Architecture Design Studio: Learning Transformation from Physical Design Studio to Virtual Design Studio in the Era of COVID-19

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Abstract-When COVID-19 broke out in Wuhan, China in December 2019 and spread quickly throughout the world, and was declared a deadly disease by the World Health Organization in March 2020, the entire world was under strict lockdown. All sectors such as education can operate solely through the Internet by using ICT tools. Building instruction also has turned to a "new traditional - online courses, but with its problems as engineering programs are heavily connected to social studio settings, so the effort is a big challenge. Style Studio relies on face-to-face interaction during a physical studio environment for helpful criticism. During this 'new normal, manual drafting and model creation are replaced by advanced arrangement stages. For showcasing plan ideas, students need to develop their online presence as well as organizational skills as well as software skills. and supplant the physical studio; to degree the level of adaptation of advanced innovations within the online plan studio teaching-learning handle. The research paper focuses on architecture students & faculty challenges & opportunities in online education, two close-ended survey forms on online education by architecture faculty and students were formulated. Moreover, the study contributes to the development of design standards for establishing integrated architectural education following COVID-19. It also discusses the advantages and disadvantages of the Physical Design Studio (PDS), and Virtual Design Studio (VDS). This researcher found the importance of online education post-COVID-19 and in the future.

Keywords: Architecture Design Studio, Physical Design Studio (PDS), Virtual Design Studio (VDS), COVID-19, Architectural Design, Architecture Education

1. INTRODUCTION

With the flare-up of COVID-19 after December 2019 in Wuhan, China where it spread quickly everywhere around the globe, and its consequent announcement as widespread by the globe Health Association on march 2020, the whole world came beneath strict lockdown. All sectors including instruction seem to proceed to work because it was through the online utilizing ICT tools. Like numerous instructive education, structural instruction, as well, turned towards a 'new normal – online classes but with its issues as design program is majorly addicted to the social studio setting, and subsequently, confronting a significant challenge (D. & Hourigan, N, 2013). Design Studio, a central component, depends on face-to-face interaction during a physical studio environment for valuable criticism. Beneath this 'new normal, manual drafting and model making are supplanted with computerized plan stages. during this manner, in expansion to software skills, understudies are required to make their online nearness and organizational aptitudes for showcasing plan thoughts (Akoury, C, 2020). The architecture design studio courses are at the heart of architectural education, where learners demand innovation, create prototypes, and submit design proposals in a collaborative setting. Many have been teaching design studios for the last two years, with this term being one of the most difficult due to COVID-19. They enjoy having a studio space for educating and functioning as architects; it's critical to have a room or office where you can get dirty, pin drawings to the wall, and stack prototypes on the table (R. & Chatterjee, I, 2020). Most designers, I believe, do not view design, instructing, and working from home as a viable option; nevertheless, the disruption caused by COVID-19 necessitates a significant change in the industry. I wish to talk and remark on the shift from educating in a real studio to educating in a virtual distant design studio.

For more than twenty years, the Virtual Design Studio (VDS) has become a component of architectural education (Kvan, T, 1997). The importance and use of various virtual learning tools and methods have sparked a debate in the main physical studio-based education system, which examined the benefits of VDS and concluded that the instruments and communications technologies

present at the moment were insufficient for the task. Nevertheless, in the last twenty years, the globe has seen a massive advancement in how such innovations have become less expensive, more available, and an inseparable part of daily life (Anthony, K. H, 1991). The practicality of holding VDS is no longer in doubt, and the emphasis has turned to ways of implementing and using new digital media. Even though Virtual Digital Studio has been tested and improved in a small number of instances, it has never been implemented worldwide. Virtual Digital Studio as a popular educational approach will reach maturity in the year 2020. Many higher academic institutions have been compelled to shift their instruction into virtual space due to the COVID19 epidemic and its associated control measures. The design firm is the primary educational method for most architectural schools; its transfer to the virtual world presents several problems since it is more than a classroom; it is a lifestyle with an inherent socio-spatial nature (Akoury, C, 2020).

Additionally, today's pupils are born and nurtured in a world of digital interaction; they are natural speakers of the digital media and social space languages. As a result, their first interaction with VDS may be more successful since they can fully use it (Platin B. E, 1997). This newest generation of teenagers may have distinct perceptions of virtual space, making it easier for them to interact in a virtual environment.

Generally, the educational organization is hesitant to make any changes in the architectural criticism procedure. The latent potential of Virtual Design Studio would surface during the brief period when virtuality was forced on design studio education by the COVID19 shutdown (J. W. Cheng, N. & Kvan, T, 1994). This research aims to see whether Virtual Design Studio should be required in a faculty of design during the worldwide COVID-19 epidemic. Virtual Design Studio was formerly thought to be a scientific anomaly, but during the 2020 outbreak, this became the new reality in a short period of a few weeks. This research aims to compare and contrast pupils' encounters with Virtual Design Studio and the physical design studio.

Furthermore, the development of pupils in the program has not yet been well discussed in the literature. As a result, the research will evaluate Virtual Design Studio and Physical Design Studio in connection to the present semester of the students. As a result, many elements of Virtual Design Studio will be explored, including its geographical aspect, knowledge sharing, online equipment, and shared juries. The results will serve as a guide for comparable upcoming developments that may limit geographical participation (Platin B. E, 1997). Additionally, Virtual Design Studio contributes to the multifaceted element of design by allowing cross-cultural and cross-disciplinary cooperation to take place in the virtual environment. The current obligatory Virtual Design Studio experience has established a new standard, a new power structure that many professors had previously dismissed as unrealistic. It should be emphasized that the purpose of this essay is not to promote Virtual Design Studio as a perfect platform for architectural education; instead, it is to demonstrate its positive effects even in an unexpected urgent situation. As a result, the positives and negatives of this event will be examined for reference purposes, and recommendations for changes will be made. The structures that arose during the isolation phase may open up opportunities for prospective design studios that combine Physical Design studios and Virtual Design studios. Additionally, the absence of significant knowledge of digital environment interaction underlines the need to do further research into Virtual Design Studio from a fresh perspective. 'What happens when we shift the design firm into the media of computer-mediated collaborative efforts?' (Kvan, T, 1997) raises the very same issues that we are confronting now on the topic of architectural instruction. What happens to the instructor's position, and how does the pupil's involvement transform?'

1.1 The virtual studio

In the virtual studio, because it was challenging to discuss with fifteen learners, we used Zoom, Concept board, and Google Drive as our innovative studio space. Because it was challenging to discuss with fifteen learners simultaneously, one usually separated the conversations into relatively small teams of three or four (Clark, S. & Maher, M. L, 2005). Because many of the pupils went to other areas of the globe, studio sessions were held at various times throughout the day, including a morning session for foreign learners. They would virtually meet as a whole class for final and mid-progress evaluations.

Participants would submit a PDF for consideration before our design crits, which were held via Zoom. Teachers then connect their screen with the learner

and virtually mark up the design as they spoke, as well as the labeled PDF would be re-uploaded later for reference (Platin B. E, 1997). One of the advantages of this approach is that it creates a very clear permanent copy of all conversations organized by date. At the same time, in a real studio setting, drawings are often strewn around and occasionally lost.

Physical model creation was out of the discussion since pupils were now working remotely, at their dining tables, on sofas, and improvised workstations. This freed up time for the students to concentrate on other kinds of media, such as video and animated GIFs, and we smoothly transitioned to other types of communications for presentations.

Rather than the traditional boards tacked up in real space, studio presentations are increasingly becoming PDF presentation slides or videos. Students had to be more accurate with their oral stories and picture transitions as a result of this. From the presenter's perspective, Zoom provides a lot of control. In contrast, the presenter talks, they can see precisely what the assessors and their students are staring at, creating a period of undivided concentration (Dutton, T. A,1987). Guest reviewers would frequently extend the conversation after they talked. The recordings of the textual conversations, links, and citations they gave could then be saved and preserved. The option to capture presentations on video is also advantageous; how many instances have you missed what somebody has mentioned during your finalization? The learners may simply view the pre-recorded lectures again later (Schnabel, M. A, 2011). As unpleasant as it may seem, this is a wonderful method to observe yourself in the current moment and identify places where you may develop. The concept board was an amazing finding that quickly evolved into an extraordinary instrument for replicating a digital pin-up, allowing all pupils to collaborate in the very same digital area. We were able to conduct quiet inspections in which we examined one another's work and wrote virtual remarks, suggestions, and mark-ups. Several learners remarked on how wonderful it was to see everybody's effort in a common area together after using the Concept board to help restore a feeling of the community to the distant live session. A concept board is a device that teachers want to use in their studio classes in the coming period. Regardless if you have a real studio space, creating a common digital pin-up that you can return to during the year

but not have to think about mounting your stuff on the board is beneficial.

2. TRANSITION FROM PHYSICAL TO VIRTUAL STUDIO

With the flare-up of COVID-19 after December 2019 in Wuhan, China where it spread quickly everywhere around the globe, and its ensuing affirmation as widespread by the globe health association, the entire world came beneath strict lockdown. All sectors including instruction may proceed to work because it was through the net utilizing ict tools.

Virtual design studio, in particular, imitated the way conventional design studio was structured in the initial periods (babu, s. V. Et al, 2020). In reality, a virtual design studio enables us to accomplish a lot of what we do in face-to-face architectural training. The education goals are the same in both virtual design studios and physical design studios, but the settings are unique. Email, video conferencing, and collaborative whiteboards, for instance, may be utilized to promote regionally distant student-teacher and student-student discussions in online learning settings since communication and collaboration are essential components of the design studio. The usage of these communication channels allows for an increase in the pace with which knowledge is sent. Yes, information and communication technology has tremendous promise for instructional design, according to yee, however achieving these advantages is not simple, to this expert. Strong technical assistance and an eager reaction from design students define a successful virtual design studio (Schnabel, m. A, 2011). When it comes to student sensitivity, In contrast, the idea of the digital generation is commonly used, which tends to lead to the presumption that 'tech-savvy' learners would adopt online learning, architecture learners favor to research layout in a face-to-face ecosystem when given the option of a completely online and offline design studio.

Furthermore, (kvan, t, 1997) found a major stumbling block that asks students to work with individuals they don't know and frequently don't trust. Students see numerous benefits of physical design studio over virtual design studio, particularly when it comes to design interaction, like facial expression and the capacity to react quickly. Pupils prefer to discuss innovative construction options in person with their instructor(s) and peers, who ask

questions, demonstrate hands-on answers to potential issues, provide comments, and encourage contemplation. Being fully present and receiving quick feedback, as per pupils, also influences their desire and concentration in the design studio (Clark, s. & Maher, m. L, 2005).

The instructor is in charge of the teaching-learning activities in both the physical design studio and virtual design studio. Still, in the virtual design studio, an additional job is required, notably supporting and managing online interaction. Together with modern innovation and early enthusiasm, virtual design studios may cause dissatisfaction when teachers' and pupils' aspirations exceed technical limitations (babu, s. V. Et al, 2020). Increasing technology alone would not improve student results; creating completely online architecture and design learning activities necessitates a significant amount of work on the part of the teacher, who is not necessarily well equipped for the job. When faced with new technology tools and instructional techniques, most teachers and students need time to develop and adjust.

The studio and criticism sessions are at the core of architectural education; they are a socio-spatial structure that allows for both imagination and reason at the same time. While it has been critiqued and characterized as maybe not the best teaching technique, it is still the most important ritual in the process to become a designer. According to some research, shared criticism meetings are the primary cause of discontent among design students, as well as the process requires new adaptive methods. Others believe that having one personal hard work critiqued next to colleagues is a right of initiation for all builders (Clark, s. & Maher, m. L, 2005). The primary educational purpose of the design company is the practice of witnessing and participating in it. The idea is termed, a "reflective practicum," which is based on the principles of "learning by doing" and "reflection in action." the ds, which serves as the practicum, is inherently reflective and promotes bilateral conversation. This conversation isn't only between the instructor and the learner; it's part of a larger social framework of group work known as the classroom culture.

The discussion around the shift to virtual design studio focuses on preserving the good aspects of physical design studio while also modifying the educational structure to take advantage of the virtual environment's particular possibilities. The virtual design studio has shown great promise to foster a more interconnected, diverse, and multidisciplinary educational atmosphere (kvan, t, 1997). The observed increase in pupils' ability to do independent research is a valuable tool in resolving the mentioned flaws. In this view, a virtual design studio's lack of proximal limitation is both a blessing and a curse. It may introduce new characteristics into architectural teaching if used to enhance social and cultural cooperation and study. On the other side, a lack of spatial configuration may be a disadvantage if it restricts the studio environment and unstructured, internal education amongst pupils (lewis, r. K, 2013).

In architecture, the visual design studio has been proven to offer educational benefits. Bucknell emphasizes the advantages of a visual design studio as a tool for team management. Expands the studio's scope, allowing for additional opportunities for cooperation across schools and disciplines. Web2.0's communication media have turned active cooperative interaction in virtual space into a strong educational instrument still in its infancy. Additionally, (kvan, t, 1997) claims that since the visual design studio is more procedure-focused, both instructional methods and assessment methods must be adjusted in this respect.

Modern design training increasingly emphasizes the architecture's technical, technological, and structural elements, sometimes at the cost of its cultural and social dimensions. As a result, a virtual design studio, with the computer monitor as its primary means of contact, may isolate such values even more. As a result, one of the virtual design studio's major drawbacks could be its absence of involvement with the growth of pupils' social interactions and background information (lewis, r. K, 2013). The physical design studio seems to be more effective at knowledge sharing via a hierarchical social phenomenon. At the same time, the virtual design studio has more promise in terms of research, debate, and self-reliance. Without a doubt, architecture training is about building a social personality, a communicative personality with the ability to notice and create peer relationships, in addition to the problem - solving abilities and architectural goods (kvan, t, 2001). Dutton refers to this as the "hidden curriculum," which is focused on socio-spatial interaction. An invisible – but essential – element of design teaching is the character of unstructured background education from colleagues. 'the unstructured, socially-oriented peer contact that defines the studio is complementary to and very

different from, the education gained via instructor contact,' (lewis, r. K, 2013)write. The physical layout space determines the underlying education that takes place in the design studio. The studio method is intended to enforce a tacit education method that enables architecture learners to understand, interact, and cooperate, resulting in the development of key competencies for entering the workforce.

However, there is still debate over the viability of knowledge sharing in the virtual design studio. Virtual design studios' social structure has been demonstrated to be influenced by the nature of developing social media. However, a virtual design studio environment is approaching a physical design studio, as new technologies have enabled one-to-many and real many-to-many communications, surpassing what was thought to be a virtual design studio's primary constraint in its early experiment. Coming to a school far away from family is a character-building journey for many pupils, allowing them to acquire autonomy and establish new personal networks (lewis, r. K, 2013). The absence of a feeling of location may be remedied in two different ways: first, by combining a virtual design studio with a physical design studio, and secondly, by future virtual reality advancements. According to (Clark, s. & Maher, m. L, 2005) certain changes, such as the visual presence of avatars rather than simply names, might enhance students' feeling of belonging in the virtual design studio.

3. ONLINE EDUCATION BEFORE COVID-19 AND DURING COVID-19

Before COVID-19, some educational institutes were adopting online education in blended mode. But during COVID-19, During the episode of COVID-19 after December 2019 in Wuhan, China where it spread quickly all over the world, and its subsequent declaration as widespread by the World Wellbeing Association on 2020, the entire world came under strict lockdown. All divisions counting instruction might proceed to function as it were through the web utilizing ICT instruments. Like numerous instructive institutions, architectural instruction, as well, turned towards a 'new normal – online classes, all institutes, and education platforms

have decided on online education to overcome the loss of students. Online education helped architectural students to achieve their goals differently. And therefore, faculty members have to protect their students in education.

4. RESEARCH METHODOLOGY

The main aim of this survey was to find the importance of online education, challenges & opportunities for architecture students and faculty in the era of COVID - 19. The study was developed by two different surveys of teaching and learning of architecture colleges. The surveys were done online in form of a questionnaire and were distributed to students and faculty of architecture colleges. Statistical analysis was prepared. The response received from the student is 80 students and 20 faculty members of different colleges responded. Both questionnaires are quantitative-based and only the questionnaire for faculty members consists of two qualitative questions. So, SPSS analysis is used to analyze both the questionnaire.

4.1 participants

In the study, 18 faculty members and 77 students took part in these surveys. All faculty members and students are at both undergraduate levels. All the participants were from the architecture department of universities and colleges in north India. The faculty members range from 25 to 70 years old. 4 faculty members teach in a university, 11 in colleges, and 3 in training institutes. 6 of the participants were professors, 5 associate professors, and 9 assistant professors. Students - a total of 77 students of architecture college took part in this survey. Some are using computers; some are laptops but a maximum of students are using mobiles for their online education.

4.2 online teaching experience

For every teaching person, an online teaching experience was a different experience. Some had positive and some had negative. More percentage indicated that teachers had flexibility for this. Because it could decide according to time and place. (See figure 1).

Figure 1. Faculty response on online teaching experience.

4.3 Online Teaching Experience Before COVID-19 And During COVID-19

Before COVID-19, 60% of teachers had experience with online teaching and the other 40% were not aware of any experience with online teaching. Different online aids have been used in online teaching like zoom, Google meets, and Microsoft Teams. Faculty members have done more efforts in online teaching than in face-to-face interaction. The participants had different opinions and experiences with online education. (See Figure 2).
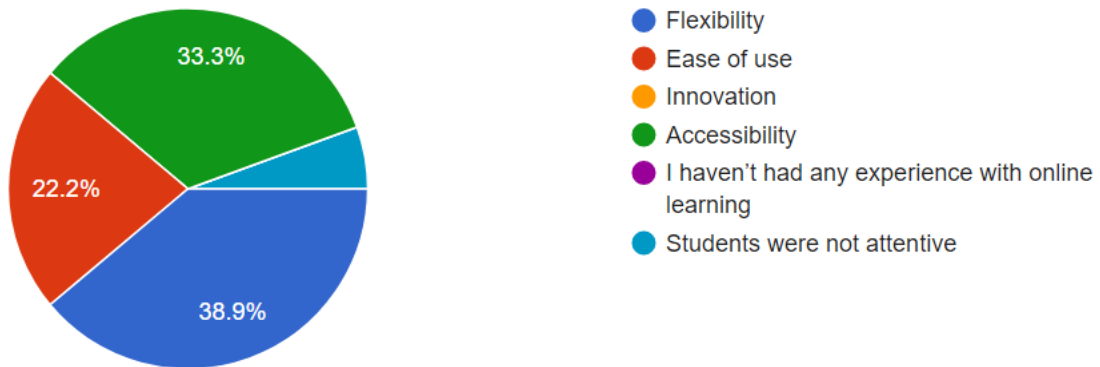

Figure 2. Faculty response has surprised you about online learning

4.4 Online Teaching Experience According to Age

25-70 aged people participated in architecture online education. Faculty members teach in universities, colleges, and training institutes. In this survey some were professors, some were associate professors, some were assistant professors and others were training teachers. The maximum Percentage of 42 aged persons was calculated. (See Figure 3)
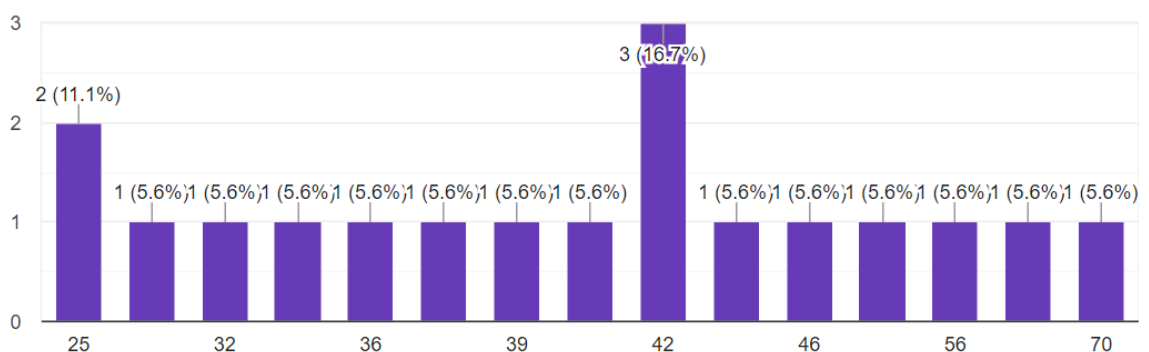
18 responses

Figure 3. The age factor in online education.

4.5 Satisfaction of Faculty Members Toward Students

When architecture surveys were done. Faculty members had different experiences Positive and negatives. The positive experience made them satisfied that students attended their classes properly and did their assignments from time to time.
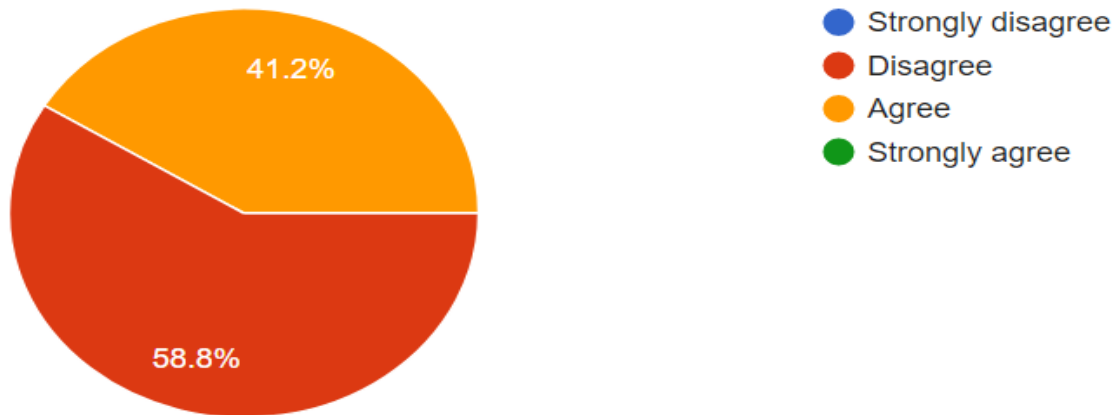

Figure 4. Faculty are satisfied with the student-teacher interaction during online teaching & learning.

4.6 The Effectiveness of Online Teaching and Learning During the COVID-19 Pandemic

First, the study examined the effectiveness of online learning during COVID-19 (see Figure 5). They said it is moderately effective.

Figure 5. Effectiveness of online teaching and learning.

4.7 Faculty Members Helpful While Teaching Online

Question asked architecture Students about their learning experience. Which depended upon faculty members' teaching help. Architecture students agreed that online teaching was very helpful for us. Because it reduced our education loss during COVID-19 (see Figure 5).
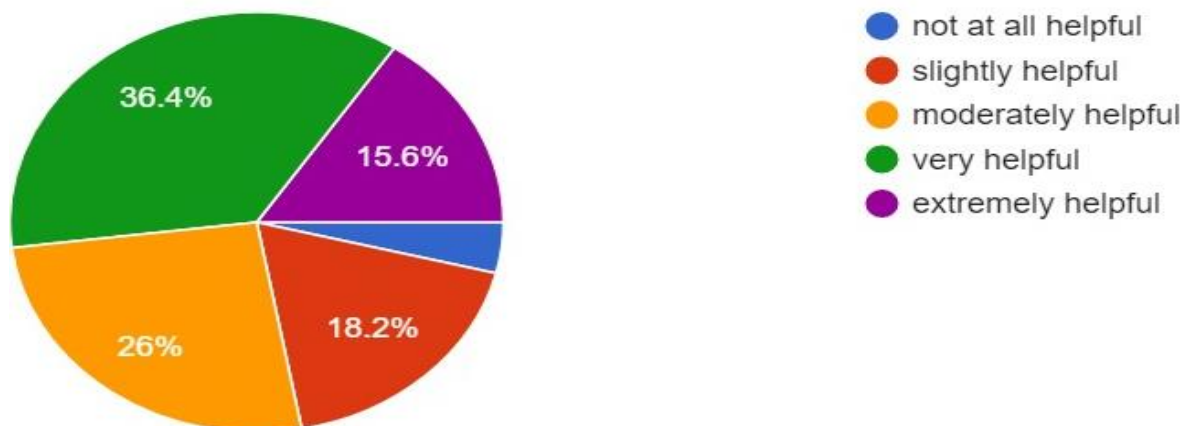

Figure 6. percentage of faculty members helpful while teaching online

4.8 How Much Agree with Architecture Class/Studio Online Class

Legend:
- Meeting regularly in a classroom setting, rather than completing coursework online
- Completing coursework online, rather than meeting regularly in a classroom setting
- A combination of meeting in a classroom setting and completing coursework online
- other

Figure 7. Preferring the architecture class/studio format.

4.9 Overall Opinion on Online Architecture Education

In this survey, all architecture students attended online learning. Online education reduced their education loss during COVID-19. More than 50% of students would prefer online architecture education in the future.
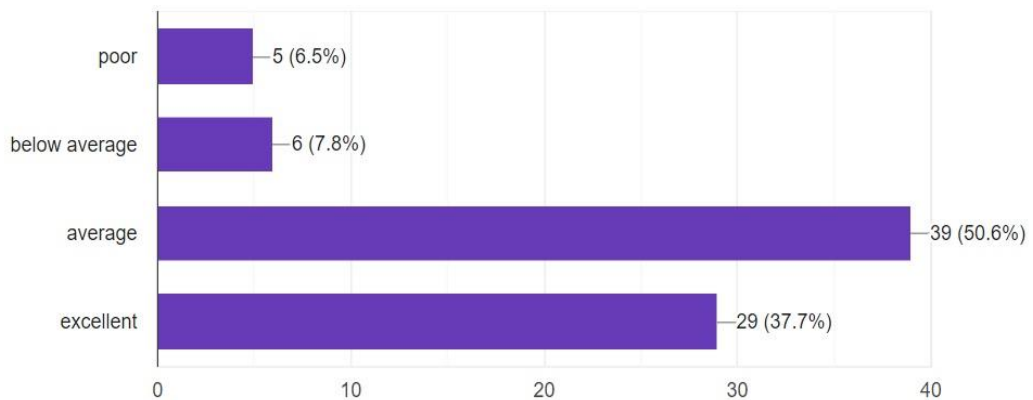
77 responses

Figure 7. overall opinion on online architecture education

5. REFORM IN ARCHITECTURE EDUCATION AFTER POST COVID-19

As a result, distance learning systems have gained more attention and appreciation, teachers' roles have become better understood, and teachers have had the opportunity to receive technical development related to distance learning; international partnerships have been established in the technology field.

The existing gap in distance learning implementation on a national and international level, the variation in the academic attainment of students depending on whether educational institutions and countries can provide distance learning, and the negative impact on the quality of life for students, teachers, and parents during the lockdown.

Advantages of Online Design Studio
➢ Time-Saving
➢ Improved Accessibility
➢ Refine Digital Skills
➢ Reasonable
➢ Instant Examination
➢ Demonstrated Self-Motivation
➢ A Broader, Global Perspective
➢ Accessibility Of Time and Place

Online education, often known as online virtual classrooms, is more versatile since students are not bound to a particular class and may learn whenever and wherever they choose.

Disadvantages of Online Design Studio
➢ Inability To Focus on Screens

➤ Hand Sketching missing
➤ Lacks One to One teaching
➤ Additional Training
➤ The dearth of Societal and Emotional Skills
➤ Even more intense requirement for self-direction.
➤ E-Learning can cause social Isolation.

6. DEVELOPMENT OF DESIGN STANDARDS

As arrangement to the problems attended over, some of the analyst researchers' analysts have suggested some best ones. To list the identical – for viable communication in virtual studio environments, one might utilize miro, an elective drawing and conceptualizing malicious program. To avoid negligence amid exams, open-book tests or project-based assessment methods are also embraced. Essentially, virtual field trips may progress understudy engagement and they are overall intrigued. Too, to preserve social networks amid the amount of social distancing, group assignments and studio work area surveys can fortify peer-to-peer understudy interaction. Amongst the advanced innovations, Expanded Substances (XR) like computer games (VR), Augmented Reality (AR), and Mixed Reality (MR), may be coordinated into advanced learning to relinquish understudies with upgraded involvement within the education of both hypotheses and studio subjects.

An analysis of online teaching and learning experience of architecture students and faculty members on behalf of their effectiveness of learning and teaching, advantages, and disadvantages. Students faced difficulties when attending online classes. They highlighted the challenges during COVID-19, less internet access, lack of direct contact with faculty, time management, and not proper communication with faculty members. Faculty members agreed that online education has become a major part of their studies during COVID-19. Moreover, online courses helped them to achieve the learning outcomes of their academic syllabi. This finding shows that students gave less attention to classes and improve their knowledge.

7. CONCLUSION

The study shows the challenges and opportunities for architecture students and faculty members. Online education is effective like physical classes. The students faced many challenges due to less

interaction with their tutors. All online education platforms motivate students for online education to achieve their goals for education. Government and other authorities should do more efforts to acknowledge all service companies to improve their products and services so that every student can afford them. The educational centers should provide all required materials and teaching aids for online education that helps faculty members with their best teaching. A student needs more synchronous classes, where the experts should have guided their students properly. Pupils' strong desire for a mixed studio that combines physical and digital workshops, one that is more relevant to the essence of today's society, with the digital environment linked with all areas of daily life. When virtual design studios' maximum capabilities are realized, including open multicultural, interdisciplinary connections that go beyond the constraints of conventional physical design studios, it may be very effective. As per Rodriguez, combining physical design studio and virtual design studio in architectural education may provide the best of all worlds. Demonstrates a successful virtual design studio effort, demonstrating the value of blended techniques in highlighting the capability of both virtual design studio and physical design studio. Nonetheless, it appears that the virtual design studio may need some spatial expertise during the early phases of the design process when it comes to site visits. This element was not considered in this instance since the first two weeks of the term were done in the actual studio. It was recommended for future research. The architectural studio juries and criticism workshops are fundamentally student-centered activities, even though this characteristic is frequently buried in the hierarchical assumptions that exist between the instructor and the pupil. Students have greater influence over their designs using virtual design studios, as demonstrated above since they can become more precise about which design elements need to be highlighted (near east university, 2020). The virtual design studio has a distinct hierarchical system than the physical design studio, bringing it nearer to what it is intended to be: a student-centered learning experience that honors learners' developing creative abilities as they work toward becoming an architect.

Virtual design studio, it might be claimed that the teacher's position in virtual design studio has to alter. Instead of being the primary influencer in the procedure, the teacher in the virtual design

studio becomes more of a facilitator. On the other side, to assist the design process, the future virtual design studio teacher must be well-versed in a range of digital media. To handle the significance of underlying knowledge sharing, the virtual environment itself must become more participatory. The virtual design studio was previously restricted by technical problems, including connection speed, cost and accessibility, constraints of cad programs, and constraints of digital innovation for residential and recording architecture studio sessions, although it is a powerful possibility. However, with the rapid advancement of digital innovation, many of these concerns have been alleviated. As a result, it's necessary to design recent research models for a virtual design studio that aren't constrained by technological constraints but rather by a conventional system resistant to change.

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