

Technology contribution in higher education during COVID-19

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ABSTRACT

This paper investigates the role of information technology in higher education during COVID-19 as a stand-in teaching and learning platform. If this outbreak lasts longer than expected, educational institutions, particularly universities, will have no choice but to hold their events remotely. We tried to figure out what elements both students and teachers consider when using tech tools and techniques. We conducted an online survey using a Google Form to collect structured questionnaires. By learning unique mechanisms through an online class, learners can add value and retain knowledge, as individual learning dashboards help them check their capability more often than offline. Students can improve their global collaboration skills by participating in online class activities. They found IT useful for group presentations where they needed to communicate with their group members. The faculty are aware of the online classroom techniques. Faculty believe online platforms help students learn online etiquette, including writing emails, as well as complex problem-solving skills. Online teaching also helps faculties stay up to date on their subjects. More factors could have been identified if the sample size had been larger.

Keywords:

Technology, Contribution, ICT, Higher-Education, COVID-19, Bangladesh

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1. INTRODUCTION

The world is fighting coronavirus disease epidemic in 2019, simply known as COVID-19. Due to this, a global health crisis has been evolved cause a severe effect not only on social life but also on family life. Organizations are also under threat, where many start-ups are going to be shut down (frontiersin.org, 2020). The situation is also acute in tertiary level education systems for the universities which don't have a robust infrastructure for providing online education. Both students and faculties have to be skilled in delivering and receive benefits offered by Technology. According to the world bank (blogs), massively open online courses, or MOOCs- enroll thousands of students concurrently with various subjects and topics (TRUCANO, 2014). Previous researches dealt with Technology and higher education only where our paper tries to show the impact of Technology on continuing higher education during the epidemic. We have emphasized on tracing the reasons based on which students and teachers interact in online learning.

2. LITERATURE REVIEW

Shenoey et al. (2020) found that at the time of lockdown for COVID-19, despite fear, anxiety, nothing but the technology adoption longing faculties to involve various online modes of teaching and learning. They described issues like technology adaptation, education, and knowledge engagement, students' engagement, faculty experience. (Samuels, 2010) said that the negative impact of COVID-19 could be minimized by addressing social distancing. Decree that all sorts of work, education, and entertainment doings are home-centered. (CPG, 2020) mentioned that challenges are being arisen from the Covid-19 spread; hence, to accelerate the use of modern technologies and tools as people go into lockdowns. They are forced to work even residing at their home with digital connectivity. (UNESCO, 2020) stated that throughout the world, most governments have temporarily closed down their educational institutions to control the spread of COVID-19 pandemic. For this reason, more than 90% (290) million of the world's student population will be impacted. (UNESCO, 2020) also suggested that in response to educational institutions' closures, the utilization of distance learning programs and open educational applications and platforms can be used to succeed in learners remotely and limit the disruption of education must be ensured.

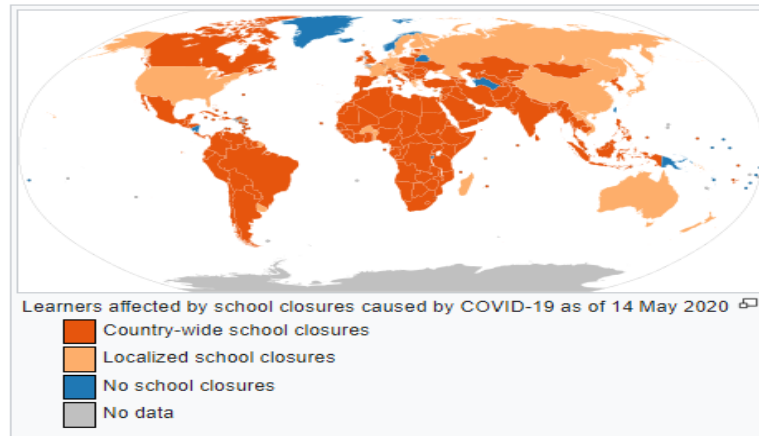


Fig. 1. Learners affected by school closures, Source: (Wikipedia, 2020)

As of 18 May 2020, in response to the pandemic, approximately 1.725 billion learners are affected because almost all educational institutions are closed down. According to UNICEF observation, 156 countries are currently implementing nationwide closures where 29 are implementing local closures, and 98.5 percent of the world's student population is being affected (UNESCO, 2020). This pandemic influences on various issues like social and economy consisting of student debt (Josh & Joshua, 2020), food insecurity (Cory & Anya, 2020), homelessness (Sessoms, 2020), digital learning (Paul & Michael, 2020), as well as disability services (Nadworny & Kamenetz, 2020). The impact was severe for disadvantaged students and their families owing to interrupted learning, tuition fees, and economic cost to families without work (Reuters, 2020). So, to overcome the interrupted education, UNESCO suggested the use of distance learning programs as well as keep the educational applications open and create the platforms so that institutions and teachers can reach learners or students remotely and make limit the education disruption as much as possible (UNESCO, 2020)

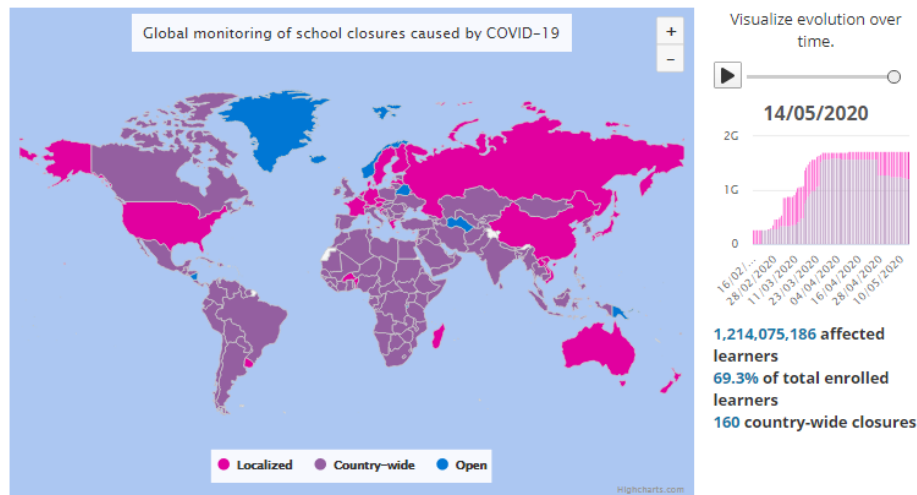


Fig. 2. "Figures correspond to the number of learners enrolled at pre-primary, primary, lower-secondary, and upper-secondary levels of education [ISCED levels 0 to 3], as well as at tertiary education levels [ISCED levels 5 to 8]. Enrolment figures based on the latest UNESCO Institute for Statistics data".

Source: (UNESCO, 2020)

The structure of schooling and learning, such as teaching and assessment methodologies, was the first affected one for these closures. Only a well prepared and handful of private institutions could adopt online teaching methods. Because of Low-income private and government school counterparts and for not having access to e-learning solutions, they have completely shut down. Students who also missed opportunities for learning will no longer have access to healthy meals even during this time, often directed to socio-economic stress. The pandemic has started disrupting the higher education sector significantly, which is one of the critical determinants of a country's future economy. Many Indian students enrolled in universities abroad, especially in countries like the US, UK, Australia, and China, which are worst affected by the pandemic. Many such students have now been barred from leaving these countries. If the situation stands, in the long run, a decline in the demand for international higher education is expected (Choudhary, 2020). Colleges and universities have already stopped their campus activities for curbing the spread of COVID-19. But tech companies involved in the education system have come forward to assisting the movement of students' learning by using virtual platforms. Among them, a few companies are offering paid services as a free tool for teaching and learning, where others are enlivening learning limits to services (Schaffhauser, 2020). Undoubtedly, it is essential to make acknowledgment that students are getting interested and engage them in using

Technology. It generates incredible opportunities for both educational institutions and teachers/faculties/instructors to benefit from the integration of Technology in the classroom; it may be from an online classroom or distance learning. Some of the benefits included Improving engagement, increasing knowledge retention, Encouraging individual learning, encouraging Collaboration, and augmenting useful life skills through Technology, Benefits for teachers (Savvidis, 2016)

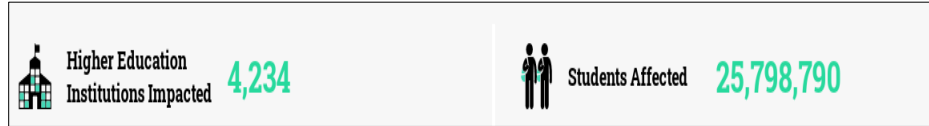


Fig. 3. Institutional Change and Impact Map (Immediate Impact), Source: (COVID-19: Higher Education Resource Center, 2020)

3. METHODOLOGY

The research is done, followed by quantitative approach. To support our research background, we searched for previous articles. Still, we found less category of information as COVID-19 is a new phenomenon in the world in line with higher education, instead we tried to collect updated information from other online sites like WHO, UNESCO, etc. to link with our research segment and all these are secondary sources of information. We have developed a structured questionnaire (Using 5 points Likert scale) for the survey and sent it to the target group to respond. Within the shorter period, we received 74 responses where 64 were students, and 10 were faculty/teacher/instructor from various disciplines. We used Google form to collect data (primary) and SPSS 26.0, Microsoft Excel to analyze the data. However, the study is cross-sectional in nature.

4. ANALYSIS AND FINDINGS

Table 1. Demographic Variables

Particulars	Category	Frequency	Percentage
Gender	Male	55	74.3%
	Female	19	25.7%
	Student	64	86.5%
Respondent Type	Faculty	10	13.5%
Category of University	Private University	70	94.6%
	Public University	4	5.4%
Tech Savvy?	Yes	59	79.7%
	No	15	20.3%
Hours spend (Per day) online for learning	<1 Hour	10	13.5%
	1-3 Hours	31	41.9%
	4-6 Hours	23	31.1%
	7-9 Hours	9	12.2%
	>=10 Hours	1	1.4%
	Honors/BBA/BA/BSc/Equivalent	60	93.75%
Students Level of Study	Masters/MBA/MSc/Equivalent	4	6.25%
	<1 Year	0	0%
	1-3 Years	5	50%
	4-6 Years	4	40%
	7-9 Years	0	0%
	>=10 Years	1	10%

From the demographic analysis, we found that under the COVID-19 crisis, students are not disinterested in online learning; instead, they attempt to keep them learning through various online platforms, which represents 86.5% of the total sample. Among the respondents, 79.7% said that they are tech-savvy, and for this, they always remain updated on what is happening around the world, where 20.3% are not tech-savvy, but they try to adapt the changes. The average hour per day students (who are students of BBA/Honors/Equivalent degree carries 93.75%) spend online for learning is 1-3 hours. Faculties/teachers/instructors who have a few years of experience are seen as more prevalent in online learning.

Table 2. Overall matrix of the response.

				Respondent Type			
				Student		Faculty	
				Tech-savvy individual		Tech-savvy individual	
				Yes	No	Yes	No
				Count	Count	Count	Count
Gender	Male	Hours (Per Day) spend learning through online platform	<1 hour	6	1	0	0
			1-3 hours	14	6	3	0
			4-6 hours	10	2	4	0
			7-9 hours	6	1	1	0
			>=10	0	1	0	0
	Female	Hours (Per Day) spend learning through online platform	<1 hour	2	1	0	0
			1-3 hours	5	1	1	1
			4-6 hours	6	1	0	0
			7-9 hours	1	0	0	0
			>=10	0	0	0	0

Table 3. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.866	.866	18

In table 3, we observe that the alpha coefficient for 18 items is .873, which indicates that the items consist of relatively high internal consistency as a reliability coefficient of .70 or higher is considered to be "acceptable" in most social science research.

Table 4. Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
EN-1	61.65	97.957	.028	.426	.877
EN-2	61.97	87.205	.622	.568	.854
EN-3	61.62	88.951	.527	.407	.858
EN-4	61.80	90.876	.354	.395	.865
EN-5	61.89	88.700	.441	.500	.862
KR-1	62.00	90.274	.400	.338	.863
KR-2	62.35	88.916	.452	.544	.861
KR-3	61.76	87.447	.576	.521	.856
ILP-1	61.09	88.936	.654	.647	.854
ILP-2	61.46	87.375	.562	.549	.856
ILP-3	61.47	88.554	.546	.455	.857
ILP-4	61.20	89.808	.429	.462	.862
IC-1	61.20	90.410	.580	.509	.857
IC-2	61.53	90.088	.587	.603	.857
IC-3	61.54	89.704	.504	.548	.859
SS-1	62.08	88.788	.436	.400	.862
SS-2	61.93	87.324	.548	.531	.857
SS-3	61.27	89.104	.545	.731	.857

This column shows the value in which Cronbach's alpha would be if a particular item is deleted from the scale. In this table, we can see that dismissal of any factor, except question Factor 1 (EN-1), would result in a lower Cronbach's alpha. Because item correlations having less than ($r < .30$) may not belong to the scale. If we delete EN-1 from the list, the Cronbach's alpha will be increased to $\alpha = .877$.

Table 5. Item Statistics

	Mean	Std. Deviation
EN-1	3.64	.996
EN-2	3.31	.974
EN-3	3.66	.965
EN-4	3.49	1.096
EN-5	3.39	1.139
KR-1	3.28	1.062
KR-2	2.93	1.097
KR-3	3.53	1.019
ILP-1	4.19	.802
ILP-2	3.82	1.047
ILP-3	3.81	.970
ILP-4	4.08	1.052
IC-1	4.08	.769
IC-2	3.76	.787
IC-3	3.74	.933
SS-1	3.20	1.141
SS-2	3.35	1.073
SS-3	4.01	.925

Table 6. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.772
Bartlett's Test of Sphericity	Approx. Chi-Square	1689.937
	df	153
	Sig.	.000

In our analysis, the KMO value is .772, which is higher than its recommended value .50, indicating that there is sufficient item for each factor. The significant value is known as p-value. It is used to state that the correlation matrix is significantly varied from the identity matrix in which the correlation between variables is all zero. In our case, it is also 0.000 ($p < 0$).

Table 7. Communalities

	Initial	Extraction
EN-1	1.000	.695
EN-2	1.000	.714
EN-3	1.000	.503
EN-4	1.000	.625
EN-5	1.000	.418
KR-1	1.000	.510
KR-2	1.000	.786
KR-3	1.000	.611
ILP-1	1.000	.681
ILP-2	1.000	.658
ILP-3	1.000	.622
ILP-4	1.000	.667
IC-1	1.000	.701
IC-2	1.000	.699
IC-3	1.000	.652
SS-1	1.000	.698
SS-2	1.000	.617
SS-3	1.000	.751

Extraction Method: Principal Component Analysis.

It is said that the commonality for every value should be higher than .4% (extraction). These communalities indicate the relationship between the variables and all other variables; in brief, the squared multiple correlations between the item and among all other items.

Table 8. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.058	33.654	33.654	6.058	33.654	33.654
2	1.771	9.840	43.495	1.771	9.840	43.495
3	1.426	7.919	51.414	1.426	7.919	51.414
4	1.240	6.886	58.300	1.240	6.886	58.300
5	1.116	6.198	64.498	1.116	6.198	64.498
6	.929	5.161	69.660			
7	.900	5.001	74.661			
8	.719	3.994	78.655			
9	.632	3.510	82.165			
10	.576	3.198	85.362			
11	.515	2.861	88.223			
12	.414	2.300	90.523			
13	.399	2.218	92.741			
14	.365	2.025	94.766			
15	.295	1.638	96.405			
16	.280	1.555	97.959			
17	.230	1.277	99.236			
18	.138	.764	100.000			

Extraction Method: Principal Component Analysis (PCA).

It is found that the total Variance explained for factors is 64.498 means that 64.498% of the Variance is accounted for by the first five factors before and after rotation. The Scree plot displays the proportion of total variation in our dataset that was explained by each of the components in a Principle Component Analysis (PCA).

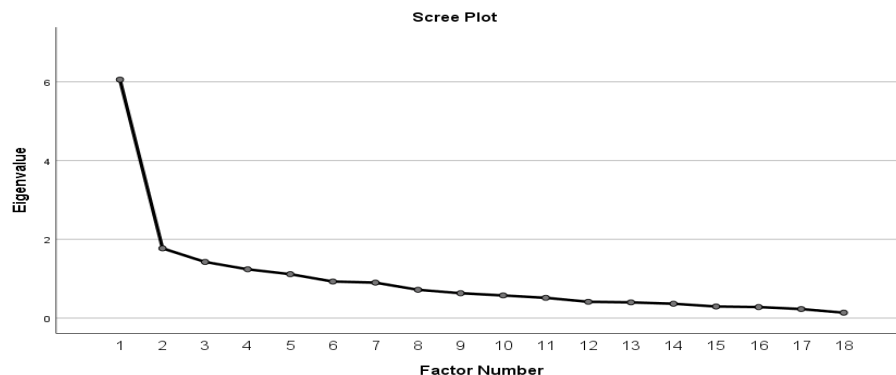


Fig. 4. Scree Plot

In these results originated from table 8, the first five principal components have eigenvalues greater than one, which explains 64.498% of the variation in the data. The scree plot indicates the eigenvalues start to form a straight line after the next selected principle component.

Table 9. Component Matrix

	Individual Learning Platform	Collaboration	Skill Set	Engagement	Knowledge Retention
ILP-1	0.714				
ILP-2	0.611				
ILP-3	0.602				
ILP-4	0.503				
IC-2		0.671			
IC-1		0.618			
IC-3		0.573			
RS-3			0.669		
RS-2			0.622		
RS-1			0.485		
EN-2				0.681	
EN-3				0.558	
EN-4				0.451	
EN-5				0.432	
KR-3					0.629
KR-2					0.613
KR-1					0.412

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

The items are now clustered into five groups mentioned by high loadings; no less than .40. *Individual Learning Platform* is described by loading factors ILP-1 which is denoted by .714, then ILP-2 is .611, ILP-3 is .602, and ILP-4 is .503; similarly, for *Collaboration* the loading factors lies on .671, .618 and .573 where Skill Set loadings include .669, .622 and .485, respectively. Component entitled *Engagement and Knowledge Retention* also have the right level of loadings, which state that as like to the Individual Learning Platform along with Collaboration and Skillset, they are the influencing factors that learners and teachers get interested in using Technology at this epidemic time.

5. CONCLUSIONS AND IMPLICATIONS

Though many problems and barriers; such as lower internet connectivity at the root level, lower bandwidth, and spectrum, financial volatility, exist to ensure the maximum level of participation in online learning during COVID-19 crisis, at least, we can utilize the comprehensive resources so that learners and teachers can interact each other and keep themselves engaged in the knowledge domain. The outcome of this study generates a positive contribution of Technology in higher education in the locked-down period.

5.1 Theoretical Implications

The study has been done with a small sample size that includes selected private and public universities in Bangladesh. So, the outcome generated from this research may not be an exact likeness of all private and public universities in the country. Since the pandemic is still going on and the number of affected students, universities, faculties are on increasing rate, future research may bring more variables where larger samples are taken to justify their method and outcomes. But it can be used as a base input for the upcoming area of research. Furthermore, educational institutions should take this pandemic as an example for their future endeavor in developing or improving infrastructure for the online education system. Students have to be prepared so sooner had they become deprived of getting involved in on time knowledge-sharing platform.

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