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E-readiness of senior secondary school learners to online learning transition amid COVID-19 lockdown

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Abstract

In the backdrop of recent COVID-19 lockdown, the school learners across the country have had the opportunity to experience online mode of learning. This study attempts to find out e-readiness of senior secondary school learners for transition to online learning along with their views on this mode of learning transaction. Quantitative descriptive survey method was used for the purpose of this study. A questionnaire comprising 20 Likert-type items covering four dimensions, viz. access, digital literacy and e-readiness, delivery of online learning, and online load, was administered on a 100-student sample from different schools of Delhi using non-probability sampling. Access to online learning and online load on learners were found to be high. The study also revealed that only 35.2% learners found online classes as effective as face-to-face classes. The delivery of online learning by teachers and digital skills of learners were found lacking. The geographical scope of the study is limited to National Capital Region of Delhi which has better smartphone penetration and internet access as compared to other states in India. The study concludes that online pedagogy and digital skills of teachers and learners need to be strengthened for a possible roadmap ahead. The study may provide useful insights into the challenges of online learning and areas for further improvement.

Keywords: COVID-19, digital access, e-readiness, online delivery, online learning.

Introduction

The COVID-19 pandemic has taken a toll on the countries worldwide. The pandemic-driven 134 country-wide closures has affected the teaching-learning of more than 64.4% of the world's student population. (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2020). India, too issued an advisory in March 2020 following which schools and educational institutions, were immediately closed. India's schooling system is one of the largest with about 1.52 million schools and 24.2 million students in secondary and higher secondary levels (Government of India [GoI], 2018). Now with such a large schooling infrastructure shut down and the students confined at their homes, it became imperative for schools to explore alternative methods of teaching-learning such as online learning. However, such a sudden shift from classroom-based conventional learning to online learning provided little or no time to teachers or learners to prepare themselves.

Such a situation necessitated learners (and teachers) to acquaint themselves with online learning tools and skills. With a 'learner-centered' approach in education, it is vital to know the learner's readiness and views about their online learning experience. This would certainly help in formulating better policies and practices for a full-fledged online learning adoption in schools post-lockdown. It is also important to clarify the term 'e-readiness' in relation to this study. The term connotes two dimensions, viz. 1) Readiness or learner's preparedness vis-a-vis digital tools and skills suitable for online learning, 2) readiness as expressed in terms of views and experiences with regards to online learning. Whereas the former indicates the learners' technical readiness for the online mode, the latter shows their psychological preparedness for online learning based on past experiences and views, which constitute an overall proclivity towards or willingness for online learning. The latter is equally important as the former for online learning to succeed as there has been evidence of reluctance to this mode of learning



even in the face of proof that online learning works as effectively as traditional onsite learning (Vivolo, 2016).

Literature Review

The ubiquitous technology has enormously helped people around the world to stay connected and continue to 'work from home' Even in the times of lockdown. Online learning tools enabled schools and colleges to ensure that the learners were not left unengaged and did not suffer academic loss. In developing countries, online learning in the formal schooling system is still in the initial stage, with face to face classroom-based teaching being the dominant methodology. The lockdown necessitated adoption of online learning by the Indian school system which was completely face-to-face and rarely relied upon online learning prior to lockdown. The availability of digital technology along with access to online content allows learner to experience new learning structures beyond the classroom (Milrad et al, 2013); COVID-19 lockdown compelled learners and educationists to experience the same.

However, the learning must be restructured and reoriented to take the full advantage of the ubiquitous technology. Sevillano-Garcia and Vazquez-Cano (2015) found in their study that "institutions need to orientate methodologies toward the use of new mobile devices, from the possibilities offered primarily through open educational resources (OERs) distributed on wikis, blogs, mash-ups, podcasts, social software, virtual worlds, personal learning environments (PLEs), massive open online courses (MOOCs), and other emerging online practices"(p.107). According to Patrick (2011), the transformative potential of online learning for K-12 segment can be realized by providing technology infrastructure like virtual learning environment (VLE), learning management systems (LMS), internet access and digital devices; professional development programs for faculty in online and blended mode which are student centered; and assessment redesign to performance-based, meaningful assessments like formative adaptive approach, demonstration of learning using multiple measures, and immediate feedback of learning.

The online learners are expected to develop 21st century learning skills which include critical thinking, creativity, collaboration, and communication along with the digital skills to use and navigate online learning resources. The learner-centered paradigm in a digital age demands for development of 21st century learning skills through domain-knowledge learning (Kong et al, 2014). On the other hand, the teachers are expected to be proficient in teaching online as well as in the classroom. However, teaching online is different from teaching in a classroom. Girardi (2016) gives three foundational principles for increasing student engagement when teaching online. These require teachers to create online community of learners, put additional efforts to engage them and carefully analyze those tools which, when used, give a highly engaging online environment. This is crucial for online learning in order to overcome the feeling of isolation experienced by online learners in absence of social presence.

In a correlation study done by Barbera et al. (2013) on students of higher education social sciences online course, learner satisfaction was positively and strongly correlated with social presence, direct instructions, learning content and course design. According to Cashion & Palmieri (2002), the high quality in online learning for VET students was characterized by its flexibility, content, technology access and communication. As per Hodges et al (2020), the design process and decisions regarding the type of online designs to be used are essential for effective online education, which is conspicuous by its absence in such sudden shifts from offline to online. Therefore, Bozkurt and Sharma (2020) opine that the current online learning scenario may be more appropriately termed as emergency remote teaching. There is already a stigma associated with online learning being inferior to face-to-face learning. Hodges et al (2020) fear that hurried shift to online education by so many institutions without truly exploring the online format will result in further accentuating this stigma. According to Vivolo (2016), there has been resistance to online learning even in the face of evidence that online learning works as effectively as traditional onsite learning. Miller (2014) found that online learning is here to stay and that learning to use it is a worthwhile investment for individuals and institutions. Moreover, in view of COVID-19 another

such future calamities, there is an ensuing need for 'online learning', and therefore the new dimensions of this learning change need to be studied.

Purpose of the Study

The objectives of this study were as follows:

1. To find out the accessibility of learners to pre-requisite constituents for undertaking online learning
2. To find out the level of digital literacy and e-readiness of the learners to study online
3. To find out learners' response towards delivery and transaction of learning through an online mode
4. To find out the nature of online load on the learners

Methodology

Research Design

Quantitative descriptive survey method was utilized for the conduct of the present study. In view of the lockdown and need for maintaining social distancing due to COVID-19, the study was conducted using an online survey tool. Data was analyzed using statistical methods and then interpreted for arriving at conclusions. There were four dimensions that were taken up in the study, viz. access, digital literacy and e-readiness, delivery of online learning, and online load.

Participants

The survey was conducted on full-time formal school students from senior secondary level, i.e. grades XI and XII from amongst three different types of schools of Delhi, namely, Kendriya Vidyalayas (KVs), state government schools, and private schools. While the KVs are administered by the central government, the state government schools are run by the Government of Delhi, and private schools are managed by societies, trusts, individuals and corporate houses. The sample size was 100 learners, out of which the researchers received 74 filled-in questionnaires (average response rate: 74%) using convenience sampling method.

Data Collecting Tools

A structured questionnaire based on a five-point Likert-type rating scale containing 20 items was framed using Google forms and digitally sent via email to students. The survey questionnaire had six sections. The first section apprised the respondents of the section details and instructions for filling the survey. The second section collected demographic details of the respondents. The rest of the questionnaire comprised the four dimensions each of this study namely, access, digital literacy and e-readiness, delivery/online transaction of learning, and online load. The last four sections had 5 Likert-type items each except the section on 'delivery/online transaction of learning' which had 4 items. All the Likert items had options ranging from strongly disagree (1) to strongly agree (5).

Reliability and Validity

In order to measure the reliability of the test, the internal consistency of the items was computed using Cronbach's Alpha value. One item was found to have a high sample variance and was therefore removed. The Cronbach's Alpha value for this test was 0.741. The validity of the questionnaire was determined with the help of education experts and their suggestions were carefully incorporated.

Research Procedure

A pilot study was conducted by administering the survey questionnaire on a set of 20 students from the sample. The responses were analyzed and some of the items were deleted, added or modified to improve the clarity of items. An open-type item was also added at the end in compliance with the suggestions of domain experts. The questionnaire was then digitally sent to 100 respondents.

Data Analysis

Data analysis was done through descriptive statistical techniques. Patterns and connections were located before coming to the conclusions.

Out of 19 items, 15 items showed a mean of more than 3.0 which indicates a general agreement of the respondents with the items. The remaining 4 items had a mean of more than 2.5 that suggests a general indecisiveness of the respondents towards those items.

Table 1. Mean and Standard Deviation of Items

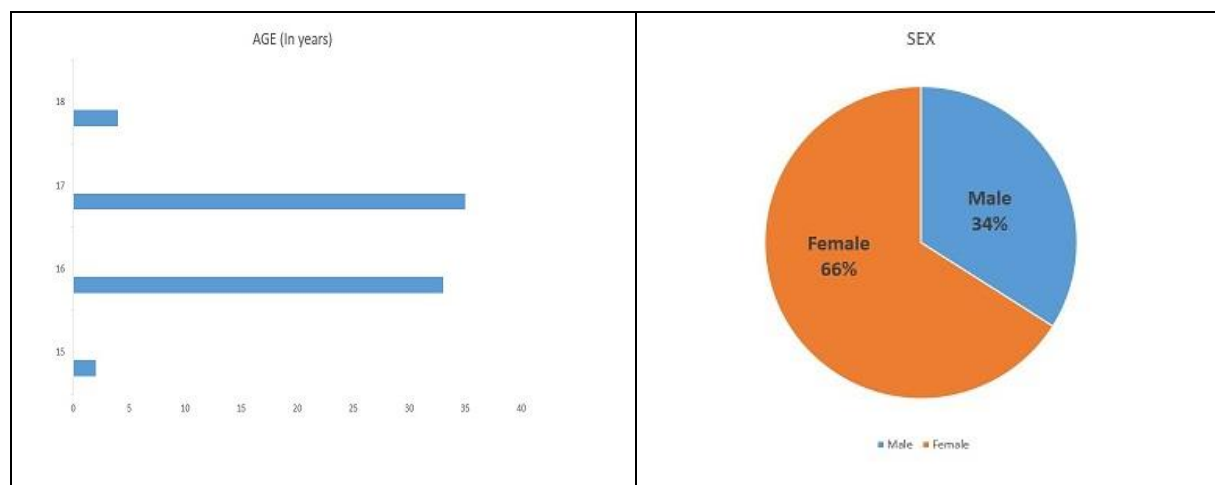
ITEM NO.	ITEM STATEMENT	MEAN	SAMPLE STANDARD DEVIATION
	ACCESS	\bar{x}	Σ
1.	I have my own smartphone, tablet, laptop, desktop computers, etc. at my home so I can study without any problem.	3.74	1.03
2.	I have access to a fast Internet connection at my home for continuing my studies uninterrupted through online mode.	3.49	1.22
3.	I have my own personal study space in my house; so I can attend my online class without distraction from my family during this lockdown.	3.59	1.06
4.	I have access to a hardware engineer or a technician who can repair my digital device if it breaks down during the lockdown.	2.59	1.22
5.	The storage capacity of my digital devices is being quickly exhausted due to digital media shared on social groups and the different types of mobile apps installed for my studies.	3.53	0.97
	DIGITAL LITERACY AND E-READINESS		
6.	It is difficult for me to search for relevant, useful, and quality study material from the vast pool of information on the internet.	3.08	1.20
7.	I am facing difficulty in switching from classroom-based, face-to-face learning to online learning.	3.16	1.12
8.	Studying in a physical classroom is different from studying online as both require a different set of skills.	3.16	1.18
9.	I do not possess adequate digital literacy and proficiency in using online learning tools for my online studies.	3.95	1.01
10.	I am concerned about my privacy and safety issues on the internet.	2.77	1.36
	DELIVERY OF ONLINE LEARNING		
11.	Teachers have difficulty in teaching through online platform due to lack of prior training.	3.61	1.11
12.	I can study on my own and do not need support or technical assistance to access online teaching-learning activities given by my teachers.	2.84	1.28
13.	I get ample opportunity to interact with my teachers and peers in online learning through synchronous and asynchronous modes of communication.	3.5	0.97
14.	Online learning can be as effective as classroom-based face-to-face learning.	2.81	1.42
	ONLINE LOAD		
15.	I feel at ease in appearing in online examinations after gaining familiarity with online education.	3.36	1.31
16.	Sometimes, I have back-to-back online classes which requires me to sit for long hours. This makes me feel tired and mentally exhausted.	3.69	1.13
17.	Studying online from home gives me the freedom and flexibility to study at my pace and I would like to continue studying through online education.	3.08	1.18
18.	There is a feeling of isolation associated with online learning as I cannot physically interact with my fellow classmates.	3.84	1.08
19.	I feel I may be left out if I am not able to cope with this new way of learning through online mode.	3.30	1.26

Findings and Discussions

The findings of the study based upon the data analysis emerged as below:

Table 2. Demographic details of the sample under study

DEMOGRAPHIC TYPE	DEMOGRAPHIC DETAIL	RESPONDENT NUMBERS	RESPONDENT PERCENTAGE
GRADE	XI	04	5.40%
	XII	70	94.6%
	Total	74	
SCHOOL TYPE	Kendriya Vidyalaya	32	43.24%
	Government School	18	24.32%
	Private School	24	32.43%
	Total	74	
MEDIUM OF STUDY	Hindi	06	8.1%
	English	68	91.9%
	Total	74	
SEX	Boys	25	34%
	Girls	49	66%
	Total	74	
AGE	15 Years	2	2.7%
	16 Years	33	44.6%
	17 Years	35	47.3%
	18 Years	4	5.4%
	Total	74	



The respondents were mainly grade XII students (94.6%) and only 5.4% were grade XI students. Low participation of grade XI students may be because many schools did not begin online classes for grade XI owing to pending grade X Board exams, in light of COVID-19 lockdown.

Access

The first dimension 'access' included access to personal e-device, internet connection, personal study space, hardware facility, and e-storage. The responses are tabulated as below:

Table 3 Learners' responses towards access to online learning

ITEM NO.	ITEM DESCRIPTION	STRONGLY DISAGREE		DISAGREE		UNDECIDED		AGREE		STRONGLY AGREE	
		Nos	%	Nos	%	Nos.	%	Nos	%	Nos.	%
1	I have my own smartphone, tablet, laptop, desktop	3	4.1%	7	9.5%	12	16.2%	36	48.6%	16	21.6%

	computers, etc. at my home so I can study without any problem.										
2	I have access to a fast Internet connection at my home for continuing my studies uninterrupted through online mode.	6	8.1%	12	16.2%	8	10.8%	35	47.3%	6	8.1%
3	I have my own personal study space in my house so I can attend my online class without distraction from my family during this lockdown.	3	4.1%	12	16.2%	8	10.8%	40	54.1%	11	14.9%
4	I have access to a hardware engineer or a technician who can repair my digital device if it breaks down during the lockdown.	13	17.6%	29	39.2%	14	18.9%	11	14.9%	7	9.5%
5	The storage capacity of my digital devices is being quickly exhausted due to digital media shared on social groups and the different types of mobile apps installed for my studies.	1	1.4%	13	17.6%	12	16.2%	41	55.4%	7	9.5%

Male and Burden (2014) found that the portability of mobile digital devices had the potential to allow any-time access for users and to become personal. In terms of access to online learning, 21.6% strongly agreed and 48.6% of the learners agreed to have their own digital devices. Among the respondents, 13.6% collectively disagreed or strongly disagreed to having their own devices. 16.2% were undecided which indicates that they might not have their own smartphones, but they do have access to one at their homes. About 55.4% reported to have a good internet connection availability whereas 35.1% may be considered to face some issues with internet connectivity or no connectivity at all. About 69% learners agreed to have their own study space at home whereas a considerable 31.1% either disagreed or were undecided. When coming to access to a hardware engineer, over half of the learners (56.8%) disagreed whereas only 24.4% agreed. 9.5% strongly agreed and 55.4% agreed that the storage capacity of their digital devices was getting exhausted due to large amount of data being shared for their studies. The findings suggest that access to digital devices and internet is still an issue with about 30-40% of the learners. For online learning to be a reality, this factor is crucial; without access the education system may actually experience the frequently quoted 'digital divide'. Further, even if the access to digital devices and internet connection improves, several other factors like personal study space for online learning, access to computer hardware technicians, availability of required computer components and accessories, etc. affect the effective online learning. Leveraging the affordances of digital devices and internet in favor of online education will mean addressing all these issues by adopting a multi-pronged, hardware-software-instructional strategy.

Digital Literacy and E-readiness

The second dimension 'digital literacy and e-readiness' focused on issues of ability to search and sift information. The Internet is a vast interconnected network of information and communication and it is often difficult for the beginners to find out relevant and useful study material on the internet. This section was framed to study learners' digital skills and readiness towards online learning and to see whether they were prepared to change gears and move to a new online learning system. The responses are tabulated as below:

Table 4. Learners' responses towards digital literacy and e-readiness

ITEM NO.	ITEM DESCRIPTION	STRONGLY DISAGREE		DISAGREE		UNDECIDED		AGREE		STRONGLY AGREE	
		Nos	%	Nos	%	Nos.	%	Nos	%	Nos.	%
1	It is difficult for me to search for relevant and useful quality study material from the vast pool of information on the internet	5	6.8%	22	29.7%	16	21.6%	24	32.4%	7	9.5%
2	I am facing difficulty in switching from classroom-based face-to-face learning to online learning.	2	2.7%	22	29.7%	18	24.3%	26	35.1%	2	2.7%
3	Studying in a physical classroom is different from studying online as both require a different set of skills.	2	2.7%	4	5.4%	9	12.2%	40	54.1%	19	24.7%
4	I do not possess adequate digital literacy and proficiency in using online learning tools for my online studies.	9	12.2%	28	37.8%	12	16.2%	21	28.4%	4	5.4%
5	I am concerned about my privacy and safety issues on the internet.	4	5.4%	10	13.5%	11	14.9%	35	47.3%	14	18.9%

About 9.5% of the learners strongly agreed and 32.4% agreed that they found it difficult to search required information from the internet. Among the respondents, 6.8%, 29.7% and 21.6% respectively strongly disagreed, disagreed and were undecided on this. Further, 37.8% learners found it difficult to switch from classroom to online learning while 32.4% did not feel so. A huge percentage of learners (78.8%) were convinced that studying in a physical classroom was different from online learning. Almost 50% of them felt that they possessed adequate digital skills in using online learning tools, whereas 33.8% thought their digital skills were inadequate while 16.2% were undecided about this issue. Regarding cyber safety and privacy, 66.2% raised their concern, while 18.9% did not express any such concern towards their privacy and safety issues on the internet. 14.9% were undecided on this aspect. Gallardo-Echenique (2015) defines digital literacy as the ability to understand and use information in multiple formats from a wide range of digital sources. The findings suggest that the participants have the realization that online learning is different from classroom-based learning. Also, the participants, as the data indicates, are not very comfortable with remote learning through online mode. This implies that there is a need to impart digital literacy to the learners to help them become 21st century learners.

Delivery/ Transaction of Online Learning

The third dimension related to the aspect of 'delivery/ transaction of online learning' and attempted to find out how delivery of online learning was taking place at the time of COVID-19 lockdown. It focused on assistance being provided to learners by teachers and their perception about their own abilities to study online along with their teacher's ability to teach online. Also, it included interactivity and effectiveness aspect of online versus classroom learning from learner's viewpoint. The responses are tabulated as below:

Table 5. Learners' responses towards delivery/ transaction of online learning

ITEM NO.	ITEM DESCRIPTION	STRONGLY DISAGREE		DISAGREE		UNDECIDED		AGREE		STRONGLY AGREE	
		Nos	%	Nos	%	Nos.	%	Nos	%	Nos.	%
1	Teachers have difficulty in teaching through online platform due to lack of prior training.	6	8.1%	24	32.4%	15	20.3%	21	28.4%	8	10.8%
2	I can study on my own and do not need support or technical assistance to access online teaching-learning activities given by my teachers.	7	9.5%	26	35.1%	16	21.6%	22	29.7%	3	4.1%
3	I get ample opportunity to interact with my teachers and peers in online learning through synchronous and asynchronous modes of communication.	4	5.4%	9	12.2%	17	23%	38	51.4%	6	8.1%
4	Online learning can be as effective as classroom-based face-to-face learning.	10	13.5%	26	35.1%	12	16.2%	21	28.4%	5	6.8%

Among respondents, 39.2% felt that their teachers had difficulty in teaching online, whereas 40.5% did not feel likewise and 20.3% were undecided. When asked if they could study online on their own without any technical assistance from their teachers, 44.6% disagreed, 21.6% were undecided, and 33.8% agreed. These results indicate lack of teacher support to teach online and student support to learn online. On the 'interactivity' parameter, 59.5% agreed to 'getting ample opportunity' to interact with their teachers and peers in online learning while 17.6% disagreed and 23% were undecided. Only 35.2% of the learners felt online learning was as effective as classroom-based, face-to-face learning. On the contrary, 48.6% favored classroom learning over online learning and 16.2% were undecided among the two. Hiltz (2002) recommends creating asynchronous learning networks (ALNs) for increasing interactivity in online learning which has been found to be as effective as traditional modes of course delivery. However, in order to obtain the maximum benefit of online learning, Ray (2009) says that faculty, new to online instruction, should be required to participate in technical and pedagogical training prior to instructing online. This is gravely lacking due to suddenness of substituting face-to-face system with online education in response to COVID lockdown.

Online Load

The fourth dimension related to the issue of 'online load'. While the time spent by a learner in a conventional school is around 6 hours interspersed with outdoor and extra-curricular activities, the online learning (especially in COVID times) is purely indoor and continuous with more exposure to computer screen as compared to offline mode. Therefore, the study attempts to find out the overall load – onscreen time, cognitive load, learning in isolation, etc. – caused by online learning. The responses are tabulated as below:

Table 6 Learners' responses towards online load

ITEM NO.	ITEM DESCRIPTION	STRONGLY DISAGREE		DISAGREE		UNDECIDED		AGREE		STRONGLY AGREE	
		Nos	%	Nos	%	Nos.	%	Nos	%	Nos.	%
1	I feel at ease in appearing in online examinations after gaining familiarity with online education.	6	8.1%	7	9.5%	22	29.7%	32	43.2%	7	9.5%
2	Sometimes, I have back-to-back online classes through which requires me to sit for long hours. This makes me feel tired and mentally exhausted.	3	4.1%	11	14.9%	10	13.5%	32	43.2%	18	24.3%
3	Studying online from home gives me the freedom and flexibility to study at my pace and I would like to continue studying through online education.	6	8.1%	20	27%	14	18.9%	30	40.5%	4	5.4%
4	There is a feeling of isolation associated with online learning as I cannot physically interact with my fellow classmates.	2	2.7%	9	12.2%	9	12.2%	33	44.6%	21	28.4%
5	I feel I may be left out if I am not able to cope with this new way of learning through online mode.	2	2.7%	18	24.3%	18	24.3%	28	37.8%	8	10.8%

Of the respondents, 52.7% felt ease in appearing for online exams after gaining familiarity with online learning, whereas 29.7% were undecided and 17.6% of the learners did not feel so. The findings indicate that with exposure to online learning environment, student familiarity with online exams may also increase. This section was of particular interest due to increased screen time of learners in front of digital devices for their online studies. Bozkurt and Sharma (2020) state that the present scenario of emergency remote teaching has led to bombardment of learners with lectures in front of the web cam without any consideration of learner or learning. The present study also revealed that the back-to-back classes were seen as mentally exhausting for about 67.5% of the learners, while 19% of the learners did not report experiencing such issues. On the aspect of flexibility, 45.9% of the learners wished to continue studying through online education whereas 35.1% showed a general unwillingness. 18.9% were undecided on this question. According to Daniel (2016), the key criterion for judging the value of flexibility in online learning is whether students become more engaged and perform better. Though the crisis-induced

online learning experiment is incapable of providing the true learning experience, it did give a flavor of flexibility to the learners.

As high as 73% of the learners felt isolated in online learning but 14.9% disagreed and 12.2% were undecided. A feeling of being 'left out' was expressed by 48.6% of the learners, whereas 27% did not report to express such a feeling. Another 24.3% were undecided on this aspect. The findings suggest that obligatory remote teaching by the educational institutions in response of the COVID crisis may aggravate the feeling of isolation and of being 'left out' in the learners. In such a situation, it is strongly felt that while adopting and customizing online learning, there is a need to empathize with students' feelings and attitude.

In addition to the above, some learners also submitted their responses towards their views about online learning.

Table 7. Responses of some learners to an optional open-ended comment

S.NO.	COMMENTS
1.	<i>Due to online study our information about internet is getting better day by day.</i>
2.	<i>I think according to me the internet is very beneficial for students in all aspects. It serves as a teacher from where you can ask everything and it will answer you. The internet gives knowledge you want to get about any subject, field of education and institution.</i>
3.	<i>Online method of education saves a lot of time. But, there should just be one app for all the teachers to take classes. Teachers should also use Google classroom app, as it helps in organizing and keeps a track record. If online education still continues, there wouldn't be any hamper in our education. Please look into the matter.</i>
4.	<i>I am very happy about the online classes being held by school and coaching.</i>
5.	<i>Teacher should teach the students in the same way as they teach in classroom by explaining the mechanism and process elaborately.</i>
6.	<i>Online classes are good way of studying these days. Although it has many disadvantages too! Sitting in front of PC/laptop for long time is causing many health issues!</i>
7.	<i>Online study is not bad if the teacher tries to do their best which they certainly aren't capable of due to lack of training.</i>
8.	<i>I feel in my opinion it's actually a great opportunity to give much time to our skill and learn more about online activities.</i>

This open-ended item gave insights on learners' feelings and opinions about their online learning experience during COVID-19 lockdown. A positive attitude for online studies can be seen among the learners. Some important suggestions were also provided such as use of single app by all teachers for online teaching/meetings and stress on Google classroom or any LMS for organizing learning resources and better monitoring of learner's performance. Other important concerns raised were capacity building of teachers to teach online, health issues and teaching methodology for online learning. An overall encouraging trend for online learning is observed among the learners. This suggests that even post-lockdown, online learning owing to its many benefits may continue to be incorporated in school education through a blended mode. Besides, more research into online learning pedagogy and its integration into school education will enable better preparedness for the adoption of online learning in future crisis situations.

Conclusion and Suggestions

The findings of this study indicate that improved smartphone penetration and fast speed internet connection is enabling more than 70% of the learners in Delhi to study online. The study showed that as regards the personal study space, an important requirement for an undisturbed online learning environment at home, as many as 69% of the learners expressed that they had their own study space. However, it also revealed that learners' access to a hardware engineer/technician was lacking. In order to enable continuity and smooth online classes, such hardware support constitutes an 'essential service' both in the pandemic-caused lockdown as well as in normal times. The issue of electronic storage showed that with the increase in online resources, students will have to be equipped with high storage

electronic devices – this implies that learning support materials may now cost more, with cheap affordable paper and pen options being replaced by expensive electronic devices to support learning. The study also revealed that more than 40% of the learners needed more support in honing their basic digital skills as they had difficulty in using a search engine for relevant and customized results. A similar trend was observed for those finding difficulty in making the switch to online learning. Another study may need to be conducted to find the correlation between the learner's difficulty in studying through online learning and their ability to efficiently use online tools. At this point, it is suffice to conclude that there is a need for training on usage of these devices for effective learning.

The awareness that the internet may not always be a safe place was also visible from the responses of this study as over 66% of the learners expressed their concern for cyber safety. Therefore, schools, teachers, and learners would need to take into account the digital safety and privacy while designing their online learning strategies.

The responses to the delivery dimension showed mixed results. While online learning gave opportunity for interactive learning with teachers and peers, yet there was also a 'nervousness' among learners toward studying on one's own without the technical support. This reinforces the importance of the role of the teacher in the online learning environment at the school level. Further, it was seen that only 35.2% found online learning to be as effective as classroom-based learning. In one of the responses, a learner stated that the teachers should teach online exactly as they do in the classroom. The issue of pedagogy for online education as a part of the regular school time table would need to be addressed, with both learners and teachers being made better equipped with skills on 'how to teach' and 'how to learn'. Just as formal school teachers are trained in face-to-face teaching, there is a need for teachers to be trained in online teaching methodologies to become equally effective in online teaching.

Due to the sudden switch to online learning due to the pandemic, learners have been exposed to a new learning environment. While learners reported mental exhaustion caused by back-to-back online classes, extended on-screen time, and feeling of isolation, there were also many positive aspects of this shift to online learning. The freedom and flexibility to study at one's own pace encouraged as many as over 40% to want to continue studying through online learning. Further, it is also clear that this opportunity to learn via online classes has given learners the confidence to engage in online assessment now and thus be better prepared for the future.

This study revealed that school learners agreed that they may be "left out" if they were not able to cope with online learning. This realization that the future of learning lies in the direction of online learning has deep implications not just for the learners themselves but also for both face to face and distance learning/alternative remote learning systems. It is quite evident that conventional face to face schooling will never be the same again. Distance learning too has to accelerate its pace of technology adoption for all operations. Moreover, in the post-pandemic period, the 'silo effect' of face to face and distance learning systems would have to be reduced and perhaps eliminated, with technology playing the linking role. Greater flexibility and mobility of learners from one system to the other supported by online learning would ultimately lead to an enabling environment for lifelong learning.

Based on the results of this study, it is suggested that pedagogy of online education for school going learners be further improved and strengthened. Increased internet connectivity, free Wi-Fi to students, and affordable digital devices would go a long way in ensuring access to online learning and overcoming the digital divide. Improving digital skills of both teachers and learners through awareness programs and capacity building initiatives would help in realizing true potential of online learning. Research and development into online teaching and learning methodology would help in improving the interactivity quotient of an online learning environment (OLE) in order to allay learner's fear of isolation. The importance of the role of the teacher and aspects of peer learning and interaction suggest that a blended approach, in which both face-to-face and online learning are used in the appropriate mix, may be a more

suitable way forward in the future. However, a system for the complete shift to online as required in the current crisis may also be devised in order to confront such challenges in future.

The findings of this study are limited to the city of Delhi. More such studies in other states will help in bringing out a clearer picture of the online learning status in the country. The study takes into account only the senior secondary school learners of grades XI and XII. Further studies to adjudge efficacy of online learning at different school levels need to be conducted. The study could not explore the role of medium of language in online learning. More research in the possibility of imparting online education in Hindi and state/regional languages is recommended.

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