processes, the measures and the future academic researches.

1.1 Aim of the study

This study aims to obtain results on the following topics:

- (1) Determining the level of adaptation of the students to online studio environment that replaces the physical studio.
- (2) Determining the study methods preferred by the students in the online studio organization.
- (3) Measuring students' level of adaptation to alternative methods and technologies during the pandemic process.

1.2 Structure of the paper

The general structure of this paper is organized as follows: The next section describes the importance of design studios in architectural education and provides information on the literature and historical background on this topic. The third part focuses on the activities of the YOK and the decisions taken for the implementation of distance education methods during the COVID-19 outbreak in Turkey. In this context, the adaptation to this process, general strategies and action plans are explained. In the fourth chapter, the transition process to distance education in the design studio courses, which is the most basic course of the department of architecture, is explained. This section provides general information about the revisions of course contents and processes according to distance education methods, the selected technological tools and online platforms and the arrangements in architectural representation techniques. The fifth section, which forms the basis of this study, includes the survey design, the method, participants, statistical analyses and primary empirical results. The paper ends with the outcomes, discussion and conclusion parts, which include main findings, results, comparisons and future research subjects.

2. Design studios in architectural education

Design is the core activity of an architect. Therefore, the process of learning to design is the most important stage of architectural education. Design studio is the environment where the students learn various ways of design and nourish their creativity through experience and learning by doing. [Ledewitz \(1985\)](#) stated that in the design studio, students learn different aspects of design education: A new language, new skills like visualization and representation and architectural thinking. Apparently, the design studio is the main element of architectural education nowadays, but it occurred through an ongoing evolution of the practice and education throughout centuries.

The history of the design studio in architectural education dates back to 18th century, when Ecole des Beaux Arts was formed in France. The institutionalization continued with Bauhaus in the first quarter of the 20th century, bringing architecture together with other branches of art and design ([Pasin, 2017](#)). Contemporary schools of architecture mostly follow the foundations formed by the two institutions, but the nature of education keeps evolving affected by emerging theories and methods of teaching, as well as the needs and requirements of the society. In the late 20th and early 21st century, there have been many proposals to improve and develop the quality of architectural design studio education. Educational concepts such as Chickering's theory of student development, Bandura's social learning theory, the constructivist learning environment, problem-based learning and learner-centered learning environment are some of the attempts that were implemented into the design studio to improve the quality of architectural education.

Design studio is the center of architectural education and it is the place where the theoretical and technical knowledge gained from other courses are brought together with skill development exercises of design. Thence it is important to maintain the balance between the different elements of the design process, giving value to intangible elements of design such as social, psychological and emotional concerns. Architectural education is not restricted to physical building design; it also incorporates value system, philosophy, sustainability, technologies and other related areas ([Ibrahim and Utaberta, 2012](#)). Accordingly, educators have the responsibility to develop the design studio based on the requirements of their time, location and society. Design education requires a structure that directs the student designer toward multi-dimensional and dynamic thought processes ([Önal and Turgut, 2017](#)). However, there are also some critical approaches to the existing structure of the design studio. Caused by the flexible nature of the studio and its need for evolution and development, critical perspectives

are very important and beneficial. The critics mostly concentrate on the unbalanced weight of technical knowledge and practical skills, the lack of interpersonal communication and collaboration and the lack of transdisciplinary work that causes the design students to recognize design as a pure technical issue rather than a social and cultural process (Nicol and Pilling, 2000; Foqué, 2011; Russell, 1995; Salama, 1995).

Design studio is a social learning environment, where instructors and students interact in physical space within the scope of the studio. Thus, the students are able to learn from the instructor, as well as from each other. Schön (1987) describes the design studio as a reflective practicum where the student enters a virtual world designed by the instructor with its limitations and rules and learns the ways of design by doing with low risk and under guidance. It has a complex structure, but the supervision of the instructor supports the student to overcome the difficulties of that complex structure. The research or study of any given architectural problem or any development in the profession can be experimented in the design studio which at the same time stimulates the students to acquire the necessary knowledge and skill in the subjects being worked on. Therefore, it is the duty of the educator to balance the design process with a grounded knowledge base that responds to research engaging daily issues at their core (Combrinck, 2018). This process of teaching and instructing requires a strong dialog and connection between the instructor and the student. The conventional studio as a physical space allows a strong connection to be built between the participants. Studio is usually a flexible space that enables various activities such as seminars, lectures, juries, one-to-one critics and collaborative or personal work (Masdéu and Fuses, 2017).

In the circumstances of the 21st century, the ecosystem of the design studio keeps evolving, creating alternatives to the existing conditions. Student-focused teaching methods are given bigger priority, and conventional methods of communication and representation are being replaced with technological instruments. Concepts like blended learning, virtual studios, or online studios are being used more frequently under the light of information and computer technologies. Using advanced methods of communication, instructors and students can meet each other regardless of the physical distance. Thus, collaboration between institutions from different countries becomes possible. Consequently, the implementation of advanced communication and visual representation technologies into the design studio becomes an obligation and the necessity and qualities of the physical environment are starting to be questioned.

In addition to all the other developments, the COVID-19 pandemic in 2020 has been challenging, but at the same time favorable period regarding the transition from physical studios to online learning environments in design education and design studios have been the places that were affected by the changing circumstances of communication and social relations. Recent approaches in the development of the design studio processes have been extremely supportive creating alternative studio environments during the pandemic period.

3. COVID-19 and online education process

Coronaviruses are a large family of viruses such as MERS and SARS (WHO, 2020b). On December 31st of 2019, Cases of pneumonia of unknown etymology were reported in Wuhan, China. The World Health Organization declared the outbreak as COVID-19 a *public health emergency of international concern* on the 30th of January and as a pandemic on the 11th of March due to the occurrence, spread and severity of the virus. In the following days increased, probably imported, cases were reported and countries with domestic contamination began to emerge in late February. At the beginning of March 2020, the pandemic slowed down in China but increased in some other countries. At that time the infection is continuing worldwide.

After the start of COVID-19 Studies on the 10th of January and the first meeting of the Scientific Advisory Committee of the Turkish Ministry of Health on 22nd of January, the first case was detected on March 11, 2020 (Turkish Ministry of Health, 2020). Current data are available in WHO's and General Directorate of Health Services for Turkey.

The courses of the Spring Semester started on February the 10th of 2020 and continued and completed their 5-weeks education in regular classrooms before the educational facilities were temporarily closed due to the COVID-19 epidemic. In the case of the architecture students, the design project was held as usual face-to-face and in architectural studios.

Caused by the spread of the pandemic in the country and the decisions by the YOK in Turkey, Academic-Planning and Distance-Education Units carried out a new course planning for online education. The announcement of the Faculty of Architecture and Design covers the use of Adobe Connect for courses and emphasize the organization of the courses 50% synchronous and 50% non-synchronous (homework, etc.). Synchronous lectures were to record in Adobe Connect to give another opportunity to watch for students having problems with an Internet connection. All design studios were already performed in virtual classrooms. The virtual studios planned to be 1.5 h could be extended up to five hours according to preference and need.

There were differences of implementation between annual studio-levels. The general course was, in order not to waste time during the lesson, uploading of the works to its learning by the student, studying of uploads by the instructors before design studio and discussing of the proposals during the studio.

4. Adaptation of design studios to online system

In the university education environment, each discipline has its own fundamental characteristics. Architecture is an active discipline based on mutual interaction, sharing and production, where research, design and implementation processes are at the forefront rather than the theoretical process. The most basic course of this training process is practical-oriented design studio courses, which continue with more intensive content in each semester. According to Dutton (1987), compared to typical classroom scenarios, studios are active sites where students are engaged intellectually and socially, shifting between analytic, synthetic and evaluative modes of thinking in different sets of activities (drawing, conversing and model making). In this context, it can be said that architectural studio courses have their own cultures and structures different from other theoretical and practical courses.

In the host university, the design studio courses, which form the backbone of the architecture program, are designed as a total of eight courses, one project per semester. These studio courses are supported by various courses on history, theory, criticism, building physics and technologies, media, environment, city, society throughout the education curriculum. Design studio courses begin in the first year with Basic Design and Design Studies courses. These courses aim to introduce students to the basic concepts they will encounter in the field of design and to develop critical thinking and solution generating skills through two and three-dimensional design problems. In this sense, the contents of these courses are designed as an introduction to design. From the first studio in the second year, architectural design 1, to the last studio in the fourth year, Architectural Design 6, the students are expected to produce unique solutions to architectural problems in different scales by using the knowledge and skills they gained during their architectural education. Studio lessons, in which there is a mentor system based on co-production rather than traditional student-teacher relationship, provide an educational environment where problems are discussed and solutions are sought together. In this context, as a creative sharing space, the studio defines a space based on mutual interaction

and communication where students experience design, theory, culture and practices throughout the education process.

One of the main concerns in the pandemic process was the efficient provision of the interactive education environment based on mentor system established in the physical studio environment in the new distance education-teaching model. Due to the fact that the break given to face-to-face education under COVID-19 measures coincides with the fifth week of the spring term and the planning of the design studio courses until this time has been arranged according to the face-to-face learning system, some revisions and arrangements have been made to ensure the continuity of the courses in this new distance education-teaching model.

4.1 Selected online education platforms

In online education, learning is asynchronous, synchronous, or a combination of both. In synchronous learning, the learner can interact with the instructor and the other learners in real time, while in asynchronous learning the learner is not in real time communication with the instructor and the other learners (Belanger and Jordan, 2000). Due to the COVID-19 pandemic and social distancing regulations, many universities around the world considered alternative ways of providing lectures and engaging students. During pandemic process, the design studio courses generally benefited from itslearning and Adobe Connect platforms to adapt courses to online education, while synchronous courses progressed through Adobe Connect platform. Adobe Connect meeting is a live online platform for multiple users to conduct a meeting, lesson or conference. The classes let students to share their screens or files, chat, broadcast audio and video and participate in interactive online activities. On the other hand, itslearning is generally used in the asynchronous part of the lessons. This is generally used to keep a written record of the progress and follow-up of the courses. Throughout this process, the technical support department of the university shared educational videos and documents for instructors and students on the school's website. In addition, by conducting trial lessons, the basic tools of online platforms were introduced to all users.

With the transfer of the design studio courses, which are dominated by the understanding of working together and social relations, to the online studio environment, all learning activities regarding the design process have also been transferred to these virtual platforms. One-to-one critics made in the studio environment were also continued in the virtual environment. In the virtual studios of Adobe Connect platform, they had the opportunity to discuss these works with their instructors and classmates via video-conference or screen sharing methods. In this platform where remote access is also possible, lecturers were able to interfere with students' screen sharing and share criticisms about their projects. In addition to these, synchronous lessons were recorded by the system, which allows students to follow the recordings after the lesson.

Since architectural project education requires a process based on mutual interaction, co-production and sharing due to its nature, these platforms have been insufficient from time to time. For this reason, alternative solutions were sought and lessons were supported by various modeling and sketching programs. In addition, different platforms such as Hangout, Zoom, Teams and Skype were used when technical problems were encountered on the platforms used, or during student-teacher meetings outside the class hours.

4.2 Revisions on the contents and syllabi

Syllabi, which are shared with students at the beginning of each academic semester, are the most important tools to progress a course regularly. In addition, they are also useful for students to learn about the course policies, studio rules, contents and exam schedules of the course and not to break away from the process. In the transition to online education, some revisions have been made in the syllabuses in order to describe the new education formation, methods and process planning to the students. Although architectural design studios do not

progress within the framework of weekly topics like other courses, it is important for students to know what is expected from them in weekly submissions. In this context, the contents and general structure of design studio syllabuses were restructured according to online education system. In addition, weekly courses and jury calendars were revised due to the one-week break given to education.

In order to minimize the motivation problems caused by being away from school during the pandemic process and to adapt students to online education understanding more quickly, all course materials had been tried to be easily accessible from online platforms. Within this process, it has been decided that all presentations, weekly submissions and all kinds of supplementary contents were uploaded to the system by the lecturers and shared in synchronous lessons. Also, it was tried to ensure the continuity of all the activities planned to be held face-to-face in the physical studios in the online education.

4.3 Revisions about the workflow

The pandemic process has also been important in terms of rethinking traditional architectural design education and the means of representation of architectural design in the digitalizing world. In face-to-face education program, students are expected to submit their works as hand drawing in the first two years of the architectural education in order to improve their hand and mind coordination. As of the third year, the usage of alternative digital tools is allowed. During the pandemic, some changes were made in this educational approach for the first- and second-year students. In this process, the discussions on the use of hand drawing and digital drawing tools, one of the most fundamental discussion topics of architectural education, were shelved for a while, and instead, the idea of working with the most efficient and accessible tools was adapted. Since students' access to stationery materials was limited under quarantine conditions, first some flexibilities were provided in using digital drawing programs. In the host institution, digital drawing lessons start with the basic 2d-3d programs in the second semester of the first year. More detailed training and advanced programs are given in the elective courses opened in the following semesters. In the pandemic, second year students who have taken the digital drawing courses or have improved on their own, were able to use digital drawing tools in their design development processes and project submissions. First-year students who did not take digital drawing courses yet or were taking concurrently, were allowed to use the drawing materials available in their homes. In addition, the faculty management also supported students who had a shortage of materials by sending materials to their houses.

4.4 Conversion of table critiques and juries into online sessions

In the architectural design studio, the student is expected to present the design idea, which can be expressed in an abstract way, by externalizing it with visual tools and to convey the idea through representative techniques (Purcell and Gero, 1998). Studio is an environment where people such as the instructors, students, guest jury members and speakers invited to the studio communicate with each other. By providing a social interaction between all these people in the studio, thoughts are freely expressed and shared (Coyne *et al.*, 1994). During lock down, online sessions held in the digital platforms have enabled all people continue to communicate within assigned hours. Two times 4-h in a week, in total 8-h of physical studio has been assigned as 4-h of online studio (synchronized) and 4-h of asynchronous study on web platforms due to the legislative instructions of Higher Education Council.

In the center of the studio, the instructor's ritual of criticizing the student's work at the desk is one of the scheduled and repeated activity (Weber, 1994). In general, the physical studio is a place where students bring their works with them to get table critiques and join to

the discussions about other students' works. Unlike, during online education, the students are expected to submit their weekly drawings online beforehand as synchronized at least 2-h before they sign-in online studio. The organization of table critiques is revised as online critiques that of the student works pre-evaluated by the instructor, which may give opportunity to the instructor to think about the students works in a wider perspective. In that case, the pre-evaluations are transferred verbally to the students one by one and questions have been answered by instructor during online studio hours. That conversion might have brought a more systematic approach for students to develop their works.

Although, at the beginning it used to be more mechanical and more scheduled than the physical studio critiques routine, in time both instructors and students got familiar to this novelty. The duration of the online studio hours is extended to the normal physical studio hours as 4-h each studio day did a great contribution to get over the education lack of physical environment and brought flexibility to start a discussion as used to be in the physical studio. As well as the online critiques, the juries have been done in online studios with the same duration and schedule as in physical studio. The jury sessions have been handled for two-days, 4-h each day with multiple jury members in different physical locations. There has not been any significant difference regarding the schedule and process between the normal juries and online ones. Even students were asked to make online evaluations about their peers during jury sessions. Also, valid for both feedbacks of critiques and jury sessions, there is an opportunity to watch the recordings later is a novelty and supportive for education. Students had a chance to visit other online juries as well.

4.5 Revisions of representational techniques

The key concept of an architectural design studio is communication. For this reason, representation techniques and tools such as hand drawing, physical model or digital drawing and model by utilizing computer-based design tools are utilized in order to express the design idea that is thought and explain design parameters that are processed in the project (Ward, 1990; Heylighen *et al.*, 1999). Online studio has brought some important opportunities and challenges for students regarding the presentation and expression of their works. Except first-year design works (1001 and 1002), the architectural drawings and models by hand or digital software is kept optional for 2000, 3000 and 4000 students to develop their design works. On the other hand, however the first project of second-year architectural design (2001) is always used to be asked to done by hand, it was kept optional as well as (2002) during online education process. Accordingly, most of the students preferred to prepare their drawings and models by digital software such as Google SketchUp, Lumion, or AutoCAD. Here, one of the most striking revisions for student works has been about the development of their presentation skills and engagement with the digital organization of their files for online submission due to the specific requirements such as MB capacity, format, embedded audio or video, etc.

4.6 Engagement to virtual site visits

Visiting the site that is assigned for the design subject of the studio, is one of the essential parts of the process. In relation with the design subject, the site selection may be in the city where the university is located or in another city. Due to the requirements of the subject or the conditions of the city where the site is located, it may be necessary to accommodate more than one day to become familiar with the city and the site. In that case, site trips are organized to the city in order to do analysis, take photos and understand the area and the environment. Especially, it is very important for students to see the architectural values, natural components, historical entities, cultural environment and comprehend the context as a whole. For this reason, the site visit is critical and inseparable part of the design process (Yürekli, 2003). At the beginning of the

semester, the students of all studios had a chance to visit the site that they will propose the design. For this reason, the shift to online studio might have been easily supported by virtual site visits through platforms such as Google Earth or Google Map. The virtual walks have been the digital tools for students to memorize/see the site whenever they need.

4.7 Online studio as a socialization platform

Design studio, is defined by [Shoshi and Oxman \(2000\)](#) as places where architecture students spend the most of their time and learn design methods. For every student to work comfortably in the studio, physical comfort conditions should be provided. Although the necessary comfort conditions are important as they affect motivation, the spatial characteristics of the studio that supports social interaction between users is much more important ([Yürekli, 2003](#)). During lock down, the physical studio environment is initially replaced with the digital ones. Although the students joined the online studio through digital platforms in front of their computers, the physical environment such as home or dormitory has been the physical space where they continue to study. In that case, the physical conditions became variable for each student.

On the other hand, the spatial integrity of considerable privacy and being aware of the other students' actions is another condition to maintain studio as a social space. So, design studio is a physical environment where the designer identity of the students will be developed, and the private spaces belonging to the user reflect the personality of the user. Everyone in this space expresses themselves and is influenced by each other with their thoughts, feelings and the way they perceive the life ([Coynne et al., 1994](#)). Therefore, the studio is a shared space for discussion, presentation, conversation, participation and education. So, the physical studio, which is the essential communication environment of architectural design project, is converted into a digital environment. However, the discussion with instructors and jury members have been held during online sessions, the other social aspects of physical studio should have been occurred among other digital communication platforms or shared digital spaces such as social media. Furthermore, online exhibitions of the student projects on Pinterest and virtual exhibitions have been the new ways of sharing outcomes with a wider audience than before.

5. Survey on students' perception of online studios

Pandemic has been one of the unexpected and challenging conditions, which inevitably brought the online education process immediately after lock-down. During online education process, for architecture students, there have been some specific issues about handling technical infrastructure such as internet accessibility, affording personal computer with suitable capacity for using software programs such as AutoCAD or SketchUp, obtaining equipment such as printer, drawing paper, cardboards for model making, etc. In that case, discovery of alternative materials for physical model making, or rapid development about using digital drawing and modeling tools were the solutions that have been brought by students and educators. Besides, travel restrictions for international students, general health problems, psychological conditions, adaptation to the new education spaces such as dormitory rooms, relatives' homes or family homes instead of class/studio have been the other challenges that all students faced. The support services have taken active part by being in touch with students all through the process. Due to this unique education condition with its challenges and opportunities, investigation of opportunities of online studio is done via a survey among architecture students, which had become the essential digital space for architecture students to socialize and produce.

5.1 *The design of the survey*

The survey was conducted at the end of the semester, from 09th to 23rd June 2020, among architecture students to examine their experience about online design studio in the architectural education during 2019–2020 Spring Term. The total survey population included first, second, third and fourth-year students of architectural design studios. Initially, the instructors of each studio contacted their student groups and delivered the forms online via the official online platform of the university.

Due to the pandemic lock-down the survey questionnaire was conducted online through Google Forms which is a free online survey tool. The user-friendly interface enabled the majority of the students to contribute to the questionnaire. The survey includes 2 questions with short nominal answers and 18 questions to choose from a 5 point Likert scale. First set of three questions focuses on the general impressions on online studio process, while the second set of five questions is about utilizing alternative learning opportunities in online studio. Third set of four questions focuses on utilizing digital drawing and model making tools, and fourth set of five questions investigates online studio as a digital platform for socialization and production. An additional set of two questions asks participants to give nominal information about their studio course and the place they resided during online education. The survey received 212 responses, 52 of them being from 1st year students, 56 from 2nd year, 59 3rd year and 45 4th year students. Responses were analyzed using SPSS, a statistical analysis software package. Survey results are given below.

5.2 *Results*

The results gained from the survey are assessed generally and in relevance with the question sets. Additionally, all the questions and question sets were assessed in relationship with the studio level of the students. Cronbach’s alpha analysis based on question sets shows that the results of the questionnaire are reliable. The analysis results are shown in [Table 1](#).

A total look at the questions regardless from the studio level of the respondents indicates that the most important benefit of online studios for the students is using alternative communication methods such as Zoom, Skype, etc. The average rate for that question is 4.17. Another advantage of the online studio appears to be the opportunity to watch the recorded sessions of the online critiques and juries, with an average rating of 3.88. For the responding students, the third biggest benefit of the online studios was that it helped them to realize their ability to be productive under sudden changing conditions. This question has an average result of 3.88 ([Table 2](#)).

Results based on the studio level of the students show that the first year students think more optimistic about the online studio than the other students, as fourth year students are more critical about it. Average of results for first year students is 3.70; as for 2nd year students it is 3.23; for 3rd year students 3.41 and for 4th year students it is 3.06. Assessing the questions one by one, results based on studio level are parallel to general averages. However, there are some exceptions. The exceptions are; first, about the physical model-making skills where the first and second year students are more positive than third and fourth year students; and secondly, about student’s opinions on the efficient use of resources as they did

Table 1.
Cronbach’s alpha
analysis results based
on question sets

Question sets	Average	Standard Deviation	Cronbach alpha
(1) set of questions (q1–q3)	3.55	0.942	0.760
(2) set of questions (q4, q5, q10–q12)	3.68	0.738	0.713
(3) set of questions (q6–q9)	2.78	0.929	0.737
(4) set of questions(q13–q18)	3.38	0.958	0.870

Questions	Avg	Std.dev
I think online studio experience is beneficial for my future career as an architect	3.35	1.173
I benefitted from joining online discussions with our instructor to exchange ideas and contribute to my friends' design process	3.41	1.167
It was useful to watch the recorded sessions of online critiques and juries	3.88	1.097
During the online studio process, I benefitted from alternative research methods and digital resources (e-library, web resource, social media, etc.)	3.62	1.139
During the online studio process, I learned to use alternative communication (Zoom, itslearning, Skype, etc.) methods	4.17	0.964
During the online studio process, I had the opportunity to improve my CAD (SketchUp, AutoCAD, Revit, etc.) skills	3.77	1.083
During the online studio process, I had the opportunity to improve my hand sketching skills	2.72	1.319
During the online studio process, I had the opportunity to improve my physical model making skills	2.32	1.258
During the online studio process, to represent my design, I utilized physical model more than digital model as a tool	2.32	1.295
Since I did not need hard copies of my work, I contributed to efficient use of resources	3.71	1.200
Online exhibition of my design proposals both in online studios and online platforms such as Pinterest will publicize my work and motive me as a prospective architect	3.78	0.980
Virtual site visits (Google Earth, Google Maps, etc.) had a positive impact on my design process	3.13	1.105
Online studio provided alternative opportunities to communicate with my friends	3.05	1.223
Physical studio discussions on our design proposals with my friends is replaced with online platforms	3.41	1.199
The online studio turned the time I spent at home into a productive activity	3.39	1.263
Online studio allowed me to become more self-disciplined and more organized in my home environment	3.33	1.294
Online studio strengthened my sense of belonging to my instructors and friends	3.28	1.271
Online studio lessons allowed me to realize my ability to adapt to and be productive under sudden changing conditions	3.84	1.131

Table 2.
Total average results of all questions

not need printed materials. Third year students have the highest average rate about that question with 4.08. One more exception is about the improvement of CAD skills as the 2nd year students are the group which has the highest average result for that question with 4.14.

The ANOVA analysis of question sets also has significant results. Results of the first set of questions are parallel to the general results, as first year students have the highest, and fourth year students have the lowest mean values. Only exception in this set is the question about the benefit of the online studio for the students' future career, where the third year students have the highest mean value with 3.61. Second set of questions is about utilizing alternative learning opportunities in online studio, and the second year students have the lowest mean value in this set with 3.48. They are least positive about the benefit of virtual site visits on online platforms with a mean value of 3.02. The ANOVA analysis results based on first and second question sets are shown in [Table 3](#).

Third set of questions that focuses on utilizing digital drawing, sketching and physical model making exercises has different mean values where the second year students have a higher mean value than third year students (2.73 > 2.57). In this set, a big gap between the first year students and others attracts attention. The mean value of first year students in this set is 3.50 as the value of fourth year students is only 2.28. Additionally, third and fourth year students have extremely low mean values about the utilization and benefit of physical models. Fourth set of questions investigates online studio as a digital platform for socialization and production, and the mean values for this set is completely parallel to the general results. The significant part in this question set is about fourth year students'

1st set	N	Mean	Std. Deviation
ARC1001–1002	52	3.79	0.920
ARC2001–2002	56	3.50	1.023
ARC3001–3002	59	3.62	0.936
ARC4001–4002	45	3.21	0.785
Total	212	3.55	0.942

Note(s): $F(3,208) = 3.343, p < 0.05$. Mean with different superscripts differ from each other at $p < 0.05$

Table 3.
ANOVA analysis of
first and second
question sets

2nd set	N	Mean	Std. Deviation
ARC1001–1002	52	3.85	0.791
ARC2001–2002	56	3.48	0.862
ARC3001–3002	59	3.84	0.528
ARC4001–4002	45	3.53	0.670
Total	212	3.68	0.738

Note(s): $F(3,208) = 3.97-42, p < 0.05$. Mean with different superscripts differ from each other at $p < 0.05$

opinions on the socialization opportunities in the online studio. They barely think that the online studio strengthen their sense of belonging to their instructors and friends with a mean value of 2.84. The ANOVA analysis results based on third and fourth question sets are shown in Table 4.

The results of the fifth set of questions indicates that the majority of the students resided at their family homes, as only 16.5% (35 students) were in a student house, and 0.9% (2 students) were at a dormitory during the online education process.

5.3 Outcomes and discussion

The survey points out important outcomes regarding students' opinions on design studio courses on online platforms. First, students think the most prominent benefit of online studios appears in the use of digital communication tools such as Skype, Zoom, Hangouts, etc. This is a predictable result because although the students already use social media instruments very effectively, they are not familiar with these formal digital communication tools, and they find

3rd set	N	Mean	Std. Deviation
ARC1001–1002	52	3.50	0.910
ARC2001–2002	56	2.73	0.820
ARC3001–3002	59	2.57	0.821
ARC4001–4002	45	2.28	0.722
Total	212	2.78	0.929

Note(s): $F(3,208) = 13.614, p < 0.01$. Mean with different superscripts differ from each other at $p < 0.01$

Table 4.
ANOVA analysis of
third and fourth
question sets

4th set	N	Mean	Std. Deviation
ARC1001–1002	52	3.67	0.930
ARC2001–2002	56	3.23	1.070
ARC3001–3002	59	3.50	0.835
ARC4001–4002	45	3.10	0.903
Total	212	3.38	0.958

Note(s): $F(3,208) = 3.827, p < 0.05$. Mean with different superscripts differ from each other at $p < 0.05$

it beneficial to get introduced to those types of instruments for distant communication. They are aware of the fact that these platforms will most possibly be important media for communication in their professional life.

Another important outcome indicates a weak side of the conventional physical studio environment. Students think that it is beneficial for them to be able to watch the recordings of the discussions in the online sessions repeatedly. In the conventional studio environment, students have to join the discussions between their instructors and peers, and at the same time they are dealing with their own design work. This situation causes them either to miss some valuable information or comments, or to interrupt their concentration while they are working. The opportunity brought by the online studio, the recording of the sessions, allows the students to concentrate on either their work or the discussion and do the other at another time without missing any information or comment. This is an important feature of online education that needs to be implemented into the design studio even if the studio transforms back to the conventional physical environment.

The study has an important outcome regarding the psychological effects of the design studio, especially at stressful times like the pandemic. For design students, the productive activity of dealing with a design problem can turn into a therapy to deal with the difficulties of the real world. If they are equipped with necessary tools and they are given the chance for self-actualization, students can make productive places even from their very own living environment.

Approaching the survey from a perspective of different studio levels, one can become aware of significant outcomes, as well. Relatively more positive mean values of first year students may derive from their eagerness for design education, as the fourth year students are under most pressure for they are going to graduate soon after the unexpected situation. There is a small difference between second year and third year students, as the total mean values of third years are slightly higher than the second year students. This may cause from the inner dynamics of the studio environment and individual or collective experiences of the students.

At the third set of questions where the changes in the digital drawing, hand-sketching and model making habits of the students are questioned, there are some significant outcomes. First and second year students' opinions are definitely more positive than the third and fourth year students. The source of these opinions may derive from the former experience of the students. First and second year students are still in the training phase in terms of visual and graphic representation methods, as the third and fourth year students think that they are in a more advanced level in that regard. Even though this comment is open for discussion, the future design of the design studio can benefit from the evaluation of the students to focus more on teaching basics of visual representation for junior students and on advanced and alternative graphic communication methods for seniors.

Socialization is an important aspect of the design studio environment. This fact is obviously reflected on the survey results. Even on online platforms, students think the design studio is a good opportunity for socialization. The online experience may help students to discover different ways of socialization. As a matter of course, social relationships rely mostly on unstructured and momentary activities. Physical studio environment provides those kinds of opportunities easily, as the online environment is a bit weak in that aspect. That might be an area of development for the online design studios, or a significant point in the design of hybrid studio environment.

6. Conclusion

The methods and strategies for learning in the design studio have been evolving since the beginning of its existence. This study about students' perception of online studios during the COVID-19 pandemic shows that online studios are yet another stage of the evolution to

develop the quality of the studio for the education of well-equipped designers. With the pandemic in 2020 it is proven once again that conventional methods of design education can easily get obsolete and it can become impossible to reach the students through physical relations and contact. Alternative methods of communication that enable distant education need to be provided, and advanced visualization and representation methods need to be developed in order to match with online communication instruments.

On the other hand, personal relations in the design studio education shall not be ignored. In the studio environment, there is still room for physical contact and conventional communication methods that allows students to get more involved with their design problem under the influence of their instructor. Even though during the pandemic period all the communication methods and representation of design proposals transformed into digital and virtual methods, it was an exception for the workflow of the design studio courses. After the pandemic is over, the conventional and emerging education technologies need to be merged in order to reach more advanced methods for the design studio education. The experiences gained during the pandemic times can be used for the development of the design studio education in the future.

Blended learning, distant education or virtual studio methods were already in the agenda of architectural design education in the last decades. There are many researches dedicated to these alternative studio organizations (Morozumi *et al.*, 2001; Niculae, 2011; Schnabel and Ham, 2012; Masdeu and Fuses, 2017; Iannou, 2018). Hybrid methods for design education are potentially the most appropriate ways of teaching and learning in the design studio. The pandemic in 2020 accelerated the speed of recognition of these approaches and forced educators to take it serious when they are designing their own design studio structures. In the future, studies on various approaches for the design studio education and transdisciplinary work on the workflow of the design courses need to be increased in quality and quantity, so that better organized and healthier design studio environments can be generated.

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