Challenges at Technology Adoption in Academic Learning among Students during the COVID-19 Lockdown

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Abstract

Introduction   Traditional classrooms with limited flexibility in cell phones and social platforms like Twitter and Facebook are typical for most schools and colleges. The coronavirus disease 2019 lockdown scenario opened up a new way and created a wave in purchasing and using android phones, laptops, high-intensity Wi-Fi, which gave an entirely new look to the educational system. Hence, the present study aims to assess the challenges at technology adaption in academic learning faced by nursing students.

Methodology   A quantitative cross-sectional descriptive survey design was adopted. A total of 708 nursing students were selected using the universal sampling technique in the study. Prior to the study obtained ethical clearance certificate and authority permission from the institutes where the participants were pursuing their nursing course. Demographic Proforma and challenges of technology adoption rating scale were prepared and sent to nursing students online to determine the challenges of technology adoption for academic learning. A second reminder was sent if the participants failed to submit the online forms within 2 days.

Results   The majority of the students, 557 (78.6%), were between the age group of 18 to 21 years, 658 (92.9%) were females, and 688 (97.2%) of them were pursuing a BSc nursing course. The majority, 188 (26.6%), of the students were pursuing second year BSc. One-third (257; 36.3%) of the participants were from Karnataka. Most of the students, (677; 95.6%), felt that virtual classes have barriers to learning opportunities. A small proportion of the students felt that technology adoption is an opportunity to learn academics during the lockdown. Mean percentage scores of (394; 55.59%) subjects indicate virtual classes made them face many challenges in the form of barriers to learning academics.

Conclusion   Adequate training on handling technical issues and advanced technology is the need of the hour in higher education institutions. Online teaching and learning should be made an integral part of teaching-learning methodologies to keep the students abreast of advancing technologies.

Keywords
► challenges
► technology adaption
► academic learning
► COVID-19
► lockdown
► students

Introduction

The novel coronavirus disease 2019 (COVID-19) has emerged as a global pandemic. It started at the end of December 2019 in Wuhan city of China. In the beginning, COVID-19 affected the people of Wuhan but gradually spread across the globe through international travel. The first case of the COVID-19 pandemic in India was reported on January 30, 2020, and in Karnataka on March 06, 2020.[1]

The COVID-19 created a dilemma at the political level to decide to what extent the lockdown to be implemented. Every citizen had several challenges at the professional, academic, and social levels. The teaching institutions gave a choice for the students to go home or to stay at their college hostels. Most of the students left immediately to their home town as their parents and guardians felt that they should be at home. The students and teachers had relatively a major role at the academic level. "Millions of children are at increased risk of harm as their lives move increasingly online during the lockdown in the COVID-19 pandemic," UNICEF said.[2] Limited scope for interaction had no other option than adhere to 100% digital mode of e-Learning method. A study conducted in Assam revealed that 87.50% of students had faced problems due to the network connectivity during the online classes.[1] However, in both the developing and non-developing countries, network connectivity and bandwidth availability were the key obstacles to the effective delivery of online learning.[3,4]

Many institutions arranged webinars and online classes for children to learn. But unaware that online platforms can serve as a double-edged sword, many institutions were not framing any guidelines to safeguard the children. Moreover, the lockdown has increased feelings of boredom, frustration, and anxiety in children.[5] COVID-19 had adversely affected the economy and social integrity. There was rising concern about the mental health challenges of the general population, COVID-19-infected patients, close contacts, elderly, children, and student health professionals. But change was inevitable. At the same time, academic pressure, socioeconomic adjustment, anxiety, stress, low purchase capacities, concern about the loved ones trapped in some COVID-19 containment areas, and many more factors might impact teachers and students.[6] A study conducted in Nepal revealed that high rates of depression, anxiety, and comorbidity were prevailing among the general population during the COVID-19 pandemic lockdown.[7] Teaching staff of all the backgrounds and ages had to prepare and deliver their classes from home, with all the practical and technical challenges, and often without adequate technical support.[8] Universities should invest in developing the skills of their teaching faculty on implementing effective pedagogical methods with or without the use of online technologies.[9] As social distancing was considered as one of the essential measures to curb the spread of COVID-19, having traditional classes was a real threat to educational institutions. With this background, the investigators aimed to assess the students' challenges and experiences at various levels of their academic learning, such as attending classes, writing tests, and assignments during the lockdown period. This would help the educators to understand the opportunities and barriers of online courses.

Methodology

A quantitative cross-sectional survey design was adopted to answer the research question "Is technology adaption in academic learning is practicable and feasible for students?" Sample size estimation with power 80% with 5% error indicated the required sample size was 702 nursing students. The selection of nursing institutions was made conveniently as the investigators were from these three institutions. A total of 1,271 students were pursuing their BSc and MSc nursing studies in three nursing colleges for the academic year 2019 to 2020. The sample selection was based on a convenience sampling technique. Ethical approvals from the Ethics Committees of all three institutions were taken before the commencement of the study. To determine the challenges faced by the students in the adoption of technology, a three-point rating scale was prepared with 23 items. The score given was 0, 1, 2 with maximum score of 46 and minimum of 23 score. The reliability of the tool was ascertained for homogeneity by using Cronbach's α. The obtained r value was 0.72 that indicates the tool was reliable. This challenge of the technology adoption rating scale was sent to five subject experts to assess the content validity of the tool. The reliability of the rating scale was established through Cronbach's α ($r = 0.72$). The pilot study was conducted with 17 samples to find the feasibility and practicability of the study. The anonymity of the study was strictly followed during the entire study. The invitation and Google Link were shared in their class coordinator and in the student Whatsapp groups. The entire BSc and MSc nursing students were taken as study subjects. Google Form had a complete description of the study, consent, and challenges of the technology adoption rating scale. The Google Link was kept open for 15 days. At the end of the 15th day, 708 students responded, which shows the total response rate of 50.70%. The students were not forced to participate in the study, and their participation was voluntary. The collected data was compiled in a master sheet and analyzed using descriptive statistics such as frequency, percentage, mean, standard deviation, and finding the difference between the batches one-way analysis of variance with post-hoc test analysis was done using SPSS package.

Results

The study findings were calculated and organized in the following tables and descriptions.

►Table 1 describes the demographic characteristics of the participants: Two-third of the total population, 557(78.6%), were young at the aged between 18 and 21 years. Most of the 658 (92.9%) were females. A large proportion of 688 (97.2%) of them were pursuing BSc nursing course and the rest were master's degree. The majority, 188 (26.6%), of the students were studying second-year BSc and almost the same proportion from I and IV BSc nursing students. One-third of the total

Table 1 Frequency and percentage distribution of students as per their sociodemographic characteristics, $n = 708$

Sl. no	Variables	Frequency	Percentage
1	**Age in years**		
	1.1 18–21	557	78.66
	1.2 22–25	134	18.90
	1.3 26 and above	17	2.44
	Mean:(20.43 ± 2.28)		
2	**Gender**		
	2.1 male	50	7.1
	2.2. female	658	92.9
3	**Course**		
	3.1 BSc (n)	688	97.2
	3.2 MSc (n)	20	2.8
4	**Batch**		
	4.1 I BSc	173	24.4
	4.2 II BSc	188	26.6
	4.3 III BSc	141	19.9
	4.4 IV BSc	185	26.1
	4.5 I MSc	14	2.0
	4.6 II MSc	07	1.0
5	**State belongs to**		
	5.1 Karnataka	257	36.3
	5.2 Non-Karnataka	451	63.7
6	**Currently residing**		
	6.1 Home	614	86.7
	6.2 Paying Guest	04	0.6
	6.3 Relative House	17	2.4
	6.4 Hostel	63	8.9
	6.5 Any Other	10	1.4
7	**Monthly family income (Rs)** Mean: 19819.69 ± 41232.05	96 not revealed the income	
8	**Type of cellphone had**		
	8.1 Smartphones	692	97.7
	8.2 Regular	16	2.3
	8.3 had no cellphones	0	0
9	**Purchased cellphone during lockdown**		
	9.1 Yes	52	7.4
	9.2 No	656	92.6
10	**Purchased laptop/notepad during lockdown**		
	10.1 Yes	13	1.84
	10.2 No	695	98.16
11	**Use of e-Platform**		
	11.1 Impartus	37	5.2
	11.2 Zoom	17	2.4
	11.3 Meet	124	17.5
	11.4 Hangout	11	1.6

(*Continued*)

Table 1 (*Continued*)

Sl. no	Variables	Frequency	Percentage
	11.5 Nlearn	159	22.5
	11.6 Multi	360	50.8
12	Strength of Wi-Fi		
	12.1 Good	58	8.2
	12.2 Average	433	61.2
	12.3 Poor	217	30.6

population were from Karnataka 257(36.3%), and the rest were non-Karnataka students, and at the time of lockdown, most were residing at home, and a very small proportion, 63(8.9%) have remained in the hostel. The mean average monthly family income indicates Rs 19,819 from the data; it can be inferred that most of them were not so well to do financially, and out of the total population, 96 (13.55%) have not revealed their income. A small proportion 16 (2.3%) had regular cell phones, and most 692 (97.7%) had smartphones with them before the lockdown. It was reported that 52 (7.3%) of them purchased cell phones, and 13 (1.8%) purchased laptops/notepads to customize themselves for online classes. The data also reveal that most of the students were using cell phones, and a small proportion only was using laptops/notepads for their online courses. It was reported that 360 (50.8%) of the total population had e-Learning by using multiple platforms, and 217 (30.6%) of the students had Internet connectivity issues due to poor signals at their place of residents, whereas a small proportion (58; 8.2%) had uninterrupted Internet connectivity.

From ►**Table 2**, it can be interpreted that most of the students, 677(95.6%), felt that virtual classes had barriers over opportunities to learn, and a small proportion felt such technology adoption is an opportunity to learn academics during the lockdown.

From ►**Table 3**, it can be interpreted that the mean percentage of 55.59% indicates virtual classes made the subjects to face lots of challenges in the form of barriers to learn academics. The mean score of 25.57 indicates that most of their scores were concentrated just above the Q2 (median) quartiles. The standard error of the mean revealed that 672 subjects' mean score was between 25.16 and 25.98, and remaining 36 subjects had above or below this score.

►**Table 4** indicates the maximum number of students of BSc nursing program and first year MSc nursing felt plenty of barriers in adopting online technology and MSc nursing second year students expressed that they had minimum barriers due to online classes.

From ►**Table 5**, it can be said that there were significant differences in the adoption of technologies for academic learning among various batches of students. From ►**Tables 6**, it can be inferred that the technology adoption difference was found between various batches of BSc nursing with final year students of master's degree program, and no difference within BSc nursing or within master's degree batches was found. The mean scores of final year MSc nursing was higher than the rest of all batches which shows the II MSc had fewer barriers in the adoption of technologies than the rest of the batches. Hence, it can be said that there was a significant difference in the adoption of technology among final year master students with the rest of the batches during the lockdown.

Table 2 Frequency and percentage distribution of scores regarding challenges at technology adoption, $n = 708$

Variables	Scoring criteria	Scoring (%)	f	%
More opportunities	Q3 and above (35–46)	Above 75%	31	4.4
More barriers	Below Q3 (34 & below)	Below 75%	677	95.6

Max scores $= 46$; minimum score $= 23.Q_3 = 35$.

Table 3 Mean, SD, and mean % and SEM scores regarding challenges of adoption of technology for academic learning during lockdown, $n = 708$

Variable	Mean $\pm$ SD	Mean%	SEM	95% CI	
				Lower	Upper
Challenges in adoption of technology	25.57 $\pm$ 5.64	55.59	0.211	25.16	25.98

Abbreviations: CI, confidence interval; SD, standard deviation; SEM, standard error of the mean.
Max possible scores $= 46$; Q2 $= 23$.

Table 4 Batch wise comparison of scores of subjects on challenges in adoption of technology for academic learning during COVID-19 lockdown, $n = 708$

Variables	Scoring criteria	f	%
I BSc ($n = 173$)			
• Opportunity	Q3 & above	6	3.5
• Barriers	Below Q3	167	96.50
II BSc ($n = 188$)			
• Opportunity	Q3 & above	6	3.20
• Barriers	Below Q3	182	96.80
III BSc ($n = 141$)			
• **Opportunity**	Q3 & above	5	2.10
• **Barriers**	Below Q3	138	97.9
IV BSc ($n = 185$)			
• Opportunity	Q3 & above	12	6.5
• Barriers	Below Q3	173	93.5
I MSc(N) ($n = 14$)			
• Opportunity	Q3 & above	2	14.3
• Barriers	Below Q3	12	85.7
II MSc(N) ($n = 7$)			
• Opportunity	Q3 & above	5	71.4
• Barriers	Below Q3	2	28.6

Abbreviation: COVID-19, coronavirus disease 2019.
Max score $= 46$; Q3 $= 35$ and above was considered as opportunity in adoption of technologies.

Table 5 Batch-wise comparison of scores of subjects on challenges in adoption of technology for academic learning during COVID-19 lockdown using one-way ANOVA, $n = 708$

	Sum of squares	Df	Mean square	f	Sig.
Between groups	483.951	5	96.790	3.091	0.009
Within groups	21,983.518	702	31.316		

Abbreviations: ANOVA, analysis of variance; COVID-19, coronavirus disease 2019.

Table 6 Multiple comparisons to determine the difference among various batches of nursing course regarding challenges in adoption of technology in academics during lockdown using Turkey test. $n = 708$

	(J) year of study	Mean difference (I-J)	Standard error	Sig.	95% confidence interval	Upper bound
					Lower bound	
I year BSc (N)	III year BSc (N)	0.10667	0.63491	1.000	−1.7077	1.9210
	IV year BSc (N)	−1.10751	0.59185	0.421	−2.7988	0.5838
	I MSc (N)	−2.47894	1.55494	0.603	−6.9224	1.9645
	II MSc (N)	−6.62180*	2.15747	0.027	−12.7870	−0.4566
II year BSc (N)	III year BSc (N)	0.46631	0.62343	0.976	−1.3152	2.2478
	IV year BSc (N)	−0.74787	0.57952	0.790	−2.4039	0.9082
	I MSc (N)	−2.11930	1.55029	0.747	−6.5494	2.3108
	II MSc (N)	−6.26216*	2.15412	0.043	−12.4178	−0.1065

(*Continued*)

Table 6 (*Continued*)

	(J) year of study	Mean difference (I-J)	Standard error	Sig.	95% confidence interval	Upper bound
					Lower bound	
III year BSc (N)	IV year BSc (N)	−1.21418	0.62560	0.378	−3.0019	0.5735
	I MSc (N)	−2.58561	1.56809	0.566	−7.0666	1.8954
	II MSc (N)	−6.72847*	2.16697	0.024	−12.9208	−0.5361
IV year BSc (N)	I MSc (N)	−1.37143	1.55116	0.950	−5.8040	3.0612
	II MSc (N)	−5.51429	2.15474	0.109	−11.6717	0.6431
I MSc (N)	II MSc (N)	−4.14286	2.59046	0.599	−11.5454	3.2597

Note: *Significant

Discussion

This study explored the challenges of technology adoption in academic learning among nursing students during the COVID-19 lockdown. As the nursing profession is a combination of art and science, using online platforms for teaching-learning was not widely practiced in the past. But due to the unprecedented situation, the whole education system was forced to shift from conventional classroom teaching to online mode, and nursing education was not exceptional. This article has tried to explain the challenges faced by nursing students during this sudden transition in the education process by identifying the barriers and opportunities for academic learning. Even though digital transformation is not a novel phenomenon in higher education institutions in recent past years, the complete shift from face-to-face learning to online is not easily accepted by all the students due to many reasons.[10]

The study findings indicate that nursing students did not accept the digital transformation easily in place of traditional classroom learning as 95.6% of the participants expressed having barriers over opportunities, and 56% of participants reported they face lots of challenges in the form of barriers in academic learning. Even though students had used the institution-based e-learning platforms, adaptation to the abrupt change in the teaching-learning system was challenging for most of them. These findings are consistent with the study conducted by Baticulon et al, in which the authors stated two-third of the participants often faced barriers during online learning.[11]

The commonly used e-platforms for online classes were Google Meet (27.8%), Nulearn (18.6%), Impartus (4.3%), Zoom (2.1%), and other platforms. Studies conducted by other authors also reported that the Zoom platform, Viber, Google Classroom, Cisco WebEx, WhatsApp live, and Skype were the common online platforms used to conduct classes during lockdown.[12,13] More than half of the respondents (59.1%) felt learning took place in a fearless atmosphere, and they could learn at their own pace. Similar findings were reported in Ghana as students could learn under flexible conditions and self-paced their learning activities.[13] Students deliberately missed the classes by keeping the device on, and they found it difficult to concentrate on the virtual sessions. Sudden change in the teaching-learning system and handling technology turned to be a major shock to many of them. About 72.2% of participants felt that they had no opportunity to learn psychomotor skills. Interrupted Internet connectivity was a major problem for 23.4% of them, while 68.6% experienced it to some extent. Most of them felt handling technical issues were not easy even though they had mastery in using smartphones. These findings are consistent with other study findings in which more than half of the subjects reported technical issues such as poor network connectivity, getting disconnected in between the classes, difficulty to rejoin the online session again, power cut, poor audio, and video quality. Students had a fear of missing the classes and attendance shortage.[13–17] Students missed the physical presence of teachers and interaction with teachers to some extent. Clarifying the doubts during the session was not effective in virtual sessions. The study conducted by Becker et al supports these findings.[18]

Current study participants felt that most of the teachers were finding it difficult to handle virtual sessions and lacked technical skills as they were not competent in using e-learning platforms, and the participants of few other studies also felt the same.[19,20] Students felt that family had to spend more on the Internet packages, and for some, it was a financial burden too as they had to buy a new android phone. Students felt physically too tired after attending virtual sessions and could not concentrate adequately.[21,22] Students preferred classroom teaching rather than online classes.[23,24] In contrast to these findings, Lall and Singh reported that students preferred online classes over classroom teaching.[25,26] The undergraduate students currently face many general challenges such as staying motivated, lack of socialization, understanding the academic expectations, coping with unfamiliar technology, and uncertainty of future.[26,27] The present study has not addressed such challenges

Conclusion

We found that through the online mode of learning, postgraduates found more opportunities for academic learning in comparison to undergraduates. The study further examined the association of demographic characteristics with

academic challenges. Older age group participants felt more opportunities in adoption of technology compared with the younger age group. Acceptance of technology adoption as an opportunity rather than challenge was sixfold higher among the final year master degree students than the first-year undergraduates and threefold higher than last-year undergraduates. Those with good Internet connectivity felt three to elevenfold more chances of technology adoption in comparison to their counterpart. We found that students faced enormous barriers and fewer opportunities for academic learning; hence, online teaching-learning is a challenging situation for nursing students.

Adequate training on handling technical issues and advanced technology is the need of the hour in higher education institutions. Online teaching and learning should be made an integral part of teaching-learning methodologies to keep the students abreast of advancing technologies. The measures need to be implemented to make the virtual class experience with the least barriers and more opportunities.

Conflict of Interest
None declared.

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