COVID-19 responsive teaching of undergraduate architecture programs in India: learnings for post-pandemic education

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Abstract

Purpose – The purpose of this paper is to have an overview of how Indian institutions offering undergraduate architecture programs have responded to the pandemic situation. It seeks to appraise the alternative approaches adopted for teaching-learning, communication, assignment and evaluation and assess their effectiveness for progressive improvisations or integration with pedagogy. The paper articulates a view on the suitability of online teaching for architecture education in India, on basis of educators' experiences of teaching during the pandemic.

Design/methodology/approach – An online survey was conducted for obtaining primary data from the educators given the paucity of information. The questions elicited structured information on aspects of the transition process, IT/online platform and tools, the efficacy of online teaching-learning and trajectory of blended learning.

Findings – All institutions managed the transition to online teaching without much difficulty. However, the paper raises the need for professional training and feedback from students. One-third of the respondents express satisfaction with online teaching, despite low satisfaction about the effectiveness of online teaching of a design studio. The results convey the need for more engagement with digital tools and representational software on integrated platforms. The study finds consensus on the future potential of blended learning and advocates developing an integrated framework and curriculum for architecture education in India.

Originality/value – The paper synthesizes viewpoints on online teaching-learning of architecture program in wake of the pandemic from an educators' perspective. The emergent perspectives are viewed dialogically in context of global voices to articulate a future trajectory of blended learning in the domain of architecture education.

Keywords Blended learning, Online education, Covid-19, Architecture education, Pandemic responsive pedagogy

Paper type Research paper

1. Introduction

Natural hazards like earthquakes, hurricanes, cyclones or chemical hazards like gas leaks, oil spills or nuclear warfare have a long-lasting impact on the ways of social living and stimulate cogitation about the best way forward. Although such happenings affect territories at varying scales, they trigger global responses in terms of human thinking and action. The ongoing COVID-19 pandemic has distinctively affected vast geographies globally due to its "viral" contagion and practically brought life to a standstill in many places. A total of 216 countries to date have had a total of approximately 38 million COVID-19 confirmed cases, and the number is rapidly increasing (World Health Organization, 2020). None of these events yet have disrupted life as widespread and as prolonged as the COVID-19 pandemic has, although climate change is prognosticated to have grave repercussions in the future, traces of which have become evident even today.

The pandemic has necessitated a shift in human endeavors towards alternative modes, and the present flux predicates the emergence of a "new normal' way of living. Almost all domains involving human activity, namely, businesses and trade, health and well-being,

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touring and traveling, education and research, etc. are responding uncertainly to the prevailing pandemic situation on one hand, while simultaneously grappling for directions for a post-pandemic scenario on the other. Most of these activity domains are closely linked to the built environment of their operations, which also impacts the degree of their operational safety or vulnerability in a pandemic (Megahed and Ehab, 2020). Aspects of the role of architecture and urban disciplines in developing safe and healthy environments have been advanced through a trans-disciplinary framework emerging from the pandemic situation (Salama, 2020). In this perspective, the paper explores the immediate consequences of the COVID-19 pandemic on undergraduate architecture education in India and predicates on its long-term implications for a post-pandemic scenario.

The COVID-19 pandemic has compelled the adoption of an online digital off-campus mode of teaching with a suddenness that is unlikely under normal circumstances. Its almost universal adoption has raised concerns about the efficacy of online education and has prompted a probing of pedagogical issues that will emerge in such a situation (Pitroda, 2020; Gopinathan and Ramachandran, 2020). The concerns include unfavorable views of online education on account of the digital divide, lack of inclusiveness, inequity, unaffordability and value of online education; yet paradoxically, online education is also argued as a panacea to these very issues (Kebritchi *et al.*, 2017; Jena, 2020).

Here, it is significant to distinguish between regular distance learning and the online, off-campus education adapted as a response to COVID-19. This mode of education has also been variously called "crisis distance education", "emergency remote teaching" or "transitional emergency model" (Lily *et al.*, 2020; Hodges, 2020; Salama and Crosbie, 2020). Whereas regular distance learning progresses with pedagogical and administrative frameworks, methods, tools and processes (Basak *et al.*, 2016; Hadullo *et al.*, 2017), the COVID-19 pandemic has led to a sudden shift to online, off-campus education on an unprecedented scale. In context, the necessity of having established, acceptable frameworks for each of the independent educational programs cannot be overemphasized.

In the domain of global architecture education, there has been an effort to assess post-pandemic responses in educational institutions, the impact of such adaptations on teaching and academic activities to portend its long-term impact on academia. In an interview feature, leaders of the academic fraternity of the architecture cohort in the USA applauded the nimbleness of the academic community in their adaptation of online mediums for remote learning. There is resolute support for sustaining the online medium for teaching architectural courses on account of its ability to recreate a richer kinesthetic experience online; and also due to the possibilities, it offers through combinations of synchronous/asynchronous, individualized learning (Ockert, 2020). Though a consensus was reached on the definitive continuance of digital education in the future, the cohort also unequivocally emphasized the critical importance of physical studio space for education in architecture. The academic leaders consensually predicted a future trajectory of transformation to hybrid formulations of content delivery, assessments and other academic aspects in a post-pandemic scenario (Archinect, 2020a, b, c). It is widely recognized, that as an instrument of teaching, the inclusion of online education in blended learning offers tremendous possibilities that can enrich the undergraduate architecture education (Anu Koponen, 2015; Ioannou, 2018; Carpo, 2020).

Recognizing the wide adoption of online teaching modes in response to the COVID-19 pandemic, this paper elicits views of educators to explore its implications for undergraduate architecture education in India. Besides, the paper also draws from the context of New Education Policy (NEP) 2020, which mandates conducting scaled pilot studies to determine opportunities presented by online/digital education (MHRD, Government of India, 2020). The paper brings us to educators' perceptions about the effectiveness and quality of education through their post-pandemic online teaching experiences to recognize the potential role of

blended/hybrid learning in architecture education in a post-pandemic situation. The primary data of the study were gathered through an online survey of the academic cohort involved in teaching architecture courses in India.

2. Survey methodology

The survey obtained responses from educators involved in teaching undergraduate programs in India through a structured online survey. The online medium was adopted because of its suitability in collecting required information as well as its wide outreach at a time when physical interactions have been constrained due to the pandemic. Accordingly, the survey was succinctly designed to elicit online responses with the following objectives:

(1) To collate structured information about the impact of COVID-19 disruption on usual face-to-face teaching-learning processes and patterns.

(2) To identify the extent to which the institutions have adapted, and the leading IT/online platforms and tools that were adopted therein.

(3) To assess the efficacy of online teaching-learning processes from a teachers' perspective.

(4) To obtain faculty perspectives on the future trajectory of online/blended education for undergraduate architecture program.

The survey format was divided into four sections to elicit information from respondents. The first section focused on their individual and institutional background, whereas the second on their success in transitioning to a post-pandemic online mode of teaching. The third section focused on the ease and effectiveness of online teaching-learning and their views on blended learning were sought in the last section. This was organized and done through a mixed set of 23 mostly multiple-choice questions that were all compulsory. After eliciting basic information about the respondents and institutions they represented, the survey design allowed only those respondents to continue whose institutions had switched to an online medium of education, thus ensuring that all responses offered were post-experience. The survey questionnaire was sent to about 410 educators from about 152 diverse institutions, of which 130 individual responses representing 82 institutions from 20 Indian states were received. The individual respondents were a mix of all teaching cadres of which 16% were academic heads and 50% were assistant professors. The median teaching range of the respondents was 5–10 years. The institutions represented have been offering an undergraduate architecture program, from less than 5 years to more than 25 years, and about 36% of these institutions also offer a post-graduate program as well.

3. Findings

3.1 Transition of institutions offering an undergraduate architecture program to online teaching

3.1.1 The transition from face-to-face teaching. The survey responses indicate that of the 82 institutions represented, about 34% of them were already following online teaching in some form. However, as a response to the COVID-19 pandemic, invariably all institutions converted from traditional face-to-face teaching to an online medium of teaching. Nearly 60% of the institutions transitioned to online teaching within a week, whereas only 15% of the total institutions surveyed took more than three weeks. About 53% of the respondents felt that transition to an online medium of teaching was easy. The data, however, do not reflect any direct linkages between the degree of ease/unease with the cadre of a teacher, or the age of an institution.

3.1.2 Tools and platforms. Most of the teaching has been undertaken through means of video conferencing and screen sharing in synchronous lectures, though some respondents relied on recorded lectures in an asynchronous mode too. Zoom and MS Teams were the most used platforms for conducting lectures, assignment introduction and feedback sessions, conducting quiz/session tests, whereas Whatsapp emerged as the most favored medium for sharing of academic information in batch/course-specific intra-groups. The responses also indicate that about 50% of the institutions used online resources NPTEL and SWAYAM initiated by the Government of India, whereas usage of external resources like EdX, Coursera, etc. was only limited to situations when online content and course curriculum coincided. Respondents also reported an enhanced reliance on online video/presentation content available on websites like YouTube, Slideshare, etc. for supplementing teaching. The pandemic affected period also witnessed a quantum leap in the number of specialized webinars that can supplement content delivery, ostensibly on account of their operational convenience and lower costs.

3.2 Ease and effectiveness of online teaching in comparison to face to face teaching of the undergraduate architecture program

3.2.1 Ease of transition to online teaching. About 53% of the respondents indicated that the transition to teaching online was easy/very easy, while only a small 14% of the respondents found it difficult. The data do not reflect a direct correlation between the ease of teaching and the teaching experience or cadre of a teacher.

Further, the survey also elicited textured responses on the ease of transition in various aspects of teaching such as (1) teaching, (2) framing assignments, (3) continuous assessments and finally and (4) achieving learning objectives. Significantly, 35% of the respondents thought the transition to be easy/very easy, whereas 29% of the respondents thought it to be difficult/very difficult. Even more significant is that while only a minuscule 21% of the respondents thought the transition to online teaching made achieving learning objectives easy/very easy, 34% responded that the transition made it difficult/very difficult.

An appraisal of the data reveals a variance between the wider perception of transition to online teaching as being easy/very easy (53%) and a more nuanced perception emerging through responses on varied aspects of teaching (Table 1). A careful assessment of the data in Table 1 reveals that in considering the various aspects of teaching, only 40% of respondents felt that the transition to an online medium was easy/very easy for framing of assignments (Figure 1), while only 33% felt that continuous evaluation was easy/very easy (Figure 2).

3.2.2 Effectiveness of online education in achieving learning objectives. Significantly, a high percentage of survey respondents reflect an awareness of the difficulty of achieving learning outcomes (34%); and, only a small percentage (21%) think it to be easy/very easy in an online teaching mode. Given the critical significance that achieving learning objectives has in student-centric learning, further questions were included in the survey format to obtain ease of achieving of learning objectives in an online teaching mode based on (1) subjective assessment of students' work and (2) students' feedback. The results obtained could offer

Table 1.
Ease of transition to online teaching

Sr. No	Activities	Very difficult	Difficult	Average	Easy	Very easy
1	Teaching	7%	22%	36%	32%	3%
2	Framing assignments	3%	15%	42%	30%	10%
3	Continuous assessment/evaluation	7%	29%	31%	25%	8%
4	Achievement of learning objectives	12%	21%	45%	18%	3%

varying perspectives of the academic cohort on the perceived difficulty of achieving learning objectives through an online medium of education.

This variance indicates that although the technical aspects of the transition to online teaching appear easy, major inputs to enhance the efficacy of all aspects of online education will be required urgently to improve education during this COVID-19 pandemic crisis. To gain a deeper understanding of the pedagogical effectiveness of online teaching in the undergraduate architecture program in India during the COVID-19 pandemic, the research gathers information on the efficacy of online teaching of courses included in the curriculum. Accordingly, the information is gathered by the inclusion of relevant questions in the structured survey.

3.3 Effectiveness of online teaching in the undergraduate architecture curriculum

3.3.1 Background. The curriculum of institutions offering undergraduate architecture education in India is governed by the largely heuristic framework laid out by the Council of Architecture (COA), India, that provides individual institutions with some flexibility to define their institutional priorities and vision (Council of Architecture, 2020). Broadly, the design studio is the kernel of architecture education, and this is globally recognized as pivotal for pedagogical initiatives in education (Salama, 1995), The COA guidelines categorize all courses of study into four categories: (1) professional courses (PC), (2) building science and applied engineering (BS & AE) courses, (3) elective courses and (4) value-enhancement courses. This research focuses on obtaining a response to the efficacy of online teaching vis-a-vis traditional face-to-face teaching for the first two categories (1 and 2), which together constitute 70% of the recommended curriculum. In addition, the survey also seeks to gather information about the relative efficacy of online learning for theory-based courses vis-a-vis design/application-based courses.

The PC are broadly constituted of two related yet distinctive broad sub-categories of (1) architecture design studio and (2) design/architecture-based courses, for both of which the pedagogy pivots on the architecture design studio for the undergraduate architecture

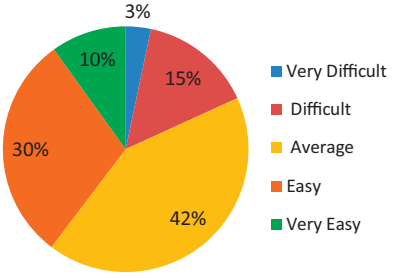

Figure 1.
Ease in framing assignments

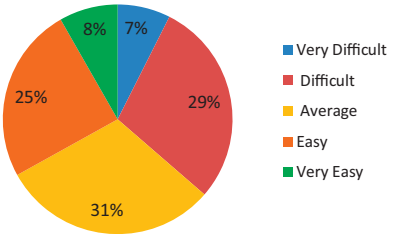

Figure 2.
Ease in continuous assessment/evaluation

program. Similarly, BS & AE courses have two sub-categories of (1) building material and construction technology and (2) building engineering services, both of which impart practical applied knowledge which contributes immensely to future professional practice.

3.3.2 Effectiveness of online teaching in undergraduate architecture courses. Since PC are the most substantive component of the curriculum, and that pedagogy of other subjects also hinges on it, feedback on the efficacy of the PC will be a very significant indicator to assess the effectiveness of the pedagogy. For the architecture design studio (within the PC), an astounding 61% of the respondents found the medium of online teaching not so effective/not at all effective, whereas only 8% found it very/extremely effective when compared to traditional face-to-face teaching (Figure 3). This indicates a high level of dissatisfaction with the present state of online teaching of the design studio.

For design/architecture-based courses, 41% of the respondents found online teaching not so effective/not at all effective (Table 2, Figure 3). Even though online teaching for BS & AE courses was relatively more effective in comparison with PCs, only 13% of the respondents felt online teaching of courses under building material and construction technology was very/extremely effective (Figure 3).

In contrast to PC/BS & AE, the switch to online teaching for theoretical subjects was considered not so effective/not at all effective by only a small 12% of the respondents (Figure 3). Nevertheless, 48% of the respondents believed that online distance teaching was a very/extremely effective medium of teaching *inter alia* face-to-face teaching. These indicate a high degree of acceptability of the online medium of education for theoretical courses. Regarding levels of teaching satisfaction in online teaching, a low percentage of only 3% of the respondents are either very satisfied or very dissatisfied with online teaching. An additional 35% of the respondents are satisfied/very satisfied with online teaching vis-a-vis face-to-face teaching (Figure 4).

The responses on levels of satisfaction of online teaching suggest that educators draw considerable satisfaction from teaching on the online medium, especially in the teaching of the theoretical subjects.

After the collation of structured information of various responses about the consequences of disruption that COVID-19 has had on usual face-to-face teaching-learning processes in

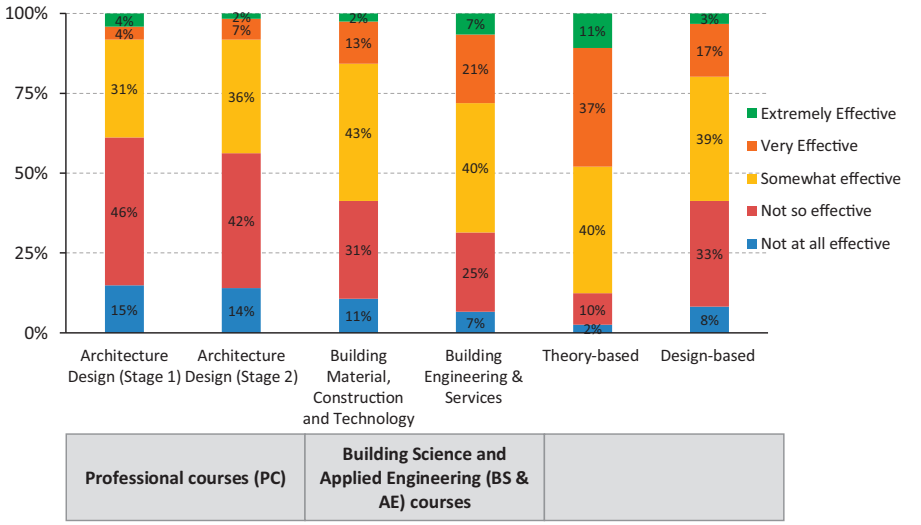

Figure 3.
Level of Effectiveness of online teaching for B. Arch undergraduate course categories

Sr. No	Level of effectiveness	Professional courses (PC)		Building Science and Applied Engineering (BS & AE) courses			
		Architecture Design (Stage 1)	Architecture Design (Stage 2)	Building Material, Construction and Technology	Building Engineering and Services	Theory-based	Design-based
1	Not at all effective	15%	14%	11%	7%	2%	8%
2	Not so effective	46%	42%	31%	25%	10%	33%
3	Somewhat effective	31%	36%	43%	40%	40%	39%
4	Very Effective	4%	7%	13%	21%	37%	17%
5	Extremely Effective	4%	2%	2%	7%	11%	3%

Table 2. Experiences of level of effectiveness in online teaching

undergraduate architecture education, the paper informs about the extent of adaptation by institutions and relative efficacy of online teaching-learning processes. Following the preceding information, the survey had included questions to obtain views of the educators on the future of online/blended education for undergraduate architecture programs.

3.4 Blended/hybrid teaching-learning in undergrad architecture programs

The pandemic has resulted in a compelling switch to online teaching, and at the time of the survey, respondents have had about four months of experience of teaching through an online medium. Through their experiences, the survey seeks to gather early responses and perceptions from the academic cohort about the efficacy of blended teaching-learning in undergraduate architecture programs in India. Accordingly, the survey form included queries on (1) perceived significance of face-to-face teaching for various aspects of teaching-learning, (2) expected efficacy of transition to blended teaching for various categories of courses elaborated in the earlier section and (3) views on recognition of identified factors as drivers or barriers for a transition to blended teaching-learning.

In their responses, less than 20% of the respondents perceive that blended learning will be very/extremely effective for teaching PC and even lesser (7%) for architecture design studio (Figure 5). Of the BS & AE courses, 31% responses indicate that blended teaching will be very/extremely effective for these courses (Table 3).

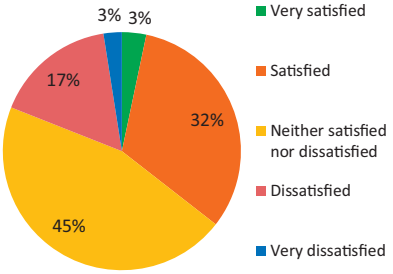

Figure 4. Satisfaction in online teaching

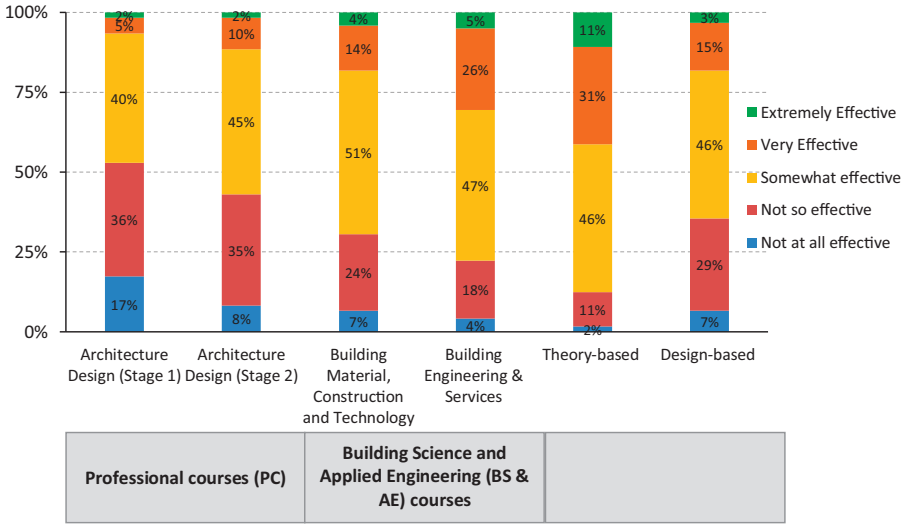

Figure 5.
Opinion about effectiveness of blended teaching-learning for different course categories

A comparison of the perceived effectiveness of online education (Table 2) and the expected effectiveness of blended learning (Table 3) was undertaken for various course categories recommended by COA for undergraduate architecture education. This had been done to review if the perceived effectiveness of online teaching was also consistently reflected in the responses about the future efficacy of blended learning. The responses inform that during post-online teaching experience, the respondents appear more amenable to a transition to blended teaching, even though the results do not reflect it's being a very/extremely effective teaching-learning tool for undergraduate courses of architecture in India. This is reflected in a reducing number of respondents in Table 3, who consider blended learning as not so/not at all

Table 3.
Opinion about effectiveness of blended teaching-learning

		Professional courses (PC)		Building Science and Applied Engineering (BS & AE) courses			
Sr. No	Level of effectiveness	Architecture Design (Stage 1)	Architecture Design (Stage 2)	Building Material, Construction and Technology	Building Engineering and Services	Theory-based	Design-based
1	Not at all effective	17%	8%	7%	4%	2%	7%
2	Not so effective	36%	35%	24%	18%	11%	29%
3	Somewhat effective	40%	45%	51%	47%	46%	46%
4	Very Effective	5%	10%	14%	26%	31%	15%
5	Extremely Effective	2%	2%	4%	5%	11%	3%

effective for all courses, and a discernible corresponding increase in numbers who consider blended learning somewhat effective.

4. Discussions

4.1 Transition and adaptation to online teaching with the inception of COVID-19

The most notable impact of the "black swan" pandemic on architecture education in India is the almost complete transition to online teaching, regardless of the intent, skills or preparedness of the educators. Academicians of architecture cohort have risen to the challenge of continuing education through an online medium despite the constraints of infrastructural capacities inherent in emerging countries. Having unbegun until the COVID-19 pandemic, the expansion of online education was phenomenally difficult in a situation characterized by under-preparation, evident digital divide, infrastructure challenges, perceived lack of value of online architecture education and most importantly, by teachers' apathy on account of the perceived unsuitability of the online mode for undergraduate architecture education. However, the survey also reveals that this transition is marked by a general sense of insufficiency in conducting PC, subjects that are pivotal to the undergraduate architecture program. The insufficiencies are deliberated in the following text, while it is expected that the deficiencies will be progressively resolved during the pandemic and education will much improvise through blended learning in a post-pandemic situation.

4.2 Efficacy of digital education – feedback loop: best practices for peer learning

This transition from the traditional to the online, through a continuous process of trial and error, has been a major learning curve for educators, who had to explore and imbibe methods of online teaching almost overnight. The survey reveals a large-scale engagement with methods and techniques of content development and as well as with different platforms of online teaching for course delivery. It also highlights the increasing compulsion for the faculty and students to be adept at digital learning. Consequent to these observations, the study proposes a critical necessity of systemically training educators in technological and pedagogical tools for adoption for content development and further for teaching undergraduate architecture programs.

The spectrum of subjective responses on perceived efficacy of digital education for undergraduate architecture programs obtained from the survey necessitates a triangulation of results of this study with feedback from a students' perspective for more meaningful conclusions. The paper proposes a critical need of evolving a comprehensive feedback loop on diverse issues related to education in this pandemic period. This could seek information from all stakeholders like IT administrators and management etc. in a structured manner. The holistic information gathered through such feedback about academic experiences during this pandemic period is critical for deliberations to examine the continued adoption of online teaching for the architecture program. This is sure to augment peer learning and support networks and will positively contribute to discussions on the trajectory of digital/blended teaching-learning in a broader framework. In doing so, it can be made possible for clusters of educational institutions to collaborate at regional scales and collate the best practices of online teaching for adoption in blended learning. This is also something that has been suggested in the New Education Policy (NEP) 2020.

4.3 Efficacy of conducting Architecture Design Studio in a digital mode

In response to the pandemic, the survey establishes the diminished fecundity of conducting architecture design studio in *only* an online medium, which is more in consonance with the

views expressed by educators globally. The survey responses also categorically reaffirm the importance of face-to-face studio learning or a physical studio environment for architecture design education, which, again, aligns with the predominant view (Archinect, 2020a, b, c; Murphy and Scanlon, 2020). The study discerns a view that conducting an architecture studio course cannot be transactional, as most courses usually are when taught online. Moreover, the diminished efficacy could very possibly be a result of the absence of informal discussions, non-verbal cues and serendipitous encounters, which are *de rigueur* in physical studio spaces, as a learning process (Mostafavi, 2020). The respondents also express a (transient) inability to demonstrate their ideas visually during discussions with students, due to their unacquaintance with suitable tools and platforms and unavailable computer hardware.

Concurrently, respondents look forward to greater possibilities of studio collaborations between institutions and acknowledge the potential of easier involvement of specialists and professionals in education through the digital medium. The respondents agree that online digital tools allow participation from multiple locations by reducing barriers of distance, which also favors maximization of its potential through the exploration of collaborative architecture design studio.

4.4 Efficacy of digital medium as a tool of representation, communication and the process of design in education

The survey revealed an overwhelming dissatisfaction in teaching, especially with representational aspects of students' outputs and inept communication during design crits or design-based courses when conducted online. It suggests a reappraisal of precedents where digital tools were integrated with education, to explore a more immersive teaching-learning experience (Saghafi *et al.*, 2012). Substantial advancement of prevalent digital tools and software will be required to improve online studio interface in academia, wherein faculty reviews are presently dependent on inadequate, work-in-progress digital representations. In the context of architecture education in India, the digital tools are still used for shape generation (Rhino) sparsely, visualization (VRay) and construction documentation (Revit) and generative design approaches or artificial intelligence models are still rarely employed (Bernstein, 2020). The study recognizes that the inclusion of available digitalization tools in academia – which can potentially maximize contribution to architecture pedagogy – is a domain that remains to be explored. Considerable developments of integrated software are required that allow seamless integration of various processes of design considerations like geometry, form, light, energy, services, structures, etc. in a model on a single platform. The interface of such models with virtual and augmented reality, in the long run, will improve visualization, representation and communication, which may potentially transform the representation of architecture design processes (Milovanovic *et al.*, 2017; Nisha, 2019). Further, Thomas Frey predicts that the Internet access will likely be three dimensional in the distant future, and it may be possible to have all information of architectural representation through a virtual building twin (Veltheim, 2020). This will allow for better inclusion of even sensory and experiential data into the architecture design process. In short, this paper reinforces the need for increasing adoption and advancement of tools for a digital mode for representation and experience of the architecture design process.

4.5 Curriculum redevelopment and pedagogy

In response to the pandemic situation, the transition of architecture education to an online mode is a paradigm shift from the prevailing education pattern of face-to-face teaching. The survey, from the data collected from the teaching fraternity, collated and analyzed institutional responses to the pandemic and attempted to rethink the prevailing curriculum and pedagogy in architecture undergraduate programs. The respondents' are widely in

agreement with the continuance of online teaching, and a few suggest a fundamental exploration of its integration with the prevailing architecture education system in India.

Given the increase in digitalization of data, modes of visualization and communication in online teaching, this paper proposes a fundamental rethink to formulate a new framework that includes hybrid/blended learning in architecture education. This framework should consider alternatives for conceiving, delivering and evaluating architecture programs. It will require that the curriculum, pedagogy and the administrative aspects of education in architecture take cognition of the post-pandemic online teaching experiences in India, as well as learn from multiple other global perspectives (Mahmoud Reza Saghafi, 2012; Marta Masdéu, 2017). This framework should grant institutions the autonomy to conduct programs on hybrid models that give options of choosing physical/virtual spaces, synchronous/asynchronous content delivery, self-paced or programmed courses, communication platforms, feedback mechanisms and assessment methods, amongst other aspects.

The recommendations of the New Education Policy 2020 shall vitally impact the education of architecture in a manner that is expected to fundamentally restructure the framework of the undergraduate architecture program. According to NEP 2020 recommendations, the curriculum may require to consider multiple exigencies, namely, introducing exit options at various stages, re-definition of the program structure from the present two-stage five-year bachelor of architecture program, initiation of multiple specializations after the third year, emphasis on skill development and pedagogical integration within a multi-disciplinary environment (MHRD, Government of India, 2020).

5. Conclusion

In response to the COVID-19 pandemic, the undergraduate architecture education scenario in India presents a "new normal" situation where teaching has majorly transitioned to an online medium. Its utmost significance is in overcoming the barrier of inertia, with which it could have taken years to shift to online teaching. The widespread adoption of an online mode of teaching undergraduate architecture programs in India provides an opportunity to deliberate on its future trajectory in a post-pandemic situation. The survey responses mentioned a few generic beginners' issues also applicable to education in architecture. These included issues of availability of hardware and software platforms, net connectivity, digital divide, low-interactivity, lack of attention to weak/docile students, lack of concentration, fatigue and issues of time-management amongst others. While a few of these issues could be ascribed to the lack of familiarity or suddenness of the shift, others were more situational and could be resolved through careful planning. It is advanced that with systemic training of educators in various tools and platforms, as well as creating a general awareness of digital resources can enhance the teaching quality considerably.

The paper contends it as essential to address concerns raised through the survey of conducting architecture studio in an online/virtual/blended mode. The diverse aspects of conducting studio-based design courses will have to be considered in any unique institutional context in deciding on its adoption. Blended mode of education melds the benefits of synchronous crits and asynchronous learning and offers the potential of collaborating with institutions and professionals across time and geographies. On the flip side, only a very low level of satisfaction is experienced in conducting studio-based courses on an online platform that has also been gleaned through similar global responses (Grover and Wright, 2020). It is argued that reiterative face-to-face interactions with faculty and peers, learning through fortuitous encounters, informal discussions and non-visual clues are critical to the learning processes in studio-based courses. The problem of conducting studios in the absence of a physical studio space is further compounded by the limited adoption of available digitalization tools and communication platforms for design studios. The paper is of the

view that the imminence and success of blended/hybrid learning in architecture education would considerably depend on a well-thought-out pedagogical framework inclusive of online platforms and the adoption of new digital tools for architecture design representation and communication. Future architecture education, henceforth, will be grounded in real situations and institutions, with imaginations and reach soaring across the frontiers in a virtual mode.

The post-pandemic architecture education in India shall need to confront not only the challenges of adapting to blended teaching but also take into account the recommendations of the New Education Policy (NEP), 2020. As a disparate coincidence, the expansion of online learning and the transition to blended learning is an overlapping priority for higher education. As a result, the paper envisions the tremendous possibilities of blended education and hybrid models of teaching-learning experiences in a pandemic scenario and emphasizes on its inclusion in theorizing a new paradigm of architecture education in India. The paper strongly advocates the need to develop new frameworks for undergraduate education of architecture which shall consequently reflect in the curriculum design and pedagogy.

The evidence presented by the paper needs to be dialogically assessed with empirical information obtained through the feedback of students, the most vital stakeholders of the teaching-learning process. The digital mode of education is envisaged to provide multiple learning opportunities and envisions students as active learners instead of passive listeners (Salama and Crosbie, 2020). However, further studies are required to collate didactic information related to various pedagogical initiatives, processes and experiences in design-based courses during the pandemic period. The data should be collected from sufficient institutions of distinctive types, selected on basis of accreditation, experience and region. Clusters of institutions can collaborate to develop digital resources and repositories and share not only their successful experiences but also those of failure, to arrive at the best practices to teach online architecture programs in India.

Every crisis offers an opportunity, and this pandemic may just be an opportunity to make the transition from a stagnant, archaic education to a learning system that celebrates intuition, insight, imagination, skills and creativity. The challenge is to introspect and evolve a progressive undergraduate architecture education framework in India that has a wider outreach is responsive to technological advances, and which thrives in its interaction in a holistic multi-disciplinary education ecosystem. This is an opportunity that should be taken forward by not attempting to regress but to reimagine the future, once the pandemic situation is normalized.

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