Strengths Opportunities Weaknesses and Challenges (SWOC) analysis of Online Education for teaching Urban Planning and Construction Management in Pandemics

Attaullah Shah[1*] and Hafiz Ehsan U Qazi[2]

[1*] Corresponding Author: Department of Civil Engineering and Technology, Karakoram International University Gilgit Baltistan-Pakistan

[2.] Capital Development Authority Islamabad Pakistan

Corresponding author E-mail: drshah965@gmail.com

Abstract:
The Novel Corona Virus and its infection COVID-19 has played an unprecedented havoc with the world. Education sector in general and Higher Education in particular has received the big shock as the need for physical distancing has forced the closure of these institutions. The Challenges of poor access, low speed of internet, geographical diversity, and poor socioeconomic condition of the people in the development countries, further multiply these challenges. Teaching of professional programs like Engineering and Construction Management becomes even more difficult. In this mixed mode research based on questionnaire survey and Focal Group Discussions (FGDs) with the students, faculty and senior staff, Strength, Weaknesses, Opportunities and Challenges (SWOC) analysis has been carried out, to assess the Online Education and eLearning in professional education with special reference to teaching of Construction Management education and research. The results were used for improvement of the systems, processes and capacity of the human resource for acceptability of the online education in the COVID-19 scenario.
Keywords: *COVID-19; Physical distancing; Higher education, Construction Management*

1. Introduction:

i. *COVID-19 and its impacts on global higher education:*

The lockdown due to COVID-19, has forced the educational institutes for more than a year now and all levels of education including elementary, secondary and post-secondary have been affected (Saavedra J, 2020). This uncertainty has been growing in many parts of the world, as the third wave of the infections is more lethal in the developing world, where vaccination has not been very effectively administered (Chinazzi *et al*., 2020; Hopman, Allegranzi, & Mehtar, 2020; Kraemer *et al*., 2020). After a pause of almost one year through extensive vaccicantion programs around the world, the pandemic is reported to resurface in some parts of the China and different new variants are experienced by thousands of people. The higher education has been affected in many ways. Severe anxiety, depressions and mental ailments have been reported in many parts of the world, due to continuous isolation of the students. The welfare of the students, normally acquired at the schools, through socialization, sports activities and interaction with the teachers and class fellows has been severely disrupted with the long term closure of schools and Universities (Wang.G *et al*,2020; Nicola *et al*,2020). The higher education at global level has been receiving a number of socks. The decline of students' enrolments, disturbance of academic calendars postponement of conference and workshops have led to serious decline in the Universities revenue (Ogunode,2020). Though the vaccination against COVID-19 has been intensified during last 6 months across the world, yet educational institutes are expected to remain either closed or partly closed till Fall 2021 till Dec 2021.

ii. *Various options for teaching and learning during COVID-19:*

Variety of platform for teaching and learning have been explored during COVID-19. These include online education, eLearning, Distance learning, hybrid learning, collaborative learning, Team Based Learning (TBL) and blended etc. (Gwein V,2020). With the advent of modern technologies, the online and virtual education has been increased many times during last few decades and it was mainly used to supplement the existing face to face teaching and learning ((Nic.B and Frederik A, 2020). During the COVID-19, the entire world has to switchover suddenly to online education, for which both the faculty and students were not ready in fact, hence the satisfaction of students in design schools for use of online education remained sparse and varied. The major concerns like the platform adoptability, platform privacy, platform service and maintenance as well as the system quality, interaction quality, service quality, and platform availability were shared by students and faculty (Tingguie C *et al*,2020).

iii. Health and Urban design in post COVID-19 era: The current focus of the post COVID-19, new normal is mainly over the health and wellbeing of people. A number of associated harmful issues related to human

health include, depressions, loneliness, shocks, domestic violence, insomnia etc. (Dore 2020; Douglas et al. 2020). The positive sides of the pandemic include, reduced air pollution, noise level, less traffic jams, more physical exercises and use of cycling etc. The human health is defined as "a state of complete physical, mental and social well-being". Hence the urban design, can play a pivotal role to address the contemporary health challenges while using interdisciplinary solutions (Azzopardi-Muscat et al,2020). The *health in all policies* or *design for health approach* has further, compelled the urban design professionals, to have human health as the top agenda for all designs (Rice, 2019). The treatment of diseases has been shifted from traditional prescribing of medicines to "social prescribing", "Nature prescribing" or "Spatial prescribing" through better urban design. Hence urban design can be involved in the modifying, retrofitting and regenerating existing urban areas, so that the built environment can have healing and regenerative impacts on human health (Marsh and Rice, 2020). In this context the basic dimensions of urban design to ensure health may include, i. Morphological dimension ii. Perceptual dimension iii. Social dimension iv Visual dimension v. Functional dimension and Temporal dimension (Carmona *et al*, 2010). In the post COVID-19 world, there is a high need of health related evidence based urban design, to mitigate the impacts of pandemics. The urban design as a result has taken a new paradigm shift, which is portrayed to develop amicable relation between nature and health (Rice L.2020). The post COVID-19 new era has posed many questions to the contemporary urban design approaches, which has forced the designers for more urban resilience. The need for physical distancing and isolation has advocated polycentric cities rather than monocentric cities and the availability of daily needs on walkable distances in the neighbourhood becomes more important, as the people would avoid to travel in public transport to rush areas. The design of large parks and large dwelling blocks will also need rethinking, as such places don't have private spaces. The social distancing during pandemic have further isolate the societies, as the high reliance of the people on IT based networks have already fragmented the society. Hence the major focus for urban design teaching will be specific curriculum on *Socio-Spatial Justice*. This will require redesigning the relevant courses and practicum. The post COVID-19, urban planning and designing pedagogy will need to be focused on rebalancing the ecological system in a better way. The concept of "*Live in Harmony with nature"* appears to be more dominant in the post of COVID-19 (Attenborough 2019).

iii. Challenges of Teaching of Engineering and Construction Management in Pandemics: The imminent stress due to isolation and physical distancing of students in the post COVID-19, has led to many psychological, social and physiological issues. Design education has deep involvement of the students with the faculty and peers in development of the projects, assignments mostly in studios and their physical interaction is maximum during the classes and lab works. The sudden restrictions of physical interaction, through a series of lock downs, spanning for more than a year now, has serious repercussions on the teaching and learning of deign courses. Online support systems were set up by various Universities across the world for Engineering and Design programs, but these solutions are not sufficient to provide, the desired emotional and personal support required to reduce the pressure during COVID-19 (Rooij.R *et al.*,2020). Though, the more informal way of learning becomes difficult during online teaching, yet it has been observed that some preparatory work can be more rigorously done online. In the post COVID-19 era, blended learning model incorporating face to face on campus and online education may be used as an alternative but in both cases, the students' engagement becomes more important for teaching of design courses. The sessions have to be content rich in both the cases, so that the effectiveness of the blended system can be resulted.

In this research, the challenges and opportunities in teaching of design courses in Engineering and Construction Management programs have been assessed on the basis of literature review and questionnaire survey of the students of the design and Engineering schools and results have been shared.

2. **Problem Statement and Methodology**: Teaching and education of design based Engineering and Construction Management programs are faced with serious challenges after shifting of most of the teaching & learning to online modes during and post pandemic era. In this research
questionnaire survey was conducted to Engineering and construction Management students, through google form. The questionnaire mainly involved assessment of the perceptions of students and faculty about the use of online and blended education model for teaching of design and labs related courses. The survey was followed by online interviews with the faculty to assess their preparation and adaptability to the online & blended education during COVID-19.

3. Results:

3.1: Use of various platforms for teaching of Engineering and Construction Management courses:

A variety of technological platforms for teaching and learning were used, which included Corporate E-mails (35%), Webinars (20%), messengers (5%), Web and Cloud Services (10%), Model Simulations (15%), Labs not conducted (10%) and others (5%). The distribution has been given in Fig 1.

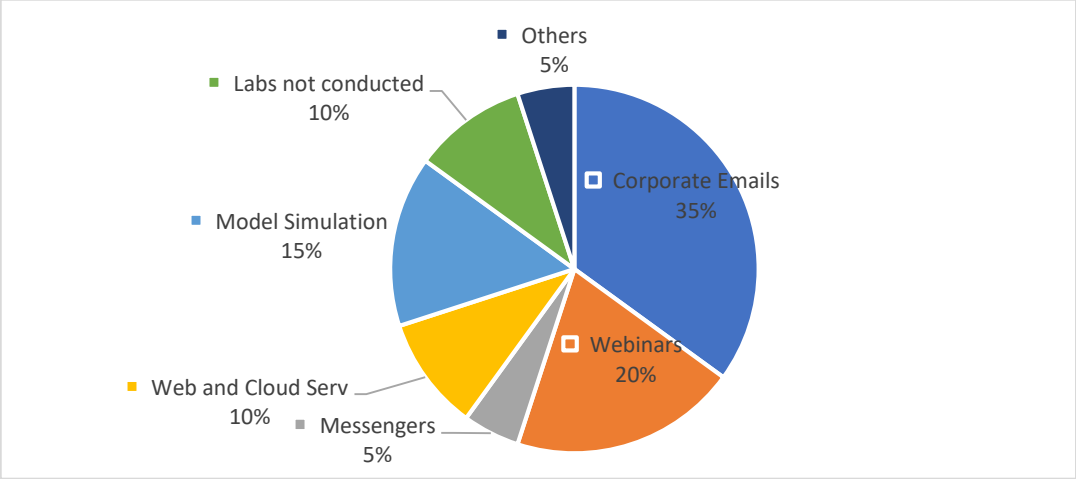

Fig 1. Use of various Technological Platforms for teaching of Engineering and Construction Management Courses.

4.2 ***Perceptions of students for Online Education of Urban Planning and Engineering courses:*** The sudden transition from purely face to face modes to online mode for teaching of design courses, certainly created many concerns amongst the students. Based on the post Spring 2020 semester review, it was revealed that almost 48.8% students regraded the online system as either good or very good. A big majority of students, declared it either satisfactory or poor (47.6%), whereas only 2.7% declared it, same as face to face education. The major impediments for effective online teaching of design courses, as identified by students are given in Fig 2. Students also reported psychological and social impacts of the lockdown, as they lost their contacts with the peers and project team members in face to face mode. In case of resurgence of COVID-19, beyond the Spring 2020 semester majority of the students (48%) preferred the face to face mode, whereas 32% opted for online education and 15% for hybrid learning. This shows reasonable acceptability of online and blended learning (combined 47%). Based on this analysis, the subsequent Fall 2020 semester was designed and implemented on hybrid/blended learning mode. ***iii. Teachers' Perceptions about Online system for teaching of design and Engineering Courses.***
The sudden transition to purely virtual platforms, created many challenges for faculty and teaching support staff as well. Majority of the teachers were though using the computerised design tools during face to face system, yet the online teaching and assessment still remained a major challenge for them. One of the major issues faced by almost all the faculty (81%) in teaching of design and Engineering courses was non availability of appropriate writing and sketching tools (digital pen) for online design work. The non-availability of personalized printer, scanner and plotter with the students and faculty was another major issue at their home places. Faculty also faced the technological issues such as non-availability of reliable high speed internet, professional webcam, licenced software for teaching and design exercises, non-availability of tablet etc. The major challenge was faced in the assessments, though a breadth of assessment tools were provided to the faculty by the Higher Education Commission and their institutes. The work study/teaching balance was another issue, as the teachers were required to develop their online lectures and record them for asynchronous teaching, which doubled their efforts. At the same time, their personal privacy and family lives were also compromised. In blended learning, when students were divided in 3-4 small cohorts, concerns were shared about the extensive teaching to the students. To address, this challenge the teaching was condensed to 75%, which again created quality challenges. These major challenges are given in Fig 3.

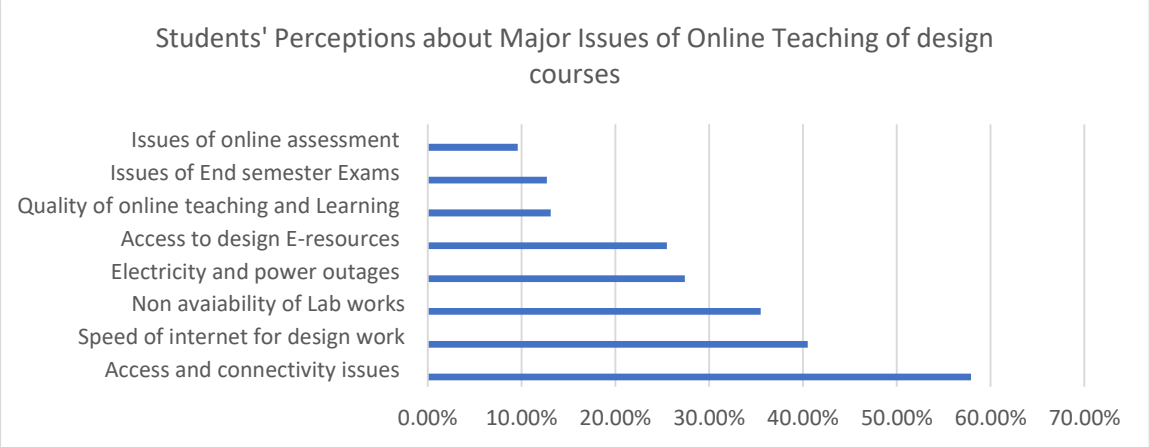

Fig 2. Students' Perceptions about the online teaching of Design Courses (n=175)

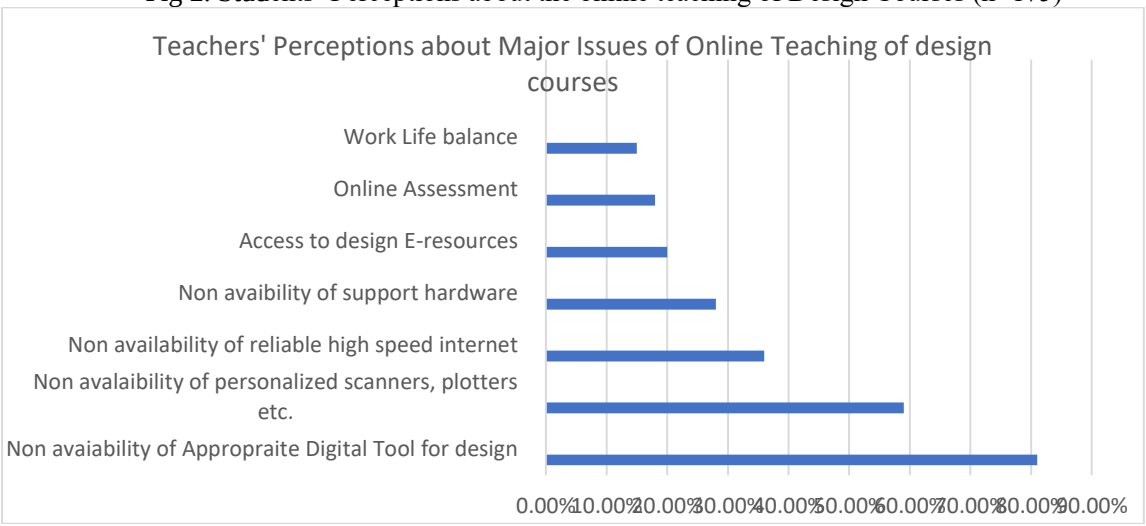

Fig 3. Major challenges for faculty of design schools during teaching and assessment of design courses in COVID-19.

iii. ***Logistic issues including hardware and software challenges***

Various technological teaching and learning provided ample free of cost courses for the benefit of students and faculty during COVID-19. The access to Open Educational Resources (OER), provided ample opportunities for students and faculty to learn from these resources. Yet the major challenges of appropriate teaching and assessment platform in terms of software and hardware was faced by all institutes. Faculty used various platform like Google meet®, Microsoft Team ® and Zoom ®, but all this software had their own limitation.s The availability of licensed software to students and faculty, online exams, online submission of assignments and time management remained major challenges.

iv. ***Limitations on design Labs during online teaching and learning:***

Based on the feedback from senior faculty and students, teaching of design lab work remained one of the major challenges. Design Teachers reported that a minimum of laptop of core i5 and window 2007 was required at the instructor's end for teaching of normal design Lab courses, however for high level courses, involving complex design solutions, Core i7 and latest version of Windows may be required. Besides licensed software, guidelines for online teaching of Lab work, its assessment, attendance mechanism, high speed internet with ample bandwidth and clear guidelines for assessment of design lab work will be required. The teaching of Design Lab will remain the major challenge, even if these supports are provided.

v. ***Guidelines of the Regulatory bodies for teaching and assessment of design and Engineering courses.***

Within the challenges of the online education and assessment for design and Engineering courses, the technology and design experts, still explored to innovate appropriate tools and processes to continue with the education during pandemics. Pakistan Engineering Council, the regulatory body for Engineering Education Town Planners (PCATP) for design and architecture education provided various guidelines in consultation with Higher Education Commission (HEC) of Pakistan. The important policy guidelines are reproduced as follows (PEC, 2020; PCATP, 2020).

- **Class size**: Online class was advised not to be greater than 100 for online engineering and design courses and 240 for non-engineering courses.
- **Content Delivery**: Faculty must be trained and assessed by a senior committee, with special reference to use of audio, video and sharing of screens and materials.
- **Attendance**: The Engineering and design schools, are responsible to introduce suitable monitoring & feedback evaluation mechanism to record/ log students' participation
- **Assessments and Quizzes**: Assessments, number of quizzes and type of assignments/PBLs/CEPs must be innovative enough to cover Course Learning Outcomes (CLOs) to attain respective Program Learning Outcome (PLOs) of the courses appropriately.
- **Final Year Design/Capstone Project (FYDP):** may be conducted by using computer-based simulation, presenting literature critiques or system designs etc. utilizing appropriate modern tool usage and technologies.

iv. ***Impact of COVID-19 on research activities in Engineering and design schools***

The ban on face to face interaction due to forced lockdowns for more than a year now, has seriously jeopardized the research interventions of the Engineering and design schools. The external evaluation of design works by juries and peers has restricted the inputs of the experts to the design reviews. Similarly, the research activities across the country and design schools in terms of face to face International and National Conferences, Workshops, Seminars, Colloquia etc. Nevertheless, the online platforms for teaching and learning provided ample opportunities for virtual research collaboration and virtual seminars and conferences have been increased manifold. These webinars, have replaced some of the isolation of students and faculty with involvement in the research activities. HEC, PEC and PCATP have provided guidelines for the external assessment of design work, final year projects and programs through virtual means.

iii. Conclusions and Recommendations:

The pandemic has certainly created serious issues for continuity of quality teaching and learning process for Engineering and Construction Management programs involving design interventions. Like other disciplines, various virtual portals have been used by the Engineering and design schools, yet the perceptions of the students and faculty remained varied. Majority of the students were not satisfied with the Lab work being offered through virtual platform. The major findings are summarised as follows:

i. Majority of the students, still support the Face to face teaching for effective teaching and learning process of Engineering and Design courses, especially the Lab design works.

ii. A number of issues have been identified by the students, impeding the effective teaching and learning process, which mainly include the poor access and connectivity to the internet, lack of availability of requisite technological gadgets for design work, issues with the assessments etc.

iii. The faculty at the other hand have also concerns about the virtual platforms which include non-availability of the requisite teaching tools, lack of capacity for online teaching and assessment, work life balance issues.

iv. The students and faculty has, even then supported to continue with virtual platform, blended with face to face teaching for limited time at the campus, so that they can manage their design & lab work on one hand and interact with their peers, teachers and class fellows to move out of the isolation.

Some of the major recommendations for effective teaching and learning of design and engineering courses are given as follows:

i. Substantial budgetary allocation required to both faculty and students for procurement of basic equipment for online teaching and learning of design courses. For access of faculty and students to reliable software and design tools, virtual desk top environment may be required.

ii. For strengthening of Lab work through virtual platforms, discussions, dialogues and problem solving activities may be encouraged.

iii. Repository of E-resources and recorded lectures may be provided to the students and faculty for asynchronous learning.

iv. References:

- Attenborough, D. 2019. New deal for nature. Speech to World Economic Forum, Davos 2019. 22 January 2019. https ://www.wwf. org.uk/updat es/sir-david -atten borough-calls -new-deal-nature (Accessed March 3,2021).
- Carmona, M., T. Heath, S. Tiesdell, and T. Oc. 2010. Public places, urban spaces: The dimensions of urban design. London: Routledge.

- Chinazzi, M., Davis, J. T., Ajelli, M., Gioannini, C., Litvinova, M., Merler, S., ... Viboud, C. (2020). The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak. Science. https://doi.org/10.1126/science.aba9757
- Dore, B. 2020. Covid-19: Collateral damage of lockdown in India. BMJ. https://doi.org/10.1136/bmj.m1711.
- Douglas, M., S.V. Katikireddi, M. Taulbut, M. McKee, and G. McCartney. 2020. Mitigating the wider health effects of covid-19 pandemic response. BMJ. https://doi.org/10.1136/bmj.m1557.
- Gewin V: Five tips for moving teaching online as COVID-19 takes hold . Nature. 2020, [Epub ahead of print] :10.1038/d41586-020-00896-7
  Hopman, J., Allegranzi, B., & Mehtar, S. (2020). Managing COVID-19 in Low and Middle income Countries. JAMA. https://doi.org/10.1001/ jama.2020.4169 https://doi.org/10.1002/pa.2355
- Kraemer, M. U., Yang, C. H., Gutierrez, B., Wu, C. H., Klein, B., Pigott, D. M., ... Brownstein, J. S. (2020). The effect of human mobility and control measures on the COVID-19 epidemic in China. Science. https://doi.org/10.1126/science.abb4218.
- Marsh, R., P. Pilkington, and L. Rice. 2020. A guide to architecture for the public health workforce. Public Health 178: 120–123.
- N., A. Brambilla, F. Caracci, and S. Capolongo. 2020. Synergies in Design and Health. The role of architects and urban health planners in tackling key contemporary public health challenges. Acta Biomed 91 (3): 9–20.
- Nic Beech and Frederik Anseel (2020) COVID-19 and Its Impact on Management Research and Education: Threats, Opportunities and a Manifesto *British Journal of Management, Vol. 31, 447–449 (2020)* DOI: 10.1111/1467-8551.12421
- Nicola F.S. Dirk K, Alexander L, Irina P (2020) The long-term distributional and welfare effects of COVID-19 school closure" NBER working paper series working paper 27773 http://www.nber.org/papers/w27773 national bureau of economic research 1050 Massachusetts avenue Cambridge, ma 02138 September 2020.
- Ogunode N.J , Abigeal.I, Lydia, A. E. ISSN: 2706 – 8242 Apr - Jun 2020 126 Impact of COVID-19 on the Higher Institutions Development in Nigeria, Research Journal of Social Sciences and Humanities Vol 2: Issue II
- PCATP Policy Guidelines for Online Teaching-Learning and Assessment Implementation during COVID-19 Pandemic (2020), Available at https://www.pcatp.org.pk/document/Policy%20PDF%2020-4-2020%20final.pdf.
- PEC Policy Guidelines for Online Teaching-Learning and Assessment Implementation during COVID-19 Pandemic (Approved in (96th EAB meeting dated April13,2020) Available at https://www.pec.org.pk/downloads/PEC%20Policy%20Guidelines%20for%20OnlineTLA%20Implementation%20during%20COVID-19%20Pandemic%20Ver1.pdf. Retrieved on April 20, 2021
- Rice, L. 2019. A health map for architecture: The determinants of health and wellbeing in buildings. In Designing for health & wellbeing: Home, city, society, ed. M. Jones, L. Rice, and F. Meraz, 155–184. Delaware: Vernon Books
- Rice, L. After Covid-19: urban design as spatial medicine. Urban Des Int (2020). https://doi.org/10.1057/s41289-020-00142-6.
- Rooij R, Aalbers K, Hausleitner B, Newton C and Rocco R (2020) Education for the resilient city – teaching and learning urban design and planning in Covid-19 times-Proceedings of the Institution of Civil Engineers – Urban Design and Planning 173(4): 119–124, https://doi.org/10.1680/jurdp.20.00052
- Saavedra J. (2020) Educational challenges and opportunities of the coronavirus (COVID-19) pandemic. World Bank Blogs, 2020
- Tinggui Ch, Lijuan P , Xiaohua Y , Jingtao R , Jianjun Y (2020), "Analysis of User Satisfaction with Online Education Platforms in China during the COVID-19 Pandemic" Healthcare 2020, 8, 200; doi:10.3390/healthcare8030200.
- Wang, G., Zhang, Y., Zhao, J., Zhang, J., & Jiang, F. (2020). Mitigate the effects of home confinement on children during the COVID-19 outbreak. The Lancet, 395(10228), 945-947.