The Paradigm Shift from Traditional to Blended Learning Methodology in Architecture Education

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ABSTRACT

The Covid-19 pandemic has profoundly impacted the education sector, forcing institutions to explore alternative teaching methodologies. This research article examines the paradigm shift from traditional classroom-based face-to-face learning to blended learning in architecture education. A questionnaire was designed and administered to collect data from architecture students and educators in India, with a focus on their experiences and perceptions of blended learning. The results of the study indicate a significant rise in the adoption of blended learning in the postCovid-19 period. The respondents reported a favourable attitude towards blended learning, recognizing its potential to enhance learning outcomes and improve flexibility. The findings highlight the advantages of incorporating online platforms, multimedia resources, and virtual collaboration tools into architectural education. The findings indicate a significant increase in usage across various categories, with the highest increases observed in learning management systems, video conferencing platforms, online discussion sessions, live online lectures, online quizzes or assignment platforms, and online jury sessions. The research supports the idea that blended learning offers a promising approach to meet the evolving needs of architecture education in India. The flexibility and adaptability of blended learning methods provide opportunities for students to engage in self-paced learning, access a wide range of learning materials, and collaborate with peers and professionals beyond physical boundaries. This research contributes to the growing body of knowledge on the use of blended learning in architecture education, specifically in the context of India. The findings provide valuable insights for educators and policymakers seeking to integrate technology into the curriculum effectively. By embracing blended learning, architecture institutions can prepare students for the digital era while maintaining the fundamental principles of design education.

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1. Introduction

The Covid-19 pandemic has disrupted traditional educational practices worldwide, prompting a rapid transition to online and blended learning methodologies [1]–[3]. This paradigm shift has been particularly significant in the field of architecture education, where hands-on studio work and collaborative design processes have long been integral to the learning experience [4]–[6]. In response to the challenges posed by the pandemic, educators and institutions have embraced blended learning as a viable alternative, combining face-to-face instruction with online components [4], [7]. This research article explores the transition from traditional to blended learning in architecture education, focusing on the postCovid-19 period in India. By examining the attitudes and experiences of students and educators, this study sheds light on the surge in blended learning adoption and its potential to reshape architecture education practices in India.

The Covid-19 pandemic has had a profound impact on education globally, necessitating a rapid shift from traditional classroom-based learning to remote learning modalities. Researchers have extensively explored the challenges and opportunities presented by the pandemic in the educational context [8]. Studies have shown that the sudden transition to online learning has prompted educators to reconsider traditional teaching methodologies and explore alternative approaches, such as blended learning [9]–[12]. This shift has been particularly relevant in architecture education, where practical studio work and collaborative design processes are fundamental to the learning experience [2], [12].

Blended learning, which combines face-to-face instruction with online learning components [13], has gained traction in higher education even before the Covid-19 pandemic [14]–[18]. Researchers have highlighted the benefits of blended learning, including increased flexibility, improved student engagement, and enhanced learning outcomes [19]–[21]. Blended learning environments provide opportunities for students to access resources and engage in interactive activities outside of the classroom [22], [23]. The integration of online platforms, multimedia resources, artificial intelligence (AI) and virtual collaboration tools in blended learning can facilitate personalized learning experiences and foster critical thinking skills [24]–[27].

The field of architecture education has traditionally relied heavily on hands-on studio work, face-to-face interactions, and physical models [28]. However, the Covid-19 pandemic has disrupted these traditional practices, leading to the exploration of alternative methodologies. Blended learning has emerged as a promising approach to bridge the gap between the physical and digital realms in architecture education. Studies have shown that incorporating online components into architecture education can provide students with access to a diverse range of resources, promote independent learning, and foster collaborative problem-solving skills [29], [30]. Blended learning can also enhance students' technical skills by integrating software training and virtual design studios [31], [32].

The postCovid-19 period has witnessed a significant surge in the adoption of blended learning across the various educational disciplines. Institutions and educators have recognized the potential of blended learning to address the challenges posed by the pandemic and provide a flexible and adaptable learning environment. Studies have reported positive student perceptions and improved learning outcomes in blended learning settings [4], [33]–[35]. The adoption of educational technology and online platforms has become essential in facilitating remote learning and supporting students' engagement and interaction.

In the Indian context, the transition to blended learning in the architecture education has gained momentum in the postCovid-19 period. Educators and institutions have leveraged technology to deliver architectural education through a combination of online and offline components. Studies have shown that blended learning approaches in Indian architecture education have the potential to

overcome spatial limitations, increase accessibility to resources, and promote collaboration beyond geographical boundaries [7]. The Indian government has also emphasized the integration of technology in education through initiatives like the National Education Policy 2020, which advocates for the use of the online and blended learning methods [36], [37].

The studies highlight the transformative potential of the blended learning in the architecture education, particularly in the context of the postCovid-19 period. The adoption of the blended learning methodologies has emerged as a response to the challenges posed by the pandemic and offers opportunities to enhance student engagement, access to resources, and collaborative learning.

The use of the technology for the teaching and learning is a growing trend in many fields of study and has become more popular due to the increased availability and adaptability of digital tools. The blended learning approach combines traditional face-to-face learning methods with online learning and assessment. The traditional learning methods rely solely on instructor-led class sessions and associated readings, lectures, and activities. Some of the advantages and limitations of blended learning and traditional learning are presented in the Table 1.

Table 1
Advantages and limitations of blended learning and traditional learning [14], [38]–[40]

BLENDED LEARNING METHOD	TRADITIONAL LEARNING METHOD
ADVANTAGES	
Improved student engagement and motivation: With a blended learning approach, instructors are able to create a more engaging and interactive learning environment by incorporating multiple modalities such as video, audio, and text. Students can also participate in discussions and activities online, which allows for more collaboration and interaction.	**Facilitates one-on-one instructions:** Traditional learning provides the opportunity for the instructor to give one-on-one direct instructions which allows for personalized guidance and support.
Enhanced learning outcomes: Blended learning can be used to support more problem-based and inquiry-based learning strategies, which can lead to greater comprehension and retention of subject material.	**Opportunities for interaction:** Learning in a traditional setting provides greater access to human interaction and can help build classroom community.
Personalized learning: Blended learning offers the opportunity for students to tailor their learning paths based on their individual needs, interests, and goals.	**Established curriculum:** Traditional learning offers instructors the opportunity to adhere to a more specific syllabus or curriculum that can help with the assessment and evaluation of student progress.
Increased flexibility: With blended learning, there is greater flexibility around learning pace, location, and contact time. This can be particularly beneficial for working adults and those with transportation or family commitments.	
LIMITATIONS	
Accessibility: Many students may not have access to the necessary technology such as computers, reliable internet, and mobile devices.	**Time constraints:** Traditional learning can be restrictive in terms of meeting deadlines and completing assignments. This can be particularly difficult for working adults or those with independent learning commitments.
Cost: Purchasing and maintaining the necessary software and hardware can incur substantial costs.	**Lack of flexibility:** In a traditional learning environment, instructors may not be able to make wholesale adjustments to course content if there are changes in enrollment or modifications to administrative guidelines.
Technological difficulties: There is a potential for technical difficulties to arise such as difficulty in connecting or understanding the correct method for uploading assignments.	**Efficiency:** Traditional learning may not be as efficient or effective in terms of allocating teaching and learning resources, as well as employees' time.

2. Research Methodology

This section explains the procedural steps followed by the researcher to collect and analyze the data for the study. This research uses quantitative methods to achieve its objectives. A questionnaire was prepared which contains 3 sections to collect responses from educators and students of architecture about their opinion towards blended learning approach in architecture education. The questionnaire was developed by using the web-based Google Forms platform and shared with architects and students of architecture by using WhatsApp and Gmail as the primary source of distribution. The total number of responses received was 413. Section-1 of the questionnaire contains 6 questions. The personal details of the respondents were collected in Q.1 to Q.5. In Q.6 of Section-1, the respondents were asked to specify whether they are familiar about the blended learning approach in architectural education or not. If the respondents answered "YES", they were directed to proceed to Section-2 and then to Section-3. If the respondents answered "NO", they were directed to proceed to Section-3.

Section-2 consists of 7 questions for the respondents who replied "YES" for the Q.6 of Section-1. This section intends to assess the effectiveness of the blended learning approach in comparison to the traditional teaching learning approach in architectural education at graduate level in India.

Section-3 consists of 2 questions for all the respondents. Q.1 contains 10 parts while Q.2 was an open-ended question for comments/suggestions. This section intends to identify the changes in terms of using online platforms, tools, and techniques from preCovid-19 to postCovid-19 period. The details of the questionnaire are given in the form of a flow chart (Figure 1).
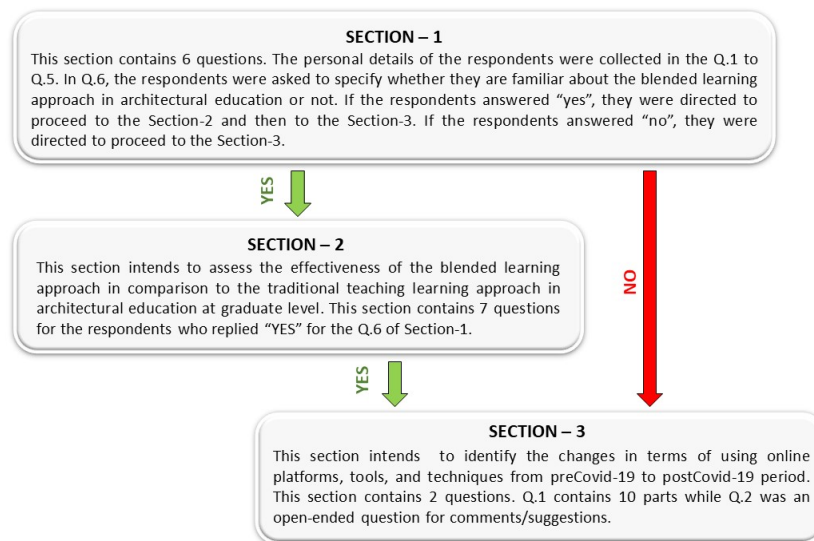
Fig. 1. Questionnaire's flow diagram

This para explains the procedural steps followed by the researcher to collect and analyze the data for the study. This research uses quantitative methods to achieve its objectives. The total number of architects and students of architecture in India was 2 lakhs approximately according to the COA website accessed on September 2021. The required sample size was 385 calculated by several online sample size calculators [41] and cross-checked manually by using Eq. (1).

$$S = \frac{z^2 x p(1-p)}{e^2} \Bigg/ 1 + \left(\frac{z^2 x p(1-p)}{e^2 N} \right) \qquad (1)$$

where,

S = sample size required

z = z-score is the number of standard deviations a given proportion is away from the mean which is 1.96 for a 95% of confidence level.

p = standard deviation

e = margin of error (percentage in decimal form)

N = population size

3. Results and Discussion

The first procedural step is the validation of sample size. The required minimum sample size is calculated to be 385 for the 2 lakh of architects and students of architecture in India. The sample size used in this study is 413 which is more than the required minimum sample size and thus the response data analysis presented in this study is valid and reliable [41].

3.1. Section-1

Section-1 of the questionnaire containing 6 questions deals with the personal profiles of respondents. The consolidated data of Section-1 of this study are presented in Table 2.

Table 2
The consolidated data from Section-1 of the questionnaire

S. No.	Question	Responses					
Q.1	Name (Optional)	Not to be disclosed					
Q.2	Gender	Male – 195 (47.2%)		Female – 218 (52.8%)		Total – 413 (100%)	
Q.3	College/University/Institution	Respondents were participated from 52 colleges/universities in India.					
Q.4	Qualification	Pursuing Bachelor's Degree – 134 (32.4%)		Bachelor's Degree – 97 (23.5%)	Master's Degree – 163 (39.5%)		Ph.D. – 19 (4.6%)
Q.5	Designation	Student – 217 (52.5%)	Visiting/Guest Faculty – 47 (11.5%)	Assistant Professor – 84 (20.3%)	Associate Professor – 39 (9.4%)		Professor – 26 (6.3%)
Q.6	Are you familiar about the blended learning approach in architectural education?	Yes – 286 (69.3%)			No – 127 (30.7%)		
		Total number of respondents – 413					
		Note: If the respondents answered "yes" they were directed to proceed Section – 1 and then Section – 2 of the questionnaire. If the respondents answered "no" they were directed to proceed Section – 2 of the questionnaire directly.					

The total number of respondents who participated in this study was 413 with a gender ratio of about 1:1 (Q.2 of Section-1). Respondents participated from 52 colleges/universities of India (Q.3 of Section-1).

The status of the academic qualifications of the respondents was asked in Q.4 of Section-1. The number of the respondents follows the order: the group of the respondents (39.5%) who have

M.Arch. degree > the group of the respondents (32.4%) who are pursuing their graduate degree at present > the group of the respondents (23.5%) who have B.Arch. degree > the group of the respondents (4.6%) who have acquired their doctorate.

The status of the designation of the respondents was asked in Q.5 of Section-1. The number of the respondents follows the order: the group of the respondents (52.5%) who are students > the group of the respondents (20.3%) who are assistant professors > the group of the respondents (11.5%) who are visiting/guest faculty > the group of the respondents (9.4%) who are associate professors > the group of the respondents (6.3%) who are professors. The total number of respondents who participated in this study was 413 with a teacher:student ratio of about 1:1. Thus, this study may be treated as a teacher:student average study.

The questionnaire analysis of Q.6 of Section-1 "are you familiar about the blended learning approach in architectural education?" given in Figure 2 was designed to know the real status of current educators and students of architecture regarding their experiences and exposure to the blended learning approach. In other words, this question (Q. 6 of Section-1) was specifically asked to detect the extent of respondents that they have any idea of blended learning approach or not.
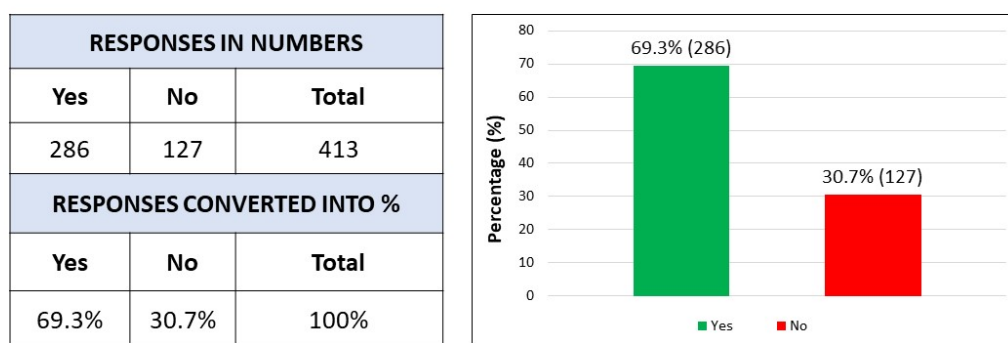

RESPONSES IN NUMBERS		
Yes	No	Total
286	127	413
RESPONSES CONVERTED INTO %		
Yes	No	Total
69.3%	30.7%	100%

Fig. 2. The questionnaire analysis of Q.6 of Section-1

According to the analysis, out of the total 413 respondents, 286 of them, representing 69.3% of the total, responded "YES" indicating that they are familiar with the blended learning approach in architectural education. This suggests that a fair majority of the respondents have knowledge and exposure to blended learning. They are likely aware of the concept, principles, and methods associated with blended learning in the context of architectural education. This level of familiarity among respondents indicates that blended learning is not an unfamiliar or unknown concept within the architecture education community.

On the other hand, 127 respondents, accounting for 30.7% of the total, responded "NO" indicating that they are not familiar with the blended learning approach in architectural education. This implies that there is a portion of respondents who lack knowledge or understanding of blended learning. These individuals may not have been exposed to or have limited exposure to the concept and its application in architectural education.

3.2. Section-2

From the total number of 413 respondents, the respondents who answered "YES" against Q.6 of Section-1 were 286 (69.3%). They were directed to proceed to Section-2 which consists 7 questions and then to the Section-3 of the questionnaire. This section intends to assess the effectiveness of the blended learning approach in comparison to the traditional teaching learning approach in architectural education at graduate level in India.

3.2.1. Analysis of Q.1

The analysis provided under is based on the responses to the Q.1 in the Section-2 of the questionnaire. The question was "when did your institution start the use of the blended learning approach in architectural education at graduate level?". The responses are presented in the form of table and bar graph, showing the different options and the corresponding number of responses and percentages (Figure 3).
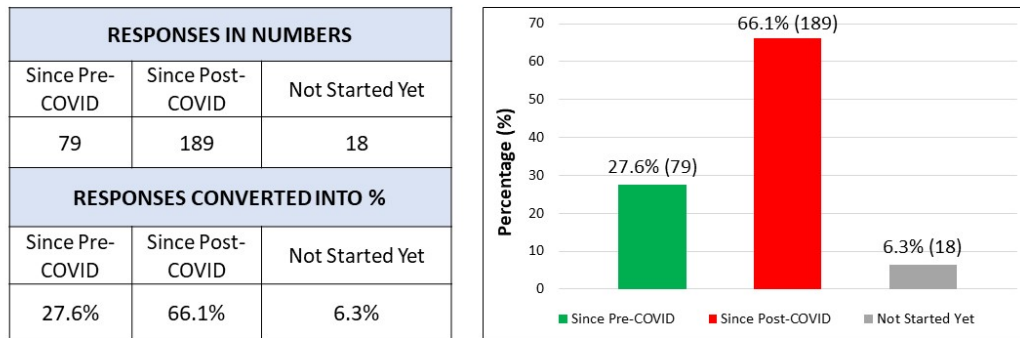
RESPONSES IN NUMBERS		
Since Pre-COVID	Since Post-COVID	Not Started Yet
79	189	18
RESPONSES CONVERTED INTO %		
Since Pre-COVID	Since Post-COVID	Not Started Yet
27.6%	66.1%	6.3%

Fig. 3. The questionnaire analysis of Q.1 of Section-2

According to the analysis, 79 responses, accounting for 27.6% of the total, indicate that institutions started using the blended learning approach from preCovid-19 period. This suggests that these institutions had already implemented blended learning as a teaching and learning method even prior to the global health crisis. These institutions may have recognized the benefits of blending online and in-person learning methodologies earlier on and had already integrated them into their educational practices.

The majority of responses, 189 in total, representing 66.1% of the total, indicate that institutions started using the blended learning approach from the postCovid-19 period. This suggests that a significant number of institutions adopted blended learning after Covid-19.

Furthermore, 18 responses, accounting for 6.3% of the total, indicate that institutions have yet not started using the blended learning approach. These institutions may still rely primarily on traditional teaching and learning methods and have not yet implemented a blended learning approach. It is possible that these institutions are still in the planning or consideration stage of adopting blended learning or may face constraints in terms of resources or infrastructure.

3.2.2. Analysis of Q.2

The analysis provided under is based on the responses to the Q.2 in the Section-2 of the questionnaire. The question was "what type of impact had the Covid-19 on the use of the blended learning approach in architectural education?". The responses are presented in the form of table and bar graph, showing the different impact options and the corresponding number of responses and percentages (Figure 4).
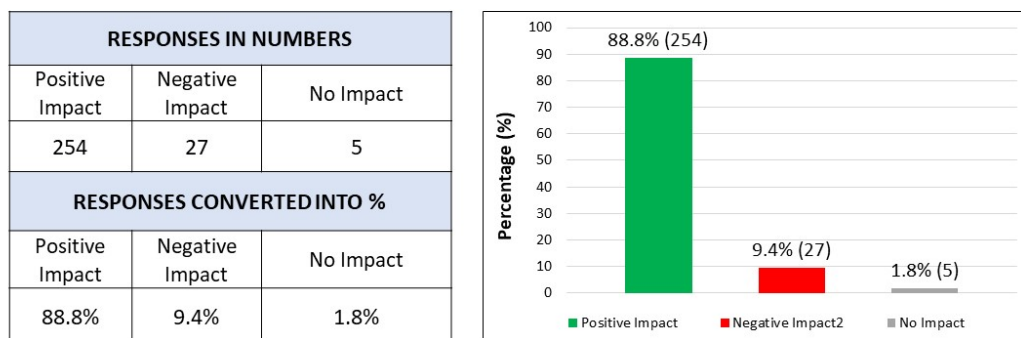
RESPONSES IN NUMBERS		
Positive Impact	Negative Impact	No Impact
254	27	5
RESPONSES CONVERTED INTO %		
Positive Impact	Negative Impact	No Impact
88.8%	9.4%	1.8%

Fig. 4. The questionnaire analysis of Q.2 of Section-2

According to the analysis, the great majority of respondents, 254 in total, representing 88.8% of the total, reported a positive impact of the Covid-19 pandemic on the use of the blended learning approach in architectural education. This suggests that the pandemic has brought about positive changes and advancements in the adoption and implementation of blended learning. The challenges posed by the pandemic compelled institutions to explore new teaching and learning methods, resulting in the increased utilization and recognition of the benefits of the blended learning in architectural education.

A smaller number of respondents, 27 in total, representing 9.4% of the total, reported a negative impact of the Covid-19 pandemic on the use of blended learning in architectural education. This indicates that some institutions and individuals may have encountered difficulties or limitations in effectively implementing blended learning during the pandemic. Factors such as lack of resources, inadequate training, or technical issues may have contributed to these negative experiences. However, it is important to note that the percentage of respondents reporting a negative impact is relatively very low compared to those reporting a positive impact.

Additionally, 5 respondents, accounting for 1.8% of the total, reported no impact of the Covid-19 pandemic on the use of blended learning in architectural education. This suggests that these respondents did not observe significant changes or advancements in the adoption of blended learning during the pandemic. It is possible that their institutions already had well-established blended learning practices in place prior to the pandemic or that they did not experience significant disruptions in their educational delivery.

3.2.3. Analysis of Q.3

The analysis provided under is based on the responses to the Q.3 in the Section-2 of the questionnaire. The question was "which learning management system(s) was/were used during Covid-19 period by your institution?". The responses are presented in the form of bar graph, showing the different learning management system (LMS) options and the corresponding number of responses and percentages (Figure 5).
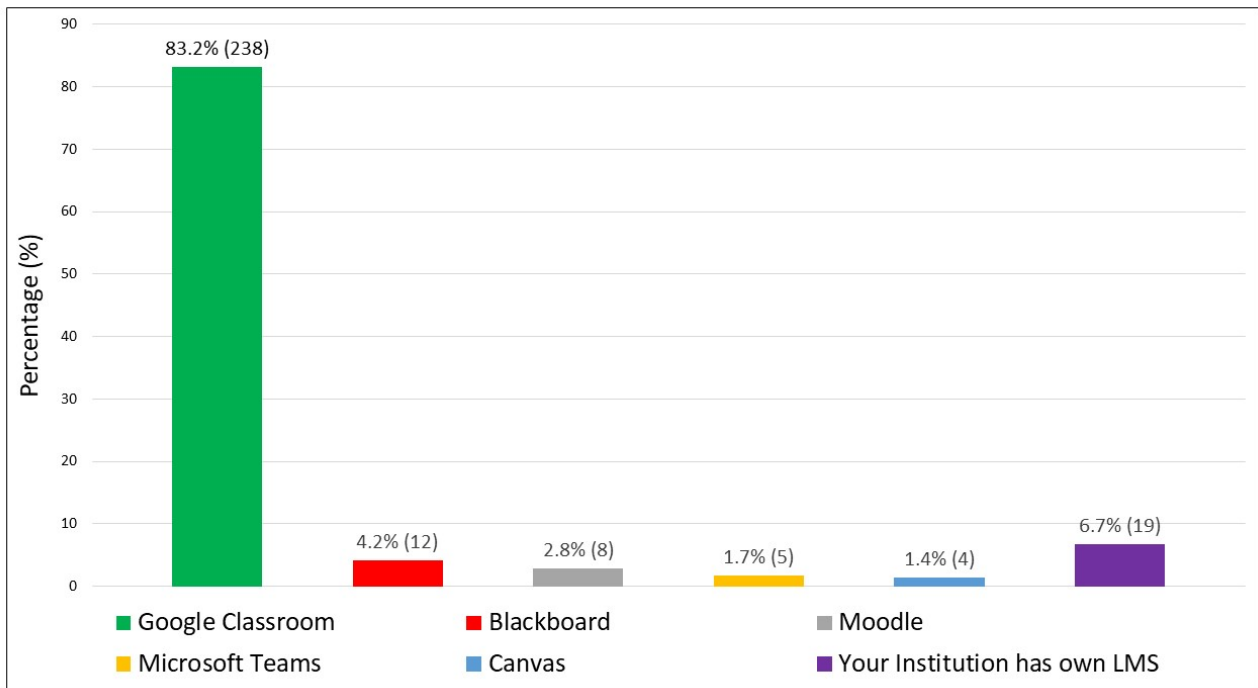
Fig. 5. The questionnaire analysis of Q.3 of Section-2

According to the analysis, the most widely used LMS during the Covid-19 period by respondents' institutions is Google Classroom, with 238 responses, accounting for 83.2% of the total. This indicates that Google Classroom was the preferred choice for the majority of institutions surveyed in India. Google Classroom is known for its user-friendly interface, ease of use, and integration with other Google services such as google drive, jamboard, google doc, google sheets, etc., making it a popular option for educational institutions during the pandemic.

There is a significant difference of 226 (79%) in the first and the second most used LMS, which is Blackboard, with 12 responses, representing 4.2% of the total. Moodle, another popular open-source LMS, received 8 responses, accounting for 2.8% of the total. Microsoft Teams, a communication and collaboration platform, was used by 5 institutions, representing 1.7% of the total. Canvas, an LMS platform known for its user-friendly interface and comprehensive feature set, received 4 responses, representing 1.4% of the total. Finally, 19 respondents reported that their institutions had their own LMS. This accounts for 6.7% of the total responses, indicating that a portion of institutions developed their own custom learning management systems to cater to their specific needs and requirements.

3.2.4. Analysis of Q.4, Q.5 and Q.6

The analysis provided under is based on the responses to three questions (Q.4, Q.5, and Q.6) in Section-2 of the questionnaire. Each question aims to gather insights about the blended learning approach in architectural education at the graduate level compared to the traditional teaching and learning approach.

Q.4 evaluates the extent to which the blended learning approach has improved the quality of architectural education at graduate level in comparison to traditional teaching and learning approach. The analysis indicates that respondents perceive the blended learning approach to have greatly improved the quality of education, as evident from the average rating of 8.08 on a scale of 0 to 10 (Figure 6). This suggests that the integration of blended learning methods has positively impacted the educational experience, enhancing the quality of architectural education for graduate students.
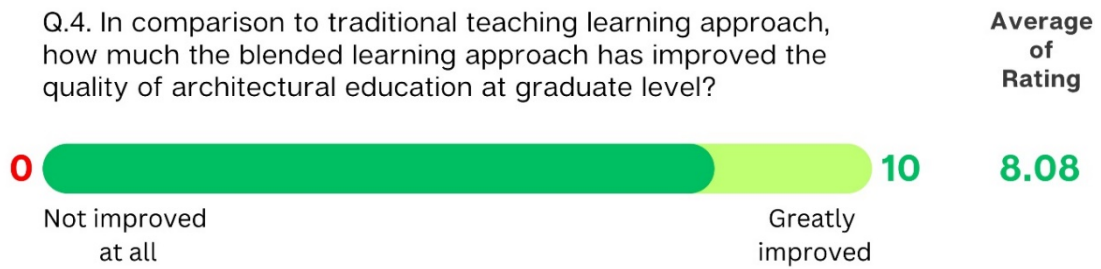
Q.4. In comparison to traditional teaching learning approach, how much the blended learning approach has improved the quality of architectural education at graduate level?

Average of Rating

0   10   8.08

Not improved at all   Greatly improved

Fig. 6. The questionnaire analysis of Q.4 of Section-2

Q.5 evaluates the extent to which the blended learning was challenging to adopt in architectural education at graduate level in comparison to traditional teaching and learning approach. The analysis reveals that respondents found the adoption process to be fairly challenging, as indicated by the average rating of 6.06 (Figure 7). This suggests that while the blended learning approach offers benefits, it also presents hurdles and complexities that need to be overcome. It implies that there are obstacles to navigate during the transition from traditional teaching and learning methods to blended learning in architectural education. This is natural to experience challenges when a system is transformed from conventional to non-conventional technology.
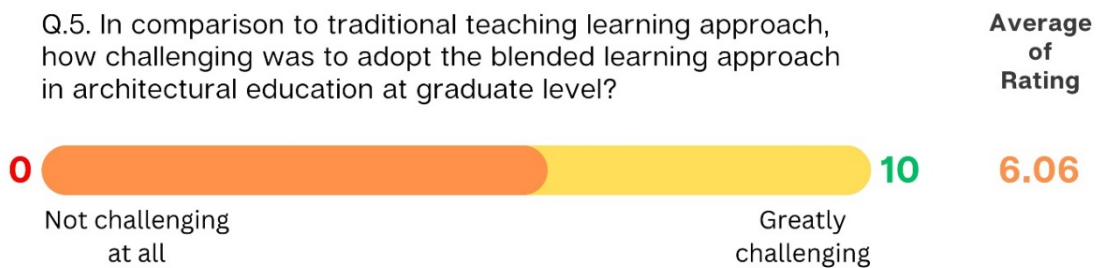
Q.5. In comparison to traditional teaching learning approach, how challenging was to adopt the blended learning approach in architectural education at graduate level?

Average of Rating

0   10   6.06

Not challenging at all   Greatly challenging

Fig. 7. The questionnaire analysis of Q.5 of Section-2

Q.6 explores respondents' perspectives on the future of the blended learning approach in architectural education at the graduate level in India. The analysis demonstrates that respondents have an excellent outlook on the future prospects of blended learning, with an average rating of 8.45 (Figure 8). This suggests that respondents perceive the blended learning approach as having excellent potential for further development and integration within the architectural education system in India. It indicates that respondents believe blended learning will continue to play a significant role in shaping the future of graduate-level architectural education.
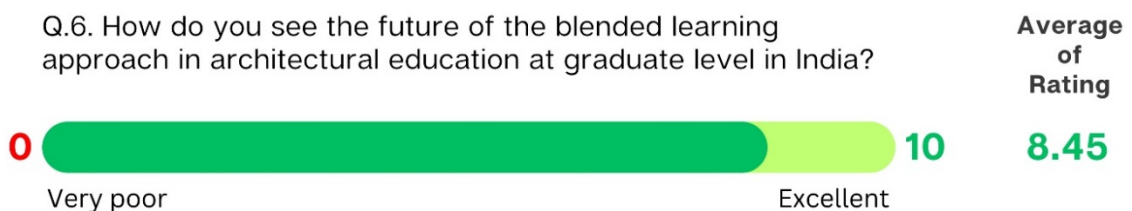
Q.6. How do you see the future of the blended learning approach in architectural education at graduate level in India?

Average of Rating

0   10   8.45

Very poor   Excellent

Fig. 8. The questionnaire analysis of Q.6 of Section-2

3.2.5. Analysis of Q.7

The analysis provided under is based on the responses to the Q.7 in Section-2 of the questionnaire. The question aims to assess the perceived benefits of using a blended learning approach in architectural education at the graduate level, in comparison to the traditional teaching and learning approach. The benefits are evaluated on a scale of 0 to 10, with higher scores indicating greater perceived benefits as shown in Figure 9.

Fig. 9. The questionnaire analysis of Q.7 of Section-2

The results indicate that the respondents consider the blended learning approach to be extremely beneficial in several aspects. The top-rated benefits include space flexibility (8.72), time flexibility (8.70), software skills development (8.54), and self-learning (8.01). These findings suggest that the integration of blended learning in architectural education provides students with the flexibility to access learning materials and engage in activities at their convenience, while also fostering the development of technical skills and promoting self-directed learning.

Furthermore, the analysis indicates that the blended learning approach is fairly beneficial in terms of presentation skills enhancement (7.58), research skills enhancement (7.55), motivation (7.24), and decision-making ability enhancement (7.18). While the ratings are slightly lower compared to the extremely beneficial aspects, they still highlight the positive impact of blended learning on these areas. Blended learning likely provides opportunities for students to improve their presentation and research skills, while also fostering motivation and the ability to make informed decisions.

In terms of financial aspects, the respondents consider the blended learning approach to be sufficiently beneficial, with a rating of 6.07. This suggests that while blended learning may not have a significant financial advantage over the traditional approach, it still offers some benefits in terms of cost-effectiveness or reduced expenses.

However, the analysis reveals that the blended learning approach is just beneficial in terms of teacher-student interaction, with a relatively lower rating of 5.20. This indicates that while the blended learning approach may provide certain advantages, it may not fully compensate for the loss of direct face-to-face interaction between teachers and students. It suggests that there is room for improvement in maintaining effective communication and engagement between teachers and students within the blended learning environment.

The consolidated results of Q.7 of Section-2 that the blended learning approach in architectural education at graduate level in comparison to traditional teaching and learning approach is –

extremely beneficial in terms of
- space flexibility (8.72)
- time flexibility (8.70)
- software skills development (8.54)
- self-learning (8.01)

fairly beneficial in terms of
- presentation skills enhancement (7.58)
- research skills enhancement (7.55)
- motivation (7.24)
- decision-making ability enhancement (7.18)

sufficiently beneficial in terms of
- financial aspects (6.07)

just beneficial in terms of
- teachers -students interaction (5.20)

3.3. Section-3

Section-3 was common for all the respondents. This section consists of 2 questions for all the respondents. Q.1 contains 10 parts while Q.2 was an open-ended question for comments/suggestions. This section intends to identify the changes in terms of using online platforms, tools, and techniques from preCovid-19 to postCovid-19 period.

3.3.1 Analysis of Q.1

The analysis provided under is based on the responses to Q.1 in Section-3 of the questionnaire. The question aims to assess the extent to which respondents are utilizing online platforms, tools, and techniques during the postCovid-19 period compared to the preCovid-19 period, assuming 100% use of online platforms, tools and techniques during COVID-19 period. The responses are evaluated on a scale of 0 to 10, with higher scores indicating a greater usage and higher difference in ratings of preCovid-19 and postCovid-19 period indicates the higher change in the usage of that particular online platform, tool, or technique as shown in Figure 10.

1. Use of social media platforms such as WhatsApp, Facebook, etc.

Pre-COVID - 4.452 || Post-COVID - 7.329 || Change - 2.878

2. Use of mailing platforms such as Gmail, Yahoo mail, etc.

Pre-COVID - 4.255 || Post-COVID - 7.153 || Change - 2.898

3. Use of data sharing platforms such as google drive, one drive, etc.

Pre-COVID - 3.961 || Post-COVID - 7.435 || Change - 3.475

4. Use of pre-recorded lectures using YouTube and other platforms.

Pre-COVID - 3.026 || Post-COVID - 6.341 || Change - 3.315

5. Use of live online lectures using Google Meet, Zoom, YouTube Live, etc.

Pre-COVID - 2.235 || Post-COVID - 6.976 || Change - 4.741

6. Use of online discussion sessions (for architecture design and other subjects) using Google Meet, Zoom, Skype, etc.

Pre-COVID - 1.853 || Post-COVID - 6.635 || Change - 4.782

7. Use of online quizzes or assignment platforms such as Google Classroom, Google Form, Quizzizz, etc.

Pre-COVID - 2.127 || Post-COVID - 6.729 || Change - 4.602

8. Use of Google Meet, Zoom, Skype, etc. for conducting online jury.

Pre-COVID - 1.451 || Post-COVID - 5.985 || Change - 4.534

9. Use of Google Meet, Zoom, Skype, etc. for conducting online seminars and guest lectures.

Pre-COVID - 1.941 || Post-COVID - 6.835 || Change - 4.894

10. Use of learning management systems (LMS) such as Google Classroom, Moodle, Blackboard, etc.

Pre-COVID - 2.020 || Post-COVID - 6.929 || Change - 4.910

Fig. 10. The questionnaire analysis of Q.1 of Section-3

The analysis reveals that the highest increase in the use of online platforms, tools, and techniques in architectural education at the graduate level is observed in several categories. These categories include learning management systems (LMS) such as Google Classroom, Moodle, Blackboard, etc., as well as platforms like Google Meet, Zoom, and Skype for conducting online seminars, guest lectures, and jury sessions. The change in the ratings for these categories range from 4.534 to 4.910, indicating a significant increase in utilization. This suggests that the adoption of LMS and video conferencing platforms has been playing a crucial role in facilitating online learning and communication during the postCovid-19 period.

Furthermore, the analysis indicates a fairly good increase in the use of data sharing platforms such as Google Drive and OneDrive, as well as pre-recorded lectures using YouTube and other platforms. The change in the ratings for these categories range from 3.315 to 3.475. This suggests that there has been a notable shift in the use of online platforms for sharing and accessing educational resources, as well as for delivering recorded lectures.

On the other hand, the analysis reveals the lowest increase in usage for mailing platforms such as Gmail and Yahoo Mail, as well as social media platforms like WhatsApp and Facebook. The change in the ratings for these categories range from 2.878 to 2.898. Although there is an increase in their utilization, it is relatively lower compared to other categories because these platforms were already used at good extent during preCovid-19 period.

Overall, the detailed analysis highlights a substantial shift in the utilization of online platforms, tools, and techniques in architectural education at the graduate level from the preCovid-19 period to the postCovid-19 period. The ratings indicate a significant increase in usage across various categories, with the highest increases observed in learning management systems, video conferencing platforms, online discussion sessions, live online lectures, online quizzes or assignment platforms, and online jury sessions. This reflects the transformative impact of the Covid-19 pandemic on the adoption of online platforms for educational purposes.

The consolidated results of Q.1 of Section-3 that the extent of increase in the use of online platforms, tools and techniques in architectural education at graduate level is observed to be –

highest in case of -
- learning management systems (LMS) such as Google Classroom, Moodle, Blackboard, etc. (4.910)
- Google Meet, Zoom, Skype, etc. for conducting online seminars and guest lectures. (4.894)
- online discussion sessions (for architecture design and other subjects) using Google Meet, Zoom, Skype, etc. (4.782)
- live online lectures using Google Meet, Zoom, YouTube Live, etc. (4.741)
- online quizzes or assignment platforms such as Google Classroom, Google Form, Quizzizz, etc. (4.602)
- Google Meet, Zoom, Skype, etc. for conducting online jury. (4.534)

fairly good in case of –
- data sharing platforms such as google drive, one drive, etc. (3.475)
- pre-recorded lectures using YouTube and other platforms. (3.315)

lowest in case of –
- mailing platforms such as Gmail, Yahoo mail, etc. (2.898)
- social media platforms such as WhatsApp, Facebook, etc. (2.878)

Bijawat and Marwaha also reported the benefits of various blended learning tools available online and their high impact on the degree of attention, passion, curiosity, interest and a level of optimism among the students [42].

3.3.2. Q.2

In response to the open-ended question, Q.2 of Section-3, 43 comments/opinions regarding the blended learning approach in architecture education at the graduate level in India were received. The qualitative analysis of this open question (Q.2 of Section-3) will be done by NVivo and will be published separately.

4. Conclusions

The total number of respondents in this study was 413 with both the gender ratio and the teacher:student ratio of about 1:1 participated from 52 colleges/universities of India. The findings indicate that a significant majority of the respondents have exposure to blended learning and reported a positive impact of the Covid-19 pandemic on the use of the blended learning approach in architectural education. While this approach was adopted by the majority of institutions from the postCovid-19 period. The most widely used learning management system (LMS) during the Covid-19 period was Google Classroom. The analysis indicates that respondents perceive the blended learning approach to have greatly improved the quality of education but also found the adoption process to be fairly challenging besides the respondents showed an excellent outlook on the future prospects of blended learning.

The results also suggested that the blended learning approach to be extremely beneficial in several aspects such as space flexibility, time flexibility, software skills development, and self-learning. The studies showed a significant increase in usage of online platforms, tools, and techniques from the preCovid-19 period to the postCovid-19 period such as learning management systems, video conferencing platforms, online discussion sessions, live online lectures, online quizzes or assignment platforms, and online jury sessions.

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