Evaluating the Shift from Physical to Virtual Design Studios During the COVID-19 Pandemic: Exploring the Second Years' Digital Design Development

COVID-19 Pandemisinde Fiziksel Tasarım Stüdyolarından Sanal Tasarım Stüdyolarına Geçişi Değerlendirmek: İkinci Sınıfların Dijital Tasarım Gelişimi

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Abstract: While online design studios have gained popularity in different universities around the world, our understanding of online design studios remains limited. Due to the rapid spread of coronavirus in 2020, universities were forced to migrate to the online platform. Consequently, many design instructors and students had their first experience with an online design studio. In the education of different design disciplines, this first online design studio experience may have resulted in different ways and different studies should be conducted to measure them. The scope of this study is limited to the discipline of interior architecture. This study aimed to investigate the experience of second-year students and instructors at Department of Interior Architecture and Environmental Design, where, under normal conditions, students are not allowed to develop their design projects using computer-aided software. This study is based on the results of the questionnaire survey conducted with students and instructors, with the ethical approval of Akdeniz University, Social and Human Sciences Scientific Research and Publication Ethics Committee, dated 20.11.2020 and numbered 19/240. All 32 students attending the Interior Design Studio IV course in Spring 2020 and three instructors were invited to complete a questionnaire about their experiences with online learning. Data from close-ended questions were analysed by using MS Excel and answers to the open-ended questions were analysed using thematic analysis. The results suggest that students demonstrated better progress in design and were satisfied with the online design studio. The results also point to shortcomings

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among instructors and the content of the course in building on teamwork and cooperation among students. Further studies are needed to present a detailed comparison between the face-to-face and online design studio learning for second-year students.

Structured Abstract: In the past few years, many interior design programs have shown interest in adopting distance learning and have adapted at least a part of their curriculum to an online environment (Fichera, 2012). Bender & Vredevoogd (2006) have defined this transformation as moving from the traditional campus of "brick and mortar" to the electronic classroom of "wire and chip". A review on this transformation reveals that interior design programs have mainly preferred a "combined learning system" which involves both face-to-face lectures and online communication over a "totally online system" (Bender & Vredevoogd, 2006). Some studies claim that online design studios have advantages for design students because millennials are familiar with communicating over technology. However, studies comparing virtual and physical and face-to-face studios and the long-term effect of students using virtual studios are very limited and therefore our understanding of the online design studio is still insufficient. The lockdown of 2020 shifted design education to the online platform, and consequently, each university faced different challenges in their own context. Designing studies that address the challenges of the COVID-19 crisis will help improve performance during similar scenarios in the future. The first coronavirus infection in Turkey was confirmed on the 11th of March 2020 and universities were closed on the 16th of March. Since the 23rd of March, universities have continued their education remotely and online. The key purpose of this study was to investigate the initial experience of second grade interior architecture students and instructors with compulsory online design studio during COVID-19. Since manual technical drawing and modelling is compulsory for second year students at the Department of Interior Architecture and Environmental Design, at the time, the shift to an online learning environment seemed risky for this group. With regard to this result, this paper intended to investigate the qualities of shifting from manual to computer-aided software in light of the challenges and opportunities experienced in online design studio during the pandemic. On that account, this study measures a range of variables by asking instructors and learners about their perceptions and experiences during the online design studio. Study is based on the results of a questionnaire survey with students via Google Forms and instructors via e-mail. Although participation was voluntary, all students and instructors agreed to take part in the survey. The majority of the students had enrolling in this design studio for the first time and none of the instructors were lecturing this course for the first time. None of the instructors nor the students had any prior experience with online education. Statistics were derived from close-ended (Likert scales and multiple choice) questions by using the MS Excel software. Later, answers to the open-ended questions were analysed using the thematic analysis. Both instructors and students were satisfied with student performance in developing the design project and believed using computer software enhanced the process of re-doing and re-designing. It could be argued that using computer software in addition to manual techniques can increase the potential of face-to-face design studios. The results from this study showed that both students and instructors had decent internet access and computers in addition to an efficient working space during the online education. It can be discussed that these advantages contributed to the success of the course. The results also point to shortcomings among instructors and the content of the course in building on teamwork and cooperation among students. Finally, results showed that most of the instructors and students preferred a combination of online and face-to-face design studio education and, overall, using computers and the internet had a positive effect on both instructors and students. This study does not suggest that online design studios will increase success among second year interior architecture students. Rather, it calls for a re-evaluation of the potentials promised by the digital age in design studios since technology seems to have a lot to offer for design education. The lockdown of 2020 shifted design education to the online platform, and consequently, each university faced different challenges in their own context. Designing studies that address the challenges of the COVID-19 crisis will help improve performance during similar scenarios in the future. Further studies are needed to present a detailed comparison between the face-to-face and online design studio learning for second-year students. It is also important to put on record that this study did not establish a step-by-step comparison between face-to-face and online design studios, however we believe such investigations are necessary to diversify available literature on online design education.

Keywords: Interior Design, Design Studio, Computer-Aided Programs, Online Education, Virtual Environment

Öz: Çevrimiçi tasarım stüdyoları dünya çapındaki farklı üniversitelerde popülerlik kazanırken, bu alandaki bilgi ve deneyimler sınırlı kalmaktadır. 2020 yılında koronavirüsün hızla yayılması nedeniyle üniversiteler çevrimiçi platformlara geçmek zorunda kalmıştır. Bunun sonucu olarak, birçok tasarım dersinde eğitmenler ve öğrenciler ilk kez bir çevrimiçi tasarım stüdyosu deneyimi yaşadılar. İlk çevrimiçi tasarım stüdyosu deneyimleri, farklı disiplinlerde farklı şekillerde sonuçlanmış olabilmektedir ve bu farklı deneyimleri araştırmak ve ölçmek tasarım eğitimi açısından önem taşımaktadır. Bu çalışmanın kapsamı iç mimarlık disipliniyle sınırlandırılmıştır ve yüz yüze eğitimde İç Mimarlık ve Çevre Tasarımı Bölümü ikinci sınıf öğrencilerinin tasarım dersinde bilgisayar destekli yazılımlar kullanılması izin verilmezken, çevrimiçi tasarım stüdyosunda bu öğrencilerin ve tasarım dersindeki hocaların dijital ortamdaki deneyimlerinin araştırılması amaçlanmıştır. Bu çalışma, öğrenciler ve öğretim elemanları ile yapılan, Akdeniz Üniversitesi, Sosyal ve Beşeri Bilimler Bilimsel Araştırma ve Yayın Etiği Kurulu'nun 20.11.2020 tarihli ve 19/240 numaralı etik onayının bulunduğu anketin sonuçlarına dayanmaktadır. 2019-20 akademik yılı bahar döneminde "İç Mekan Tasarım Stüdyosu IV" dersine katılan 32 öğrencinin tamamı ve üç öğretim elemanı, çevrimiçi öğrenme deneyimleri hakkında anket çalışmasına katıldı. Çoktan seçmeli sorulardan elde edilen veriler MS Excel ve açık uçlu soruların yanıtları ise tematik analiz yöntemi kullanılarak analiz edilmiştir. Çalışmada çıkan sonuçlar, öğrencilerin çevrimiçi stüdyoda yüz yüze eğitime göre tasarım geliştirme açısında daha iyi ilerleme kaydettiğini ve hem hocaların ve hem öğrencilerin çevrimiçi tasarım stüdyosundan memnun olduğunu göstermektedir. Sonuçlar aynı zamanda; takım çalışması ve işbirliği oluşturma yönünden, öğretim görevlilerindeki ve dersin içeriğindeki noksanlıklara işaret etmektedir. Bu araştırmanın devamında, ikinci sınıf iç mimarlık öğrencilerinin deneyimlerini yüz yüze ve çevrimiçi tasarım stüdyosu olarak daha detaylı ve ayrıntılı araştırarak iki yöntemi daha kapsamlı karşılaştırmaya ihtiyaç duyulmaktadır.

Anahtar Kelimeler: İç Mekan Tasarımı, Tasarım Stüdyosu, Bilgisayar Destekli Programlar, Online Eğitim, Sanal Ortam

Introduction

Social distancing became compulsory due to the rapid spread of coronavirus in 2020, and many design instructors had to leave the studio to teach design remotely. Some of the design-oriented academic programs were prepared for this situation since they already had a remote learning system in place, but some of them went online for the first time. While some studies focus on the advantages of online design students (Meggs, Greer, & Collins, 2012; Masdéu & Fuses, 2017; Fleischmann, 2020), others underline the necessity of a face-to-face design studio (Fleischmann, 2020, Dreamson, 2020). But overall, there were limited studies discussing the challenges and opportunities associated with digital learning at the time of the 2020 lockdown (Almanthari, Maulina, & Bruce, 2020; Basilaia & Kvavadze, 2020).

A lack of studies on online design studios at the onset of the COVID-19 pandemic emphasized the importance of developing studies that disscuss a variety of experiences during the shift from face to face to online education. Such studies would contribute to a better preparation in case of any similar scenarios. Considering this need, the key purpose of this study was to investigate the initial experience of second year interior architecture design studio with compulsory online design studio during COVID-19 lockdown. In this respect, the current study evaluated the challenges and opportunities experienced in online "Interior Design Studio IV" during the pandemic by surveying design students and instructors at Antalya Bilim University.

Manual technical drawing and modelling was compulsory for "Interior Design Studio IV" prior to the lockdown and therefore the sudden shift to an online learning environment seemed risky for this group at the time the lockdown was introduced. At the end of the semester, questionnaire surveys were conducted via Google Forms with students and via e-mail with instructors to understand the advantages and disadvantages of online design education for second year students. The questionairres were designed to obtain students and instructor perceptions and opinions to disscuss this sudden shift. The results were surprisingly optimistic, so, a number of recommendations on integrating digital and physical studios have been presented with the aim of

enhancing innovative activities and creative thinking among second year students attending the interior design studio.

Literature Review

The first architecture design studio was set up in 1819 at the École des Beaux Arts with the aim of improving the "artistic, analytical and structural thinking skills" of the students in a studio environment (Drexler, 1976). From 1930 to 1960, architecture schools adopted two distinctive approaches: one where studios were detached from theoretical courses and the other, called the Bauhaus system, where practice and theory were integrated in studio settings (Pasin, 2017).

The development of computer-aided software can be considered as technology's initial influence on design education (Brandon & McLain-Kark, 2001). As digital prototyping became more common place, design instructors were forced to include such software in their lectures to prepare students for digital collaboration in practice (Jones & Dewberry, 2013). Another technological development that influenced design studio training is the development of online education. Since the 1990s, there has been a rise in the number of the instructors and researchers who use or study distance education (Chen & You, 2009). Since 1993, various forms of virtual design studios are used in schools of architecture all over the world (Schnabel & Kvan, 2001).

The key concern for improving distance learning is providing a quality online learning environment (OLE) which relies on information technology for generating functions and tools that help online teaching and learning (Chen & You, 2009). Distance learning is generally classified into five categories (Figure 1). A Virtual Design Studio (VDS) can be defined as a networked design studio (Shao, Daley, & Vaughan, 2007). and it can be classified under the 'The Collaborative Group Model' (Simoff & Maher, 2000).
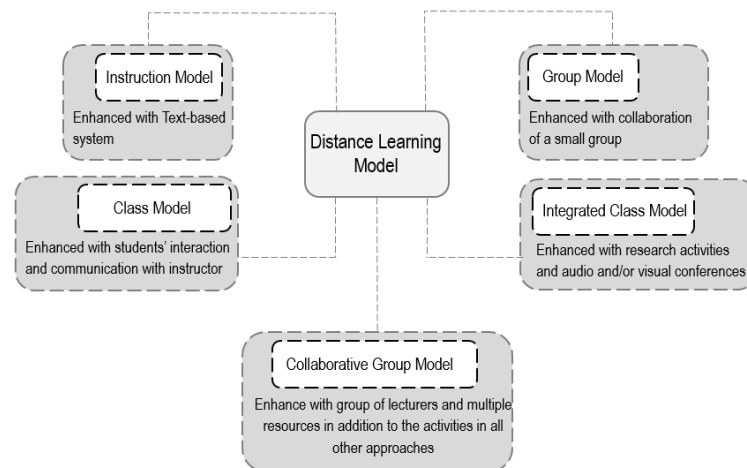

Figure 1: Five Types of Distance Learning as Proposed by Sagun, Demirkan, & Goktepe (2001).

In the past few years, many interior design programs have shown interest in adopting distance learning and have adapted at least a part of their curriculum to an online environment (Fichera, 2012). Bender & Vredevoogd (2006) have defined this transformation as moving from the traditional campus of "brick and mortar" to the electronic classroom of "wire and chip". A review on this transformation reveals that interior design programs have mainly preferred a "combined learning system" which involves both face-to-face lectures and online communication over a "totally online system" (Bender & Vredevoogd, 2006).

While there are researches that point to the advantages of the online delivery of design studio (Broadfoot & Bennett, 2003; Waks, 2001), many design instructors still believe in the importance of face-to-face studio learning (Fleischmann, 2020; Dreamson, 2020). According to a study by Chen & You (2009), online environments augment the opportunities in accessing a variety of resources, shaping a variety of interactions and communications, storing content and overcoming time and space restrictions, but the risks of losing a connection with this environment and lack of skills in using technology stand out as threats to good quality design education.

Distance learning has advantages for instructors, too. Since students have to take more responsibility for their education on online platforms, they generally have to collaborate more effectively with their instructors. Distance learning also allows instructors to easily monitor student progress, because web-based learning records all online interaction and shows student engagement (Bender, 2003). In an online design studio, instructors can manage their lecture times in a flexible way and are not confined by fixed studio hours and physical space. They can also communicate with students at their own convenience (Öztoprak, 2004).

Distance learning also allows instructors to discover the latest technological applications, search for alternative learning methods, and view or join sample distance courses, hence improve their teaching skills (Cini & Vilic, 1999). Figure 2 links the common advantages and disadvantages of online learning with the structure of an efficient design studio as defined by Broadfoot & Bennett (2003).
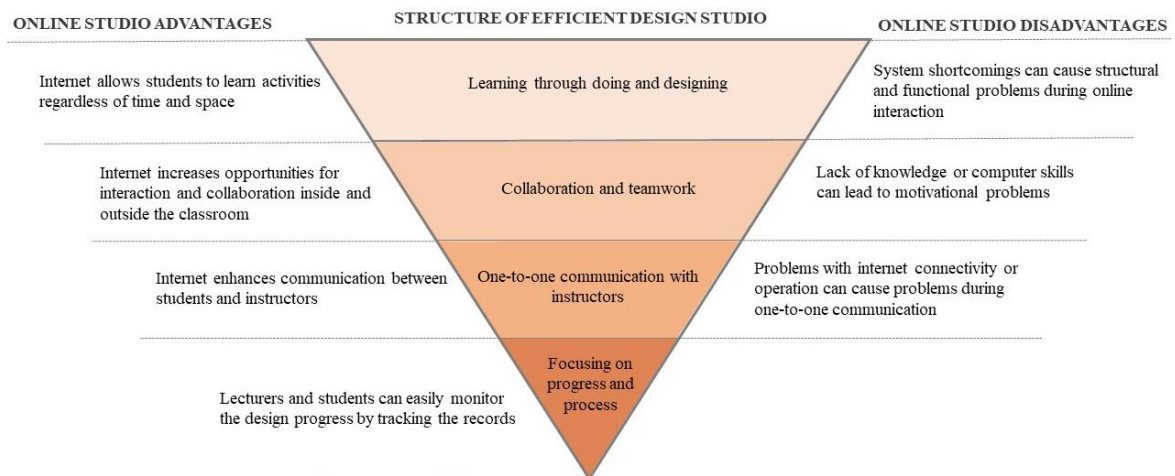

ONLINE STUDIO ADVANTAGES   **STRUCTURE OF EFFICIENT DESIGN STUDIO**   **ONLINE STUDIO DISADVANTAGES**

Internet allows students to learn activities regardless of time and space — Learning through doing and designing — System shortcomings can cause structural and functional problems during online interaction

Internet increases opportunities for interaction and collaboration inside and outside the classroom — Collaboration and teamwork — Lack of knowledge or computer skills can lead to motivational problems

Internet enhances communication between students and instructors — One-to-one communication with instructors — Problems with internet connectivity or operation can cause problems during one-to-one communication

Lecturers and students can easily monitor the design progress by tracking the records — Focusing on progress and process

Figure 2: The Advantages and Disadvantages of Online Platforms for Design Studio (Based on Broadfoot & Bennett, 2003; Bender, 2003; Chen & You, 2009)

The first online studio followed strategies similar to physical studio practices and adapted those strategies to available technologies (Wojtowicz, 1995; Malins, Gray, Pirie, Cordiner & McKillop, 2003), however, current Virtual Design Studios are finding their own patterns of learning based on existing potentials (Jones, Lotz & Holden, 2021). That said, a growing number of universities around the globe closed to avoid face-to-face education due to the rapid spread of COVID-19 during 2020 and we witnessed a very quick transition from "normal" to remote learning. While there were some studies related to dealing with social distancing and the physical rearrangement of schools during pandemics like influenza (Uscher-Pines, Schwartz, Ahmed, Zheteyeva, Meza, Baker & Uzicanin, 2018; Faherty, Schwartz, Ahmed, Zheteyeva, Uzicanin &

Uscher-Pines, 2019), most of the studies remain inadequate in terms of lasting pandemics like the case with COVID-19 (Basilaia & Kvavadze, 2020).

In conjunction with a shift to online education during the pandemic, there has been an increase in the number of studies evaluating online teaching and learning in higher education. Jones, Lotz & Holden (2021) designed a study with a large number of participants and claimed that students' engagement behavior had shifted from "passive" to "active" during online education. Similar to Jones, Lotz & Holden (2021), Charitonidou (2021) focused on new teaching methodologies that were employed for online design studios. According to this study, creating collaborative online learning environments increased student engagement which had a positive impact on students' learning processes. Similarly, Al Maani, Alnusairat & Al-Jokhadar (2021) (2021)'s study claimed that students became more independent and took more responsibilities while also developing better design decisions at earlier stages of design.

Ibrahim, Attia, Asma'M & Ali (2021) studied remote education in the architecture design studio during COVID-19 pandemic. Results showed that both instructors and students were satisfied with remote education for theoretical parts of the courses while they were less satisfied with the practical parts. Likewise, Mohammed, Taha, Mohammed, Mamand & Mohammed (2021) studied online education at the engineering faculty during the pandemic. The results suggested that departments such as interior design, which mainly rely on practical courses, faced greater challenges during online education. However, there are findings suggesting that it is possible to migrate practical education to online environments with good infrastructure and by offering online meeting programs that are suitable for practical courses (Şekerci, Danacı & Kaynakcı Elinç, 2021).

Dağlıoğlu, Pınar, Dino, Arslan & Bütüner (2020) evaluated the potentials and limitations of the online design studio. According to the study, although remote education cannot replace face-to-face design education, online discussions and critiques could be part of the design education. Additional findings also claim that technological channels can support art and design education in new ways (Marshalsey & Sclater, 2020). In another study, Özorhan & Lekesiz (2021) focused on second year students attending the online architectural design studio. Here, it was observed that the components of the studio such as interaction, collectivism, multilayeredness, dynamism, critiques, and juries, can be sustained during remote education.

Although quick transition to online learning seemed risky in the case of design studio courses, it is becoming clearer now that COVID-19 has created an opportunity for design instructors to focus on much-needed academic changes at the societal level (Allam, Dey & Jones, 2020; Marshalsey & Sclater, 2020). The inevitable shift to online learning has made design instructors realise the need for rethinking and reconsidering traditional approaches towards online design learning.

Method

This study is designed to explore the qualities of the online design studio in comparison to the key qualities of a conventional design studio. According to Dyson & Campello (2003), considering user perceptions may also be necessary and informative while assessing the learning outcome. Consistent with this argument, this study measures a range of variables by asking instructors and learners about their perceptions and experiences during the online design studio. The subjects and issues involved in learning are too complicated to be studied one research (Chen & You, 2010) and therefore, this study only focuses on the potentials and challenges of the online environment for instructors and second year design studio students.

The course used in designing this study is the IAED 2002—Interior Design Studio IV (4th interior design studio) which is taught biannually at Antalya Bilim University. A total of 32 students enrolled in the course for the Spring 2020 term and three instructors were assigned. The subject of this course was retail store design at proposed locations in Antalya, Turkey.

Manual model making and technical drawing were an essential part of the presentation and progress of the projects. The studio practice is supported by lectures and group/one-to-one critique sessions. Figure 3 shows the assessment methods and grading criteria for the course.
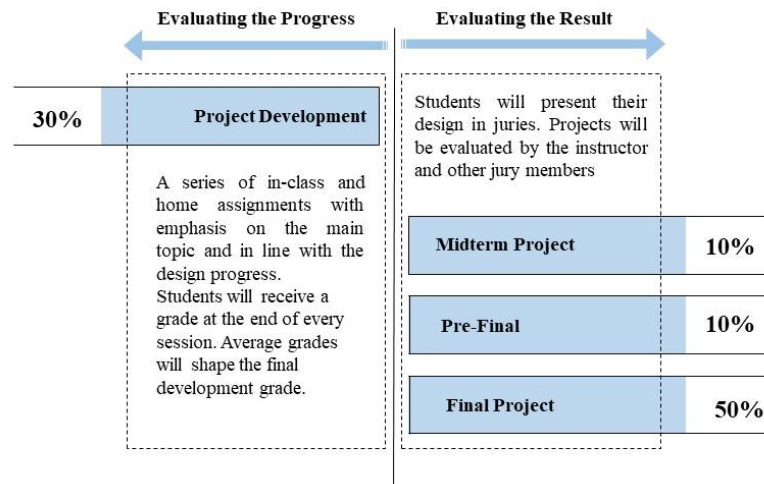

Figure 3: Assessment Methodology for IAED 2002-Interior Design Studio IV

Instructors made some changes on the application and progress of the course after the transition to the online environment in March 2020. These changes were as follow:

1) **Progress:** Students were allowed to continue their project by using drawing and modelling software. The students were expected to upload their assignments on to the Learning Management System (LMS) prior to the critique sessions.

2) **Critiques:** Microsoft Teams was used for online critiques. During the critiques, students either allowed instructors to access their computers or instructors shared their own screens with students.

3) **Attendance:** Students were expected to attend the full meetings on Microsoft Teams and listen to peer critiques.

4) **Juries:** There was no change in the jury's evaluation process however, the juries were held virtually on Microsoft Teams and the students presented their projects by sharing their computer screen.

Participants

All 32 students attending the Interior Design Studio IV course in Spring 2020 and three instructors were invited to complete a questionnaire about their experience with online learning. Although participation was voluntary, all students and instructors agreed to take part in the survey. The data from the survey was obtained privately, and participant identities were kept anonymous. The majority of the students had enrolling in this design studio for the first time. None of the instructors were lecturing this course for the first time. None of the instructors nor the students had any prior experience with online education.

Data collection and analysis

This study is based on the results of a questionnaire survey with students via Google Forms and instructors via e-mail. Based on the literature survey, six principle areas of analysis were

determined to examine the progress of students and instructors in relation to the characteristics of the design studio. These principles are as follows:

5) An assessment of students' computer skills before the transition to online learning: Understanding students' computer knowledge, skills and literacy in developing a design project prior to online education.

6) Student and instructor preparedness for E-Learning: Understanding participant access to a computer, the internet and a suitable environment for online education.

7) Student and instructor satisfaction regarding LMS and Microsoft Teams: Understanding participant satisfaction regarding the systems used for online studio.

8) Student and instructor satisfaction regarding the preparation of a design project using computer software: Understanding participant satisfaction regarding the use of digital software for project development.

9) Students and instructor satisfaction regarding the online design studio: Understanding participant satisfaction regarding online communication, the digital design progress, online research and online monitoring/recording.

10)   The risks and potentials of the online design studio: Understanding participant perception regarding the online design studio via open-ended questions.

Statistics were derived from close-ended (Likert scales and multiple choice) questions by using the MS Excel software. Later, answers to the open-ended questions were analysed using the thematic analysis. Next, a thorough overview was completed on all the responses and specific codes were defined corresponding to research questions. Afterwards, all the answers were course based on the defined codes and any other subjects that could be relevant or potentially interesting for the research were highlighted during this process. Finally, similar themes were categorised under the same group. Table 2 presents the key principals, questions and measuring instruments of the survey. Both students and instructors were asked similar questions. The only difference was that instructors answered the same questions about the students in sections P1, P4 and P5.

Table 1: Analytical Measures Applied for Instructors and Students' Online Studio Survey and Questions Investigating These Measures

Analytical measure	Survey Questions	Survey Instrument
P1. Assessment of students' computer skills before online education	How confident were you about using a computer before the online education? How good were your drawing skills on AutoCAD before online education? How good were your modelling skills using computer software before online education? Were you using a computer for developing your design project before online education?	Likert scale questions
P2. Preparedness for E-Learning	Did you have a computer at your disposal during online education? Did you have access to the internet during online education? Was your household work environment suitable for studying online? Did you experience network or technological problems to the extent of negatively affecting your progress?	Likert scale questions

P3. Satisfaction regarding LMS and Microsoft Teams	The LMS system was easy to use. I was satisfied using the LMS system. Microsoft Teams was easy to use. Microsoft Teams improved the critique session and design progress. I was satisfied using Microsoft Teams.	Multiple choice questions
P4. Satisfaction regarding developing a Design Project using Computer Software	Being allowed to draw with computer-aided software helped me develop a better project. Being allowed to use computer-aided modelling software helped me develop a better project. I was nervous about developing my project using computer-aided software. I am satisfied with the level of effort required to develop a project using computer-aided software during online education.	Likert scale questions
P5. Satisfaction regarding Online Design Studio	Listening to other student critiques in an online environment gave me a better perspective on the same design problems in my own project. I feel uncomfortable about other students listening to my critiques. I preferred cloud-based archiving rather than weekly print-outs for design critiques. I feel uncomfortable about instructors being always able to monitor and keep records of my design progress. I feel safe about and trust the assessment process due to the precise monitoring and recording in an online environment. I improved my online research skills. I feel connected to the course and my instructor Despite the physical distance. I developed my project constantly (re-doing and re-designing) during online education. Online Environment increased opportunities for interaction and collaboration with peers. Online education allowed me to communicate with other students as well as or better than a conventional face-to-face course. I am satisfied with my performance in my design project during online education. Which one do you prefer? Online, Face to Face, a combination of both	Likert scale questions
P6. Advantages and Disadvantages of Online Education	Did you develop new learning methods during online design courses? What were the advantages of the online design studio for you? What were the disadvantages of the online design studio for you?	Open-Ended

The scale

Before applying the survey study, which is the study method, with the decision of Akdeniz University Social and Human Sciences Scientific Research and Publication Ethics Committee dated 20.11.2020 and numbered 19/240, the responsibility for the method and scale of the study in terms of intellectual, law and copyright belongs to the applicant was decided unanimity as ethically appropriate to apply during the study.

Findings

The first section of the questionnaire aimed to get a better understanding of student skills and confidence about using computer and computer software. Instructors were also asked to share their opinions on students' computer skills at the beginning of online education. The findings showed that while instructors were moderately confident about students' computer skills, most of the students were confident about their skills. Findings also showed that two of the instructors believed that students' skills in using AutoCAD and 3D would be sufficient. However, most of the students claimed that they were moderately skilled in using AutoCAD and poorly skilled in using 3D programs. Finally, instructors believed that, despite the restrictions, students were using computers to develop their projects during face-to-face education. However, most of the students claimed that they rarely used computers to develop their design projects prior to the online design studio (Figure 4). At this point student confidence in their computer skills was a potential for the online design studio.

Figure 4: Findings from The Assessment of Students' Computer Skills Before Online Education

In the second section of questionnaire, questions aimed to get a better understanding of the participants' access to the internet, a computer and appropriate space. Findings from this section showed that, all instructors and a large majority of students (above 70%) had an adequate set-up during online education. The biggest problem for students was internet connection and technological limitations (38%), but overall, more than 50% of the students did not experience any major problems (Figure 5). Overall, adequate internet access, computer and working space for most of the students and instructors was another potential during the shift to online education.
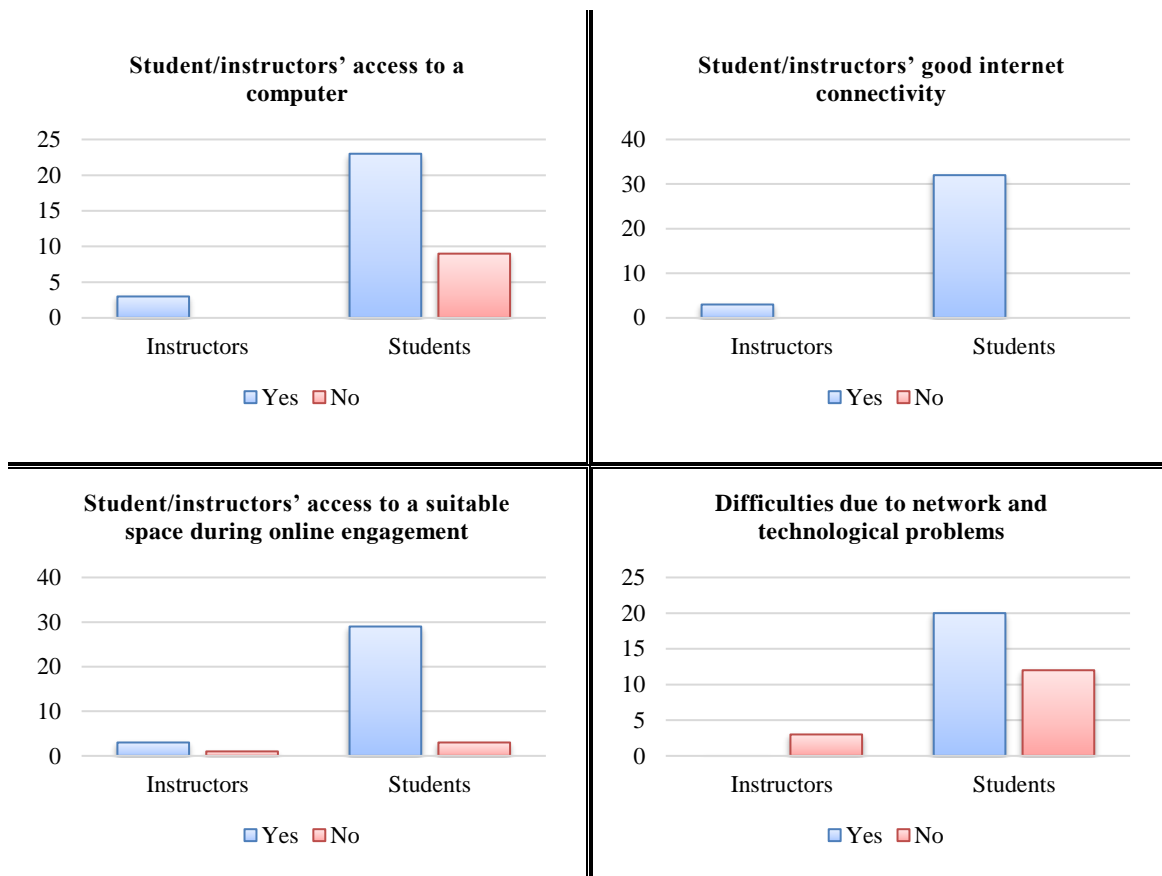
Figure 5: Student and Instructor Preparedness for E-Learning

   In the third section of the questionnaire, findings showed that all instructors found using LMS and Microsoft Teams easy and they were all satisfied with the Microsoft Teams platform. Findings also showed that most of the instructors were satisfied with the LMS and also found Microsoft Teams effective for the online critique sessions. Similarly, according to responses, most students found working with LMS and Microsoft Teams easy and efficient. According to the findings, 84% of the students found Microsoft Teams effective for the critique sessions (Figure 6). Therefore, student and instructor satisfaction concerning online platforms used during the shift to online education was another potential for the online design studio.
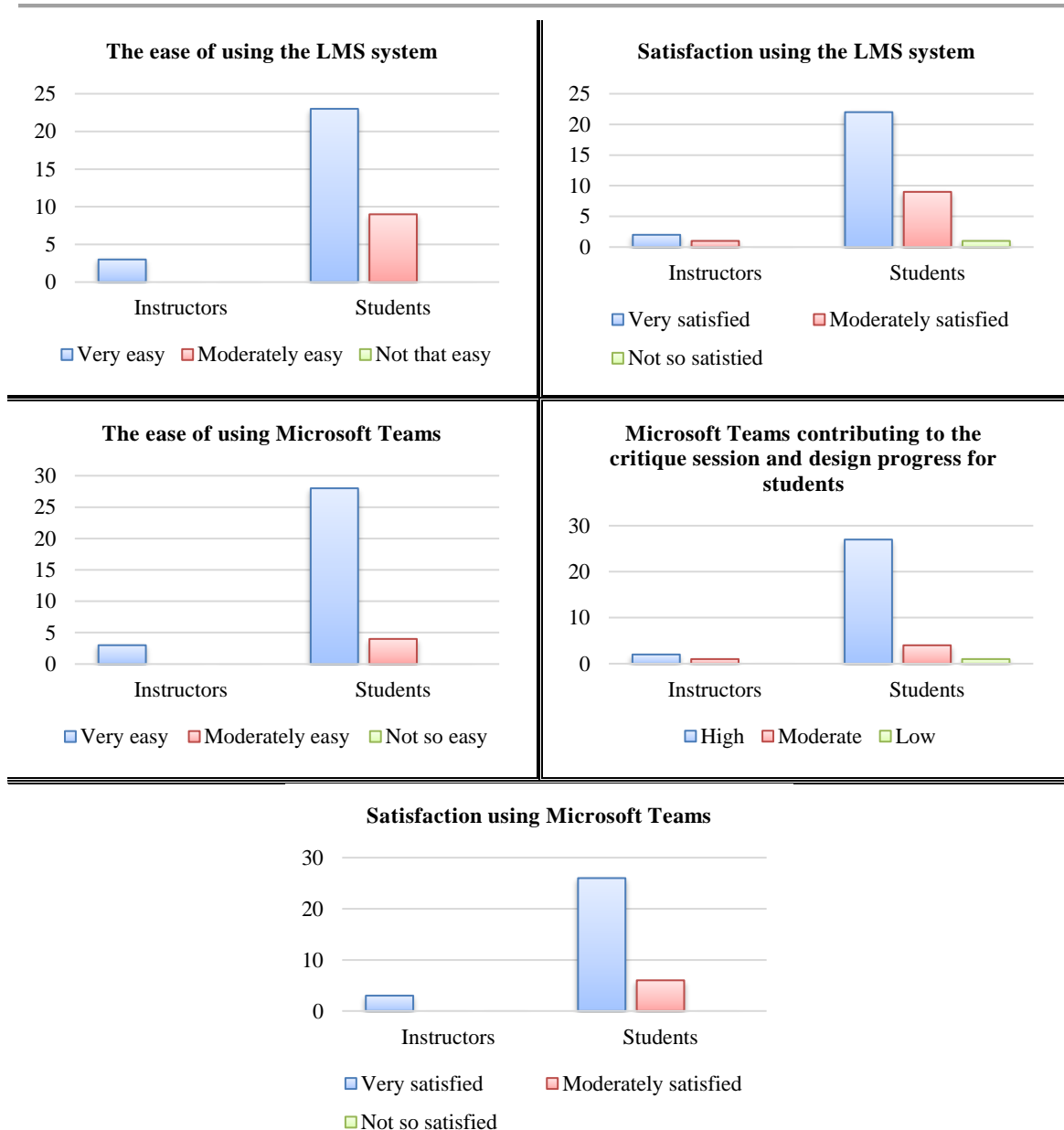
The ease of using the LMS system

Satisfaction using the LMS system

The ease of using Microsoft Teams

Microsoft Teams contributing to the critique session and design progress for students

Satisfaction using Microsoft Teams

Figure 6: The Level of Satisfaction Regarding Online Platforms Used for Delivering the Virtual Design Studio

In the fourth section of the questionnaire, instructors were asked to rate student stress after they were requested to use computer software and their satisfaction with student effort in developing their project using computer software (Figure 7). According to the findings, instructors found students moderately stressful, but they were very happy with the effort they demonstrated to develop their project with computer software. On the other hand, students were asked to rate how helpful computer software were in developing their design project. Findings showed that a high majority of students regarded the use of computer software as an opportunity in developing their design project.

In terms of stress levels, a majority of most student responses supported the answers provided by instructors who rated students stress level as moderate. Likewise, most of the students were also very satisfied with their performance in developing their project using computer software.
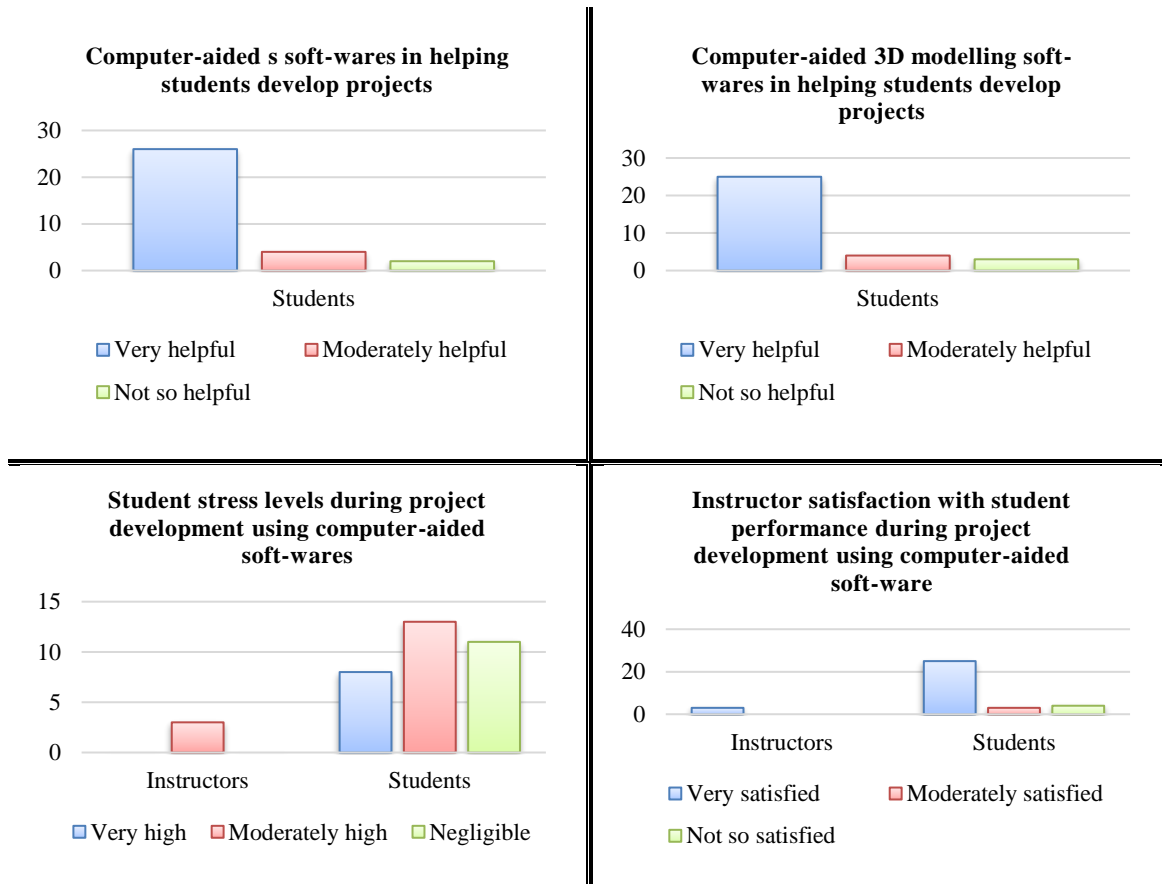
Computer-aided s soft-wares in helping students develop projects

Computer-aided 3D modelling soft-wares in helping students develop projects

Student stress levels during project development using computer-aided soft-wares

Instructor satisfaction with student performance during project development using computer-aided soft-ware

Figure 7: The Level of Satisfaction Regarding the Development of a Design Project Using Computer Software

In the fifth section of the questionnaire, instructors and students were asked to rate the strengths and weaknesses of the online design studio (Figure 8). According to the classification of findings, a majority of the participants in every group believed that the online design studio and use of digital software offered opportunities in improving students' problem-solving skills, archiving and monitoring the progress of the design, improving research skills, re-doing and re-designing ideas to develop their design project and finally satisfaction with the overall progress of their project.

Findings from this section also indicate the variation between the answers of instructors and students was about the increase in 'student interaction and collaboration' and 'student satisfaction with peer interaction'. Instructors had the impression that students had more opportunities to interact and collaborate and they believed that students were satisfied with peer interaction, however, the answers by students showed that they responded negatively on both of these subjects. Hence, students believed that the online design studio presented disadvantages in terms of communication, interaction and collaboration.

In final part of this section, both participant groups were asked to make a choice for future design studios. All of the instructors and most of the students (41%) preferred a combination of online and face-to-face studio. According to the findings from this question, only 22% of students chose to only attend face-to-face education.
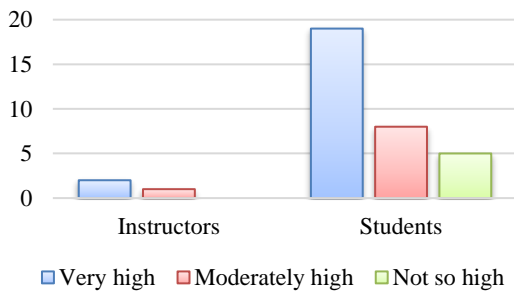
**The contribution of critique sessions in giving a better perspective on similar design problems**

□ Very high   □ Moderately high   □ Not so high
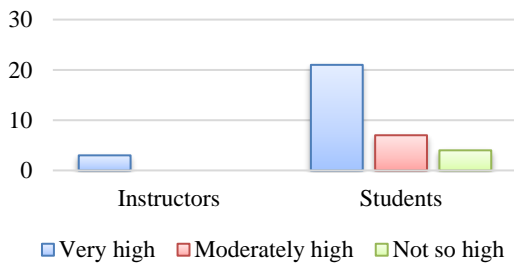
Student discomfort about peers listening to their critiques

□ Very high   □ Moderately high   □ Not so high
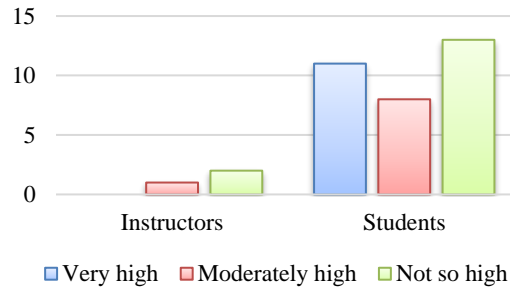
The efficiency of cloud-based archiving rather than weekly print-outs

□ Very high   □ Moderately high   □ Not so high

Student discomfort about instructors being able to monitor and record the whole process

□ Very high   □ Moderately high   □ Not so high
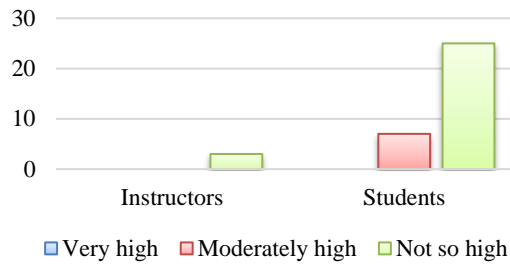
The increase in student trust in assessments during online education

□ Very high   □ Moderately high   □ Not so high
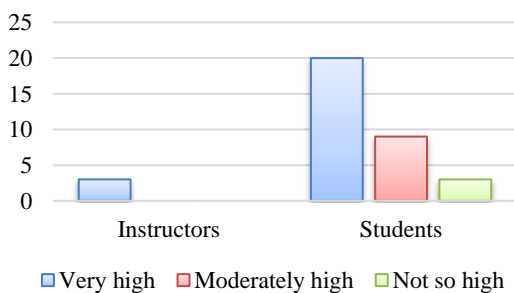
The development of research skills among students during online education

□ Very high   □ Moderately high   □ Not so high

The level of social interaction between students and instructors during online education

The level of student satisfaction with developing their design digitally by re-doing and re-designing

Providing opportunities for student interaction and collaboration

Student satisfaction with peer interaction during online education

Student satisfaction with the design process during online education
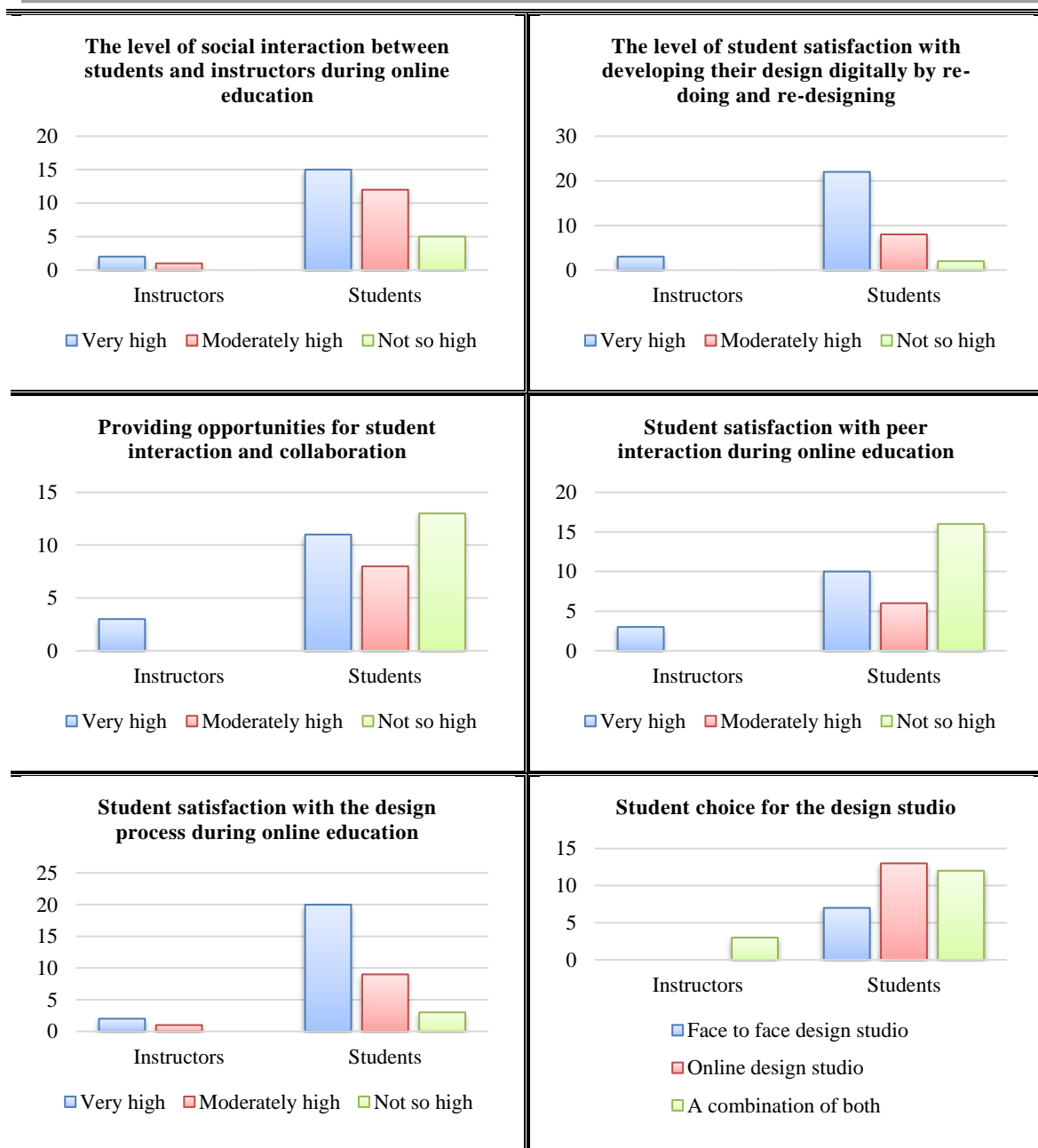
Student choice for the design studio

Figure 8: Risks and Opportunities Presented by The Online Design Studio

In the final section of the questionairres participants evaluated the risks and potentials of the online design studio with their answers to open-ended questions. Subsequently, all instructors claimed that they developed new teaching methodologies during the online design studio. According to the responses, instructors replaced desk critiques with the virtual environment of computer software such as AutoCAD and Sketch-up. Additionally, one of the instructors explained that whenever she gave an example of a technique, detail, or design solution, she immediately Googled it to find the right example and share it with the student in real time. She said she had never done this during desk critiques and therefore, students often failed to fully understand her during the lecture and generally came back with the incorrect or inadequate design proposals.

Most of the students agreed that they improved 'competence in using computer-aided softwares' and 'research skills' during online education (Figure 9). In addition, instructors mentioned observing new positive reactions from students during the online design studio like 'taking notes', 'showing better progress in design development', 'being more cooperative' and 'complain less about grading'. It was interesting to find that responses by some of the students were very similar to observations of the instructors. 'Taking notes' and 'cooperation' were common responses.

New Learning Methodologies		Advantages of Online Design Studio		Disadvantages of Online Design Studio	
Improving Skills in Computer-aided Software	37%	Using Computer-aided Software Instead of Manual Techniques	71%	Lack of Social Interaction	34%
Improving Research Skills	25%	Saving time and money	43%	Technological Problems	31%
None	21%	Staying Home	19%	None	28%
Taking Notes	16%	Taking Notes	16%	Getting Tired from Screen Time	6%
Review Watching Course Recordings	16%	None	16%	Getting Criticised in Front Peers	6%
Improved Collaboration with Peers	16%	Improved Collaboration with Peers	12%		
		Review Watching Course Recordings	6%		
		Improved Online Research Skills	6%		

Figure 9: Student Responses to Open-Ended Questions

The instructors list the following advantages of the online design studio:
1) Digital archiving in an online environment
2) Entering students' working environment (computers)
3) Student engagement in peer critiques
4)   Efficient use of the time before the courses
5)   Alignment of education with the realities of interior design practice

As for the disadvantages of the online studio, instructors complained about the online juries which demanded more commitment. They also complained about having to stare at computer screens for long hours and claimed that online critiques required more energy and time. Finally, instructors complained about student reluctance towards switching on their cameras which prevented instructors from observing their body language. On the other hand, the main complaint of students was the lack of social interaction with peers. They also complained about internet connection problems or computer/software errors. Findings also showed that 31% of the students had no complains and were content.

Discussion and Conclusion

Regardless of the increase online design studios, there is a lack of adequate findings about the potential and feasibility of this change (Broadfoot & Bennett, 2003; Saghafi, Franz & Crowther, 2012; Jones, Lotz & Holden, 2021; Houghton, 2016). The lockdown of 2020 shifted design education to the online platform, and consequently, each university faced different challenges in their own context. Designing studies that address the challenges of the COVID-19 crisis will help improve performance during similar scenarios in the future. This study intended to explore the experience of second grade students and instructors from the Department of Interior Architecture and Environmental Design.

Learning through practice and design is one of the key qualities of design studio education however, problems concerning physical space, hardware specifications and internet connectivity

can reverse the advantages. The results from this study showed that both students and instructors had decent internet access and computers in addition to an efficient working space during the online education. It can be discussed that these advantages contributed to the success of the course. Both instructors and students were satisfied with student performance in developing the design project and believed using computer software enhanced the process of re-doing and re-designing. It could be argued that using computer software in addition to manual techniques can increase the potential of face-to-face design studios.

Collaboration and teamwork are other key qualities of the design studio education. Results from this study showed that while instructors believed students were more cooperative, students complained about the lack of peer cooperation during online education. Consistent with literature, inexperience in using computers, systems and computer-aided software can hinder student cooperation and teamwork (Figure 1). However, results showed that these problems were not the case in the studied design studio. Since none of the instructors mentioned teaching methodologies employed to enhance student cooperation and since this was their first experience in online education, it may be argued that both the instructors and the course content was inadequate in supporting team work and cooperation among students. It is discussed that the design instructors need to demonstrate techniques and skills that will assist students to work individually or in groups through necessary instructions (Park, 2011). Therefore, it seems to be a need to educate instructors on strategies that will promote teamwork and improve interaction among students in online environments during the online design studio.

One-to-one communication with instructors is the third quality of a design studio education. Results showed that good internet access and full online critiques in Microsoft Teams positively supported the design critiques. Although instructors felt tired from the online critiques and increased screen time, both instructors and a majority of the students were still satisfied with the outcome of the online critiques and the design progress of students. Results also showed that most students were not stressed or embarrassed to be criticised in front of peers, so, group critiques could be repeated more frequently in the face-to-face design studios.

Focusing on the progress and process is the last quality of the design studio. Results of the current study showed that online archiving of weekly progress helped instructors and students have a better idea on the design development process. Results also showed that students were more trusting towards the grading and assessment because the entire process is archived online. Consistent with these results, online archiving could be considered as a practice that could continue during face-to-face design studios.

Finally, results showed that most of the instructors and students preferred a combination of online and face-to-face design studio education and, overall, using computers and the internet had a positive effect on both instructors and students. In addition to the discussions above, providing internet access in design studios and including computers in the studio layout could be considered as a starting point in adapting the potential of online design studio to its physical counterpart.

This study does not suggest that online design studios will increase success among second year interior architecture students. Rather, it calls for a re-evaluation of the potentials promised by the digital age in design studios since technology seems to have a lot to offer for design education. It is also important to note that our study has limitations in regards to methodology, which must be addressed in further studies. This study has focused on the experiences of second year students and instructors of the Department of Interior Architecture and Environmental Design and findings in this study exclude second year studios in different universities. It is also important to note that this study did not establish a step-by-step comparison between face-to-face and online design studios, however we believe such investigations are necessary to diversify available literature on online design education. Finally, this study did not consider age, gender, educational background and

cultural and economic status of the participants. However, these variables are also worth considering in future studies.

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