

Digitalization of Traditional Classrooms: A Students' Perspective

Dhananjay Ashri¹, Bibhu Prasad Sahoo² and Simarpreet Kaur³

¹SGTB Khalsa College, University of Delhi, Delhi, India

²Department of Business Economics, SGTB Khalsa College, University of Delhi, India

³SGTB Khalsa College, University of Delhi, Delhi, India

E-mail: ¹<ashreedhananjay@gmail.com>, ²<bpsahoo@sgtbkhalsa.du.ac.in>, ³<simarpreetkaur6@gmail.com>

KEYWORDS Covid-19. Education. Online Classes. Pandemic. Traditional Classroom

ABSTRACT Covid-19 is fiercely hurting the field of academics and education. Millions of learners and teachers and educational institutions have been adversely affected. Educational institutions have scrapped traditional physical classroom teaching during these challenging times and have adopted e-learning models. However, there exist many discrepancies in the process of digitalization of classrooms. Therefore, this present study aims to evaluate the ramifications of the Covid-19 pandemic on the education sector and provide a student-oriented perspective to address the challenges in this process. The study is based on an independent online survey conducted by authors in which 212 undergraduate students of one of India's prestigious universities, the University of Delhi, have participated. The survey unveiled that many colleges are arranging online classes for students via various technological platforms available such as Google Meet, Zoom, MS Teams, Skype, etc. However, it has been observed that almost half of the students are attending classes irregularly and do not possess requisite study material for self-study. The survey reports that many students face depression and anxiety-related problems during the lockdown period. Other issues include improper internet connectivity and the non-availability of the devices. About three-fourth of students have expressed their concerns that education may become a costly affair for them as their family income dwindles. The study stresses developing more innovative and interactive teaching methods, as online teaching is monotonous and dull. Covid-19 has led to a decline in the students' family income, making education costly to many students. More innovative teaching practices for better learning experiences and adequate funding of the educational institutes for infrastructural development is the need of the hour.

INTRODUCTION

Globalization has made the entire world more interconnected, and so also the risks we face. The ramifications of Covid-19, which initially started in China, can be felt across the globe. The epidemic has severely affected the world economy, and education is no exception. In light of public health, most countries around the world have closed public institutes, schools, colleges, and offices, halting construction activities, etc. As per UNESCO (Table 1), in India, over 320 million learners are out of the classroom, out of which 158 million are male, and over 162 million are females. Furthermore, UNESCO (Table 2) has stated that 10 million students are affected at the pre-primary level, out of which 4.5 million are female, and 5.4 million are male. At the primary,

secondary, and tertiary levels, about 143 million, 133 million, and 34 million students are affected.

Table 1: Affected learners in India

Affected learners	320,713,810
Total male	158,158,233
Total female	162,555,577

Source: UNESCO

Table 2: Affected learners in India based on school type

School type	Females	Males	Total
Pre-primary	4,557,249	5,447,169	10,004,418
Primary	72,877,621	70,349,806	143,227,427
Secondary	63,983,677	69,160,694	133,144,371
Tertiary	16,739,686	17,597,908	34,337,594

Source: UNESCO

These measures have disrupted conventional teaching practices and have forced the education institutes to shift to e-learning platforms. This dramatic shift has caused havoc and has unveiled the inequalities in the education sys-

Address for correspondence:

Dr Bibhu Prasad Sahoo,

E-mail: bpsahoo@sgtbkhalsa.du.ac.in

Dhananjay Ashri,

E-mail: ashreedhananjay@gmail.com

tem. Inaccessibility of internet connectivity, little face-to-face interaction between the teacher and the student, and computer illiteracy are some of the online education system's mounting problems. Both the students and teachers find it challenging to adapt to new teaching modes, and therefore, the e-learning process becomes boring. These problems contribute immensely to the students' skill loss, as the students, especially in the marginalized groups, fail to develop cognitive skills. Hanushek and Woessmann (2020) argue that skill loss due to learning loss will result in productivity loss. They further estimate a loss of 1.5 percent to the GDP for the rest of the century, equivalent to USD 15.3 trillion.

The pandemic has forced the countries to shut their borders, which has posed problems for international students. International students cannot return to their home countries, and without the support of families, they face a risk of isolation during this pandemic. Students who are enrolled in their home countries are not able to create an on-campus learning experience. Booming cities have turned into dormitory towns due to Covid-19, and the repercussions can also be seen in the educational institutions. Initially, the institutes were reluctant to resort to online platforms; however, this crisis has forced the institutes to substitute classroom learning with e-learning. Dhawan (2020) has even termed online teaching and learning as a "panacea for the crisis." Considering online learning and teaching as a cure-all for the education sector may be right to an extent. As Carey (2020) stated, educational institutions' concern should be to adopt and adapt online learning on a massive scale. Reluctance to change during these tough times will not be fruitful for the academic institutions; instead, they work too fast to imbibe the curriculum changes and maintain the quality of education. According to Chen (2010) and Yengin et al. (2011), various platforms and technologies such as Zoom, Google classroom, Webex Blackboard, Microsoft platform available are the torchbearers for the growth of the edtech industry globally. Reopening educational institutions will benefit students, but this step calls for a trade-off between education and public health. Schleicher (2020) mentions that several measures can be taken, such as establishing hygiene protocols, physical distancing, and revising atten-

dance policies to cope with the virus. Many scholars have argued that online classes remedy the education system's sufferings for this crisis.

It is apt to say that changes cannot be introduced overnight. Liguori and Winkler (2020) identify distance, scale, and personalized teaching and learning as the biggest hurdles for online teaching and suggest that institutes work to innovate education. Song et al. (2004) and Parkes et al. (2014) identify mediocre course content, technical problems, lack of face-to-face interaction, and unpreparedness for the learning management system as the major hurdles in online learning. In an independent survey by Kapasia et al. (2020), the various issues faced by undergraduate and postgraduate students in West Bengal included depression and anxiety, improper connectivity of the internet, and inadequate study environment at home. Shahzad et al. (2020) commented that males and females in Malaysian Universities have a different level of usage of e-learning portals. This depicts the difference in the accessibility of the e-learning portal within the university students. Manzoor (2020) has stressed the challenges faced by hearing-impaired learners.

According to Kumar (2020) and Strielkowski (2020), the education system has transformed drastically during these corona times. Online lectures, open-book examinations, and online tests have re-shaped the education system. Raju (2020) has stressed the need for innovation in teaching to conquer mental stress and anxiety. Gao et al. (2020) and Duan et al. (2020) have expressed their concerns over children's and adolescents' mental health and have found clinical symptoms among them amidst the pandemic. According to them, smartphone and internet addiction have magnified anxiety levels among children and adolescents. Wang et al. (2020) state that e-learning can be dull and monotonous. Gonzalez et al. (2020) have unveiled a significant positive impact on students' learning and performance by adopting online strategies.

The challenges to the education sector do not end here. This epidemic's economic hiccups may decline education expenditure and the education system's privatization. The insufficient investment in the public sector and private players' entrance will make education unaffordable

for the marginalized learners and further increase the inequities.

However, this pandemic has provided a golden opportunity for the edtech industry to bloom. The edtech industry was flourishing even before Covid-19, and the industry was expected to reach USD 350 in 2025. Expeditious technological developments and growing demand for higher education due to the growing population have made distance learning easy (McBrien et al. 2009). Brianna et al. (2019) believe that edtech companies can help students a lot during these tough times. These dramatic changes in the education system have led to a significantly high demand for online learning platforms and have further boosted the industry.

Objective of the Study

Covid-19 has hit the economy hard, and the education sector too has been affected. The lockdown period has put hurdles in the teaching-learning process, as the education institutions are forced to shut their doors. Many scholars have characterized the online teaching-learning process as discriminatory to marginalized students. Therefore, it becomes vital to examine the education sector's condition by emphasizing the learners. This study aims to assess the learning status and problems related to the education sector amidst the pandemic.

METHODOLOGY

This study is based on an online survey conducted from October 10 to October 18, 2020. The study is based on the 212 undergraduate students of various colleges of University of Delhi. A well-framed and structured questionnaire was prepared using 'Google Form' and was floated among the students through WhatsApp and Email. The survey was conducted from September 12 to September 16, 2020. Descriptive statistics were carried out to understand the distribution of the data collected. A simple percentage distribution was estimated to assess the learning status and the students' perspective on the online classes. The survey was also used to inspect the mode of learning and the opinion of the students on the educational decisions made by the higher authorities. All the analyses were carried out using Microsoft Excel and SPSS.

RESULTS

Table 3 depicts the attributes of student participants. A total of 212 students participated in the online survey, and the median age is reported at 20 years. Out of 212 students, 96 were male, and 110 were females. However, six students preferred not to say their gender. Almost 45 percent of the students belonged to the general category, while 24.06 percent and 23.11 percent of the total students belonged to the Economically Weaker Section (EWS) and Other Backward Classes (OBC). However, seven students (3.30%) belonged to Scheduled Caste (SC), while nine students (4.25%) belonged to the Scheduled Tribe (ST) category. Out of 212 students, 116 students reported that they reside in the Delhi NCR region, but 96 students do not live in Delhi NCR. Almost two-fifths of the total students have monthly family income between INR 25,000 and INR 50,000, whereas one-fourth of the total students have family income above INR 1,00,000. Out of 212 students who have participated in this survey, 16 students (7.55%) have

Table 3: Attributes of the students

<i>Attributes</i>	<i>No. of students (n)</i>	<i>Percentage (%)</i>
<i>Age of the Students</i>		
Median age	20	
Above 18 but below 20	147	69.34
21 or above	65	30.66
<i>Gender</i>		
Male	96	45.28
Female	110	51.89
Prefer not to say	6	2.83
<i>Social Group</i>		
General	96	45.28
Economically weaker section	51	24.06
Other Backward Classes	49	23.11
Scheduled Caste	7	3.30
Scheduled Tribe	9	4.25
<i>Residential Area</i>		
Delhi NCR	116	54.72
Outside Delhi NCR	96	45.28
<i>Monthly Income of the Family</i>		
Below 25000	16	7.55
25000-50000	84	39.62
50000-100000	59	27.83
Above 100000	53	25.00
<i>Stream of Study</i>		
Science	35	16.51
Commerce	121	57.08
Arts	56	26.42

reported a family income below INR 25,000, and 59 students (27.83%) have a family income between INR 50,000 and INR 1,00,000.

Table 4 provides insights into the status of online classes and the online learning process. It has been reported that Google meets (28.77%), and Zoom (23.11%) is the most popular platform for arranging online classes, followed by MS Teams (18.40%) and College-owned portal (21.70%). However, Skype (4.25%), Audio Materials (2.83%), and YouTube (0.94%) are also other platforms for arranging online classes. WhatsApp (48.11%), Google Classroom (38.68%), and Insti-

Table 4: Status of online classes and online learning

<i>Variables</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
<i>Platforms Used for Teaching</i>		
Google Meet	61	28.77
Zoom	49	23.11
MS Teams	39	18.40
Skype	9	4.25
Audio Material	6	2.83
Institution's Website	46	21.70
YouTube	2	0.94
<i>Platform Used to Share Study Material</i>		
WhatsApp	102	48.11
Google Classroom	82	38.68
Skype	4	1.89
Institution's Website	24	11.32
<i>Platform Used for Internal Assessment</i>		
WhatsApp	52	24.53
Google Classroom	69	32.55
Institution's Website	23	10.85
Skype	6	2.83
Google Form	56	26.42
Not yet evaluated	6	2.83
<i>Attendance</i>		
Less than 25%	69	32.55
25% to 50%	75	35.38
50% to 75%	48	22.64
More than 75%	20	9.43
<i>Gadgets For Attending Online Classes</i>		
Mobiles	136	64.15
Laptop	62	29.25
PC	14	6.60
<i>Possession of the Gadgets</i>		
Own	167	78.77
Hired from someone else	45	21.23
<i>Attended Classes Before Lockdown</i>		
Yes	156	73.58
No	56	26.42
<i>Books Purchased Yet</i>		
Yes	47	22.17
No	165	77.83

tion's website (11.32%) are the widely used platforms for sharing class notes and study materials, whereas Skype (1.89%) is the least used platform. For internal assessment, most of the students have responded that Google Classroom (32.55%), Google Form (26.42%), and WhatsApp (24.53%) are the most used platforms. However, fewer students have used the Institution's website (10.85%) and Skype (2.83%). It was also found that about 2.83 percent of the students have not been evaluated yet.

Table 3 further reveals that 32.55 percent of the students have attended less than one-fourth of the total online classes, while only 9.43 percent of the students have attended more than three-fourth of the total courses. Most of the students (35.38%) have an attendance percentage between 25 percent and 50 percent. However, almost one-fifth of the students have an attendance percentage between 50 percent to 75 percent. Nearly three-fifths of the total students use their mobiles to join online classes; 29.25 percent of the total students use laptops to connect to the online courses, and few students (9.43%) use PC. In the survey, it was found that almost one-fifth of the students do not own gadgets for attending online classes, whereas others possess their gadgets for attending online courses. About one-fourth of the students were regularly attending the classes before the Covid-19 pandemic. More than three-fourths of the students does not have requisite material, that is, books for studying.

Table 5 summarizes the problems of the students pertaining to online teaching and online learning processes. Half of the students have reported problems related to depression and anxiety. One-fourth of the students do not pos-

Table 5: Problems related to online classes

<i>Variables</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
Problems related to depression and anxiety	112	52.83
Do not have proper gadgets	52	24.53
Do not have proper studying environment	183	86.32
Do not have proper internet connectivity	149	70.28
Lacks motivation to attend online classes	198	93.40

sess the proper gadgets to attend online classes, and almost 70 percent of the students face internet connectivity issues. Nearly 85 percent of the students have an improper studying environment at home. However, the major problem identified by looking at the survey results seems to be a lack of motivation among the students.

Table 6 summarizes how the economic ramifications of Covid-19 may affect the education of the students. The survey revealed that due to economic hiccups caused by Covid-19, about 45 percent of the students had reported a fall in their family income. Furthermore, 72 students believe that this fall in income will adversely impact their education due to various reasons. Out of 72 students, 70 percent of the students think that they will not be able to afford hostel and PG expenses, whereas 25 percent believed that they would not be able to pay college fees.

Table 6: Impact of Covid-19 related economic ramifications on education

<i>Variables</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
<i>Do you think your family income has dwindled?</i>		
Yes	96	45.28
No	116	54.72
<i>Do you think your education will be negatively affected due to decline in the family income?</i>		
Yes	72	33.96
No	140	66.04
<i>Why do you think your education will be negatively affected</i>		
Not able to afford hostel/PG expenses	51	70.83
Not able to pay college fees	18	25.00
Reasons not mentioned	3	4.17

DISCUSSION

This pandemic questions on the preparedness of Indian education institutes to adapt to a dynamic environment. A substantial proportion of the students are compelled to switch to the e-learning process and face many challenges daily. This time calls for infrastructural development of the educational institutions and initiation of facilities to monitor the classrooms' digitalization.

The survey unveiled that institutions have switched to online platforms to share study material and arrange online classes, Zoom, Google Meet, and Google Classroom is the most used platforms. Many colleges have developed their platforms for arranging online classes. However, there is a difference in the usage of the portal among the students. In other words, the portal's accessibility varies from student to student, thereby affecting the process of e-education. Therefore, the quality of education via the Institution's portal is questionable. The survey has also revealed the attendance of the students in the online classes. It has been found out that almost one-half of the students have been attending classes irregularly and have attended less than 50 percent of the classes. Moreover, most of the students have not purchased books and lack proper study material for self-study.

The survey further revealed the problems faced by the students due to online classes. Students have been suffering from issues related to depression and anxiety. Amidst the pandemic, concerns over children's and adolescents' mental health are bona fide. Smartphone and internet addiction have magnified anxiety levels among children and adolescents. The non-availability of proper gadgets and lack of adequate internet connectivity often hampers the learning process via an online medium to add to its misery. However, one of the significant hurdles in the e-learning process is the learners' lack of motivation. E-learning can be dull and monotonous. Therefore, teachers have to develop unique and innovative styles for a better learning experience. Covid-19 pandemic has hit the Indian economy hard, and the repercussions can also be seen upon the students' family income. As the family income starts to dwindle, the students start viewing education as a costly affair. Therefore, students might opt to discontinue their knowledge.

To cope with the education system's current conditions, an initiative was taken up by the Ministry of Human Resource Development to develop an app "E-Pathshala." It helped create a common platform to provide all the materials related to NCERT textbooks and modules for training teachers. Other apps, such as EPG Pathshala and NROER, have also been developed. EPG Pathshala caters to class primary and sec-

ondary education, while NROER caters to undergraduate and postgraduate courses. However, more innovative teaching practices for better learning experiences and adequate funding of the educational institutes for infrastructural development need the hour.

Initiatives have been taken by the Ministry of human resource department and respective bodies in each field. They have come up with different platforms where students, teachers, and parents can have the curriculum's resource material. Few of those initiatives include ePathshala, a common platform for everyone who needs school study material. NCERT books, training modules for teachers, and many more can be availed from this app. The second one is "NROER- a National Digital Repository for Open Educational Resources," a platform with all languages resource material following the slogan "education to all" gives its readers access. Then comes the EPG Pathshala, all postgraduates can refer to this platform for their studies, resource material for all streams are available in it. It is then "DIKSHA," which is made explicitly for training teachers; well-equipped modules and unique classroom teaching theories can be availed from this app.

This pandemic may be seen as an opportunity to reinvent the education policy. Traditionally, bringing down the teacher-student ratio and constructing new schools is considered a barometer for growth in education rather than actual learning outcomes. New Education Policy (2020) can be seen as a good step in this direction. It focuses on Vocational and Technical Education and Training (VTET) for skill development at the school level. The new policy allows the Indian universities to open campuses in foreign countries and foreign universities to open campuses in India. This can help to reduce brain drainage. However, the universities' major challenges are to make the curriculum relevant and adapt to the ever-changing environment.

CONCLUSION

The survey was conducted to assess online learning and online teaching practices during corona times and analyze the pandemic's impact on the education sector. The survey targeted undergraduate students of the University of Delhi colleges. In the survey, 212 students participated. The discussions in this section are

based on this survey, and the survey has shown that the closure of colleges has led to turmoil in the academic sphere.

The survey unveiled that institutions have switched to online platforms to share study material and arrange online classes. However, there is a difference in the usage of the portal among the students. In other words, the portal's accessibility varies from student to student, thereby affecting the process of e-education. Online classes have a detrimental impact on the attendance of the students. Most of the students have not purchased books and lack proper study material for self-study. Therefore, the quality of education via the Institution's portal is questionable. The survey further revealed the problems faced by the students due to online classes. Students have been suffering from issues related to depression and anxiety. Amidst the pandemic, concerns over children's and adolescents' mental health are bona fide. Smartphone and internet addiction have magnified anxiety levels among children and adolescents. The non-availability of proper gadgets and lack of adequate internet connectivity often hampers the learning process via an online medium to add to its misery. However, one of the significant hurdles in the e-learning process is the learners' lack of motivation. E-learning can be dull and monotonous. Therefore, teachers have to develop unique and innovative styles for a better learning experience. Covid-19 pandemic has hit the Indian economy hard, and the repercussions can also be seen upon the students' family income. As the family income starts to dwindle, the students start viewing education as a costly affair. Therefore, students might opt to discontinue their knowledge.

Urgent actions are required to be taken to cure the problems of the education sector. The loss or degradation of education systems leads to skill loss and puts restrictions on economic activities. Disruption of education leaves children exposed to child labor risks, early marriages, and recruitment into armed forces. Universities, colleges, and schools need to find new ways to continue amidst the pandemic.

RECOMMENDATIONS

To cope with the pandemic first and foremost step while reopening, the concerned authorities should follow all the preventive mea-

asures to cut down the chain of virus transmission. As we know that educational institutions have been closed since the pandemic has shown its harsh effect on the education sector. The teaching-learning process has been shifted to virtual platforms. Therefore, electronic gadgets such as mobile phones, tablets, and laptops or computers have become a blood for the education sector. In a developing country like India, poor and marginalized students find it hard to arrange required electronic gadgets. Subsidies on the electronic gadgets or providing the gadgets free of cost to needy students by the government or the concerned/responsible authorities can be initiated. Students who are facing difficulties in having access to online teaching could be resolved. Another most persistent problem is the lack of internet connectivity. The Internet penetration rate in India stood at 48.48 percent in 2019. If this digital divide continues to blossom, it will make online education discriminatory and often hurt students who have financial restrictions. Therefore, this pandemic calls for more investment, at both central and state levels, in the development of IT infrastructure. Robust IT infrastructure is the pre-requisite to ensure digital learning possible during and after the crisis. Universities need to revamp their curriculum and make it more innovative and interactive. Carrying out a traditional pen and paper teaching often makes online classes dull. Further research needs to be carried out to develop a curriculum that makes “learning via engaging” an integral part of online courses.

Continuous efforts to strengthen up the education sector amidst the Covid-19 pandemic needs to be taken. The biggest lesson from this pandemic for the education system is that everything is unpredictable. We need to be ready to face the challenges as we can see that many such methods have been implemented, which were expected to come in the following years but not this much early. It has given a signal that authorities must be ready for further changes in the system rapidly. To match the speed of this fast-changing environment of study, the concerned bodies need to reimagine the education system with proper research and accelerate the change in teaching and learning.

LIMITATIONS OF THE STUDY

The present study is based on an online survey conducted by the authors. The study highlights the student’s perspective on the effect of Covid-19 on the academic sphere. The research can help policymakers gain insights into the education system’s various issues amidst the lockdown and corona pandemic. Policymakers shall formulate policies by considering the learner’s perspective to ensure a better e-learning experience and skills development. In the survey, only 212 undergraduate students of the University of Delhi have participated. To gain a more comprehensive view, the sample size can be increased by taking more colleges in the Delhi region and colleges across India.

Furthermore, this study’s scope can also be extended to primary, secondary, and higher education institutes by taking students’ and teachers’ perspectives and parents. Coronavirus has hit the world economy hard, and the definition of ‘normal’ is changing day by day. Therefore, we need to gain insights into the ever-changing world.

REFERENCES

- Brianna D, Derrian R, Hunter H, Kerra B, Nancy C 2019. Using EdTech to enhance learning. *International Journal of the Whole Child*, 4(2): 57–63.
- Carey K 2020. Everybody Ready for the Big Migration to Online College? Actually, No. The New York Times. From <<https://www.nytimes.com/2020/03/13/upshot/coronavirus-online-college-classes-unprepared.html>> (Retrieved on 24 July 2020).
- Chen HJ 2010. Linking employees’ e-learning system use to their overall job outcomes: An empirical study based on the IS success model. *Comput Educ*, 55(4): 1628–1639. <https://doi.org/10.1016/j.compedu.2010.07.005>.
- Dhawan S 2020. Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, 49(1): 5-22. <https://doi.org/10.1177/0047239520934018>.
- Duan L, Shao X, Wang Y, Huang Y, Miao J, Yang X, Zhu G 2020. An investigation of mental health status of children and adolescents in china during the outbreak of COVID-19. *Journal of Affective Disorders*, 275: 112-118. <https://doi.org/10.1016/j.jad.2020.06.029>
- Gao J, Zheng P, Jia Y, Chen H, Mao Y, Chen S et al. 2020. Mental health problems and social media exposure during COVID-19 outbreak. *Plos One*, 15(4): e0231924.
- Hanushek EA, Woessmann L 2020. The Economic Impacts of Learning Losses. *OECD Education Working Papers No. 225*. <https://doi.org/10.1787/19939019>.

- Kapasnia N, Paul P, Roy A, Saha J, Zaveri A, Mallick R et al. 2020. Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India. *Children and Youth Services Review*, 116: 105194. <https://doi.org/10.1016/j.childyouth.2020.105194>.
- Kumar DNS 2020. Impact of Covid-19 on Higher Education. Higher Education Digest. From <<https://www.highereducationdigest.com/impact-of-covid-19-on-higher-education/>> (Retrieved on 15 July 2020).
- Liguori EW, Winkler C 2020. From offline to online: Challenges and opportunities for entrepreneurship education following the COVID-19 pandemic. *Entrepreneurship Education and Pedagogy*. <https://doi.org/10.1177/2515127420916738>
- McBrien JL, Cheng R, Jones P 2009. Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *The International Review of Research in Open and Distributed Learning*, 10(3): 1–17.
- Manzoor A 2020. Online Teaching and Challenges of COVID-19 for Inclusion of Persons with Disabilities in Higher Education. From <<https://dailytimes.com.pk/595888/online-teaching-and-challenges-of-covid-19-for-inclusion-of-pwds-in-higher-education/>> (Retrieved on 23 July 2020).
- Parkes M, Stein S, Reading C 2014. Student preparedness for university e-learning environments. *The Internet and Higher Education*, 25: 1-10 <https://doi.org/10.1016/j.iheduc.2014.10.002>
- Raju H 2020. Covid-19 Lockdown-Challenges to Higher Education, Dr. AIT, ECE Bengaluru, (Ongoing Project). [20944/preprints202004.0201.020944/](https://doi.org/10.20944/preprints202004.0201.020944/).
- Schleicher, A. 2020. The Impact of Covid-19 on Education Insights From Education at a Glance 2020. From <<https://www.oecd.org/education/the-impact-of-covid-19-on-education-insights-education-at-a-glance-2020.pdf>> (Retrieved on 23 August 2020).
- Shahzad A, Hassan R, Aremu AY et al. 2020. Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female. *Qual Quant*. <https://doi.org/10.1007/s11135-020-01028-z>
- Song L, Singleton ES, Hill JR, Koh MH 2004. Improving online learning: Student perceptions of useful and challenging characteristics. *The Internet and Higher Education*, 7(1): 59–70.
- Strielkowski W 2020. COVID-19 pandemic and the digital revolution in academia and higher education. *Preprints*, 2020040290. <https://doi.org/10.20944/preprints202004.0290.v1>
- 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. [https://doi.org/10.1016/S0140-6736\(20\)30547-X](https://doi.org/10.1016/S0140-6736(20)30547-X)
- Yengin I, Karahoca A, Karahoca D 2011. E-learning success model for instructors' satisfactions in perspective of interaction and usability outcomes. *Procedia Computer Science* 3: 1396–1403. <https://doi.org/10.1016/j.procs.2011.01.021>.

Paper received for publication in October, 2020
Paper accepted for publication in November, 2020