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IMPACT OF VIRTUAL LEARNING ON PERCEIVED MENTAL HEALTH OF COLLEGE STUDENTS DURING COVID-19 PANDEMIC

Abstract. *The study in this article addresses three research questions: a) how do college students view the effectiveness of technology-mediated virtual learning during the COVID-19 pandemic; b) how does virtual learning impact their perceived mental health; and c) what is the mode of learning they most prefer? It follows an explanatory research design and survey method. Data are collected using a questionnaire with a purposive sample of 102 students and interviews with 20 students and 40 faculty members in India. The conceptual framework of this study is quite similar to the modified version of the Technology Acceptance Model (Venkatesh and Davis, 2000). The study reveals that 86% of the students find virtual learning to be ineffective. Such learning not only fails to provide adequate opportunities for experiential learning for developing knowledge, skills, and leadership abilities but also creates several perceived mental health problems. This study may help higher education institutions while designing and implementing virtual teaching-learning systems in order to prevent their negative impact on student's perceived mental health in future crises.*
Keywords: *Virtual learning, perceived mental health, COVID-19 pandemic, Behavioural Intention, Perceived Usefulness*

Introduction

The novel coronavirus disease 2019 (COVID-19) epidemic was declared a pandemic by the World Health Organisation in March 2020 (WHO, 2020). The rapid spread of this virus around the world affected billions of people, including millions of students in many countries. By the end of March 2020,

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the virus was found in over 177 countries, resulting in nationwide lock-downs and the closure of offices and educational institutions (UNESCO, 2020). For example, in the evening of 24 March 2020, the government of India ordered a nationwide lockdown, limiting the movement of about 1.38 billion population of India in response to the COVID-19 pandemic. Similarly, the Swiss Federal Council declared an "extraordinary situation" as early as 16 March 2020 and imposed massive restrictions on public life. In Saudi Arabia, the COVID-19 pandemic impacted more than 1 million university students when teaching was converted from physical classes to virtual classes through the learning management system known as Blackboard Learn (Moawad, R., 2020). A similar situation could be found in almost every country. All schools, colleges and universities had to close their campuses. Faculty and students were asked to shift from the normal face-to-face mode to the virtual mode of teaching-learning (Gettleman and Schultz, 2020; Sahu, 2020), despite their inherent resistance to do so.

Virtual learning is a type of teaching-learning approach in which both teachers and students participate in online classes using digital technology and platforms like Zoom in a flexible manner. This approach became necessary and not an option for almost all schools and colleges on a wider scale than ever before. There was no or very limited formal training given to the faculty members and students before the new technology for virtual learning was adopted. There was no time to test the efficacy of this new system. In spite of several challenges, educational institutions had to continue with online classes. Yet, unlike in many countries, Swiss universities were able to resume their normal face-to-face teaching-leaning activities and on 8 June 2020 they faced another challenge – how to continue teaching while keeping their faculty, staff and students safe from the deadly virus that was moving fast and not well understood (Hodges et al., 2020).

The transition to the virtual mode raised questions about faculty members' capability to deal with the new technology (Sahu, 2020) and meet the academic needs of students. It became a very difficult and challenging task for the faculty and students to operate online due to the heavy demand for computers, IT equipment, a stable Internet connection, adequate space and a suitable environment at home for use by the students, their parents, and other relatives who were forced to work from home. Faculty and students were uncertain about the procedure for administrating the continuous assessments through practical assignments, projects, and lab tests. It was also difficult for the faculty to monitor the proceedings of online examinations to check any malpractice by students.

Educational institutions tried to use a virtual and a hybrid mode of learning, especially when there was a little improvement in the COVID-19 pandemic in some countries. However, this meant students were deprived of

various campus events like workshops, conferences, sports, and other physical activities. This led to considerable stress and strain among students, faculty and staff. There was no clear answer to various questions such as: a) How can the students who have no access to laptops and Internet facilities participate in virtual classes at home? b) How can the practical classes and laboratory activities be conducted in the virtual mode? c) How can courses designed for face-to-face learning be conducted and assessed online? Moreover, a few cases of virtual learning having an adverse impact on students' perceived mental health came to the surface through social media news and published reports like the report of the Hospital for Sick Children (Ontario Ministry of Education, 2020). A deeper understanding of the impact of virtual learning on the perceived mental health of college students was felt necessary to help faculty members and the promoters of higher education institutions (HEIs) design the teaching-learning systems which consider the academic and perceived mental health issues in a crisis such as the COVID-19 pandemic. Therefore, an attempt is made in this study to explore how virtual learning impacts the perceived mental health of college students and their preferred mode of learning, during and after the pandemic.

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Research questions

This study examines three research questions:

Q1. How do college students view the effectiveness of technology-mediated virtual learning during the COVID-19 pandemic?

Q 2. How does virtual learning impact college students' perceived mental health during the COVID-19 pandemic?

Q3. Which mode of learning do students most prefer to reduce the potential negative impact of teaching-learning practices on their perceived mental health during and after the COVID-19 pandemic?

Research design

The study follows an explanatory research design focused on explaining the aspects of a phenomenon under study in a detailed manner. This study seeks to explains how the behavioural intention of college students with regard to virtual learning affects their perceived mental health during COVID-19 pandemic and how the perceived usefulness of digital technology impacts the students' behavioural intentions. It also explores the students' preferred mode of learning such as virtual, hybrid and face-to-face learning during and after the pandemic. This is related to the modified version of the Technology Acceptance Model (TAM) proposed by V. Venkatesh and F. D. Davis (Venkatesh and Davis, 2000). This model explains how both

perceived usefulness (PU) and perceived ease of use (PEoU) of a technology have a direct influence on users' behaviour, thereby eliminating the need for the attitude construct. A recent study in Germany (Vladova et al., 2021) "Students' Acceptance of Technology-Mediated Teaching How It Was Influenced During the COVID-19 Pandemic in 2020" applied this version of the TAM model and incorporated variables influencing PU. It also identified differences between various subject groups of students with respect to their perceived acceptance of virtual learning and showed changes in behavioural intentions (BI) over time. The mentioned study provided motivation for this study to further understand the drivers underlying students' adoption of virtual learning and its impact on students' perceived mental health during the COVID-19 pandemic.

The data were collected through survey methods (both quantitative and qualitative) using a structured questionnaire and personal interview. A purposive sampling technique was used to collect data from a sample of 102 college students from different parts of India who had experienced technology-mediated teaching/learning between March 2020 and December 2021 and through in-depth interviews with 20 of them. Similarly, 40 faculty members were also interviewed to understand their views on the effectiveness of the virtual learning, especially how quickly they could change their teaching methods and what is their most preferred teaching-learning mode during and after the pandemic.

Objectives

- To understand how the students view the virtual learning during the COVID-19 pandemic.
- To explore the parameters of perceived mental health that are impacted by virtual classes.
- To analyse the impact of intention and actual use of digital technology on the perceived mental health of the students.
- To propose and validate a novel model that includes the perceived mental health of students.
- To suggest remedial measures for improving the perceived mental health based on preferences concerning the mode of class.

Hypotheses

H1: The difficulty the students face while using digital technology impacts the perceived usefulness of virtual classes.

H2: Perceived usefulness has an influence on the behavioural intention of the students to use digital technology for virtual learning.

H3: The difficulty the students face while using digital technology influences the behavioural intention with regard to adopting a particular mode for virtual learning.

H4: Behavioural intention affects the students' perceived mental health.

Literature review

A review of available published research articles reveals certain aspects of virtual learning and its impact on students' perceived mental health which provide relevant directions for this study.

Several articles (Ali, 2020; Bao, 2020; Cao et al., 2020; Elmer et al., 2020; Huckins et al., 2020; Li et al., 2020; Wang et al., 2020; Sweetman, 2020; Ontario Ministry of Education, 2020) discuss the virtual learning–student's perceived mental health relationship. A report by the Hospital for Sick Children (Ontario Ministry of Education, 2020) revealed cases of online learning and increased screen time having a negative impact on the perceived mental health of students. Three studies (Ali, 2020; Bao, 2020; Zhang et al., 2020) found that faculty and students who participated in an online teaching-learning process faced difficulties and unforeseen challenges due to their lack of experience of using the new technology, the absence of time for preparing for the online teaching, the weakness of the online-teaching infrastructures, the information gap, and the complex environment at home. Not every student was able to find a suitable space and environment for online learning due to a wide range of distractions, insufficient hardware, and unstable networks (Zhang et al., 2020; Nayak et al., 2021). The psychological effects of the online education during the pandemic on students included anxiety, fear and worry, among others (Cao et al., 2020; Li et al., 2020; Wang et al., 2020). Another article (Sweetman and David, 2020) emphasised how synchronous and highly interactive teaching was important for improving students' learning outcome and perceived mental health.

A longitudinal study (Huckins et al., 2020) found that students were more sedentary, anxious and depressed in the winter term of 2020 than in previous academic terms. One study in China (Cao et al., 2020) indicated that college students' anxiety with the pandemic was associated with their place of residence (whether living with their parents or relatives), and the source of their parents' income. There was an association between fluctuations in news reporting on COVID-19 and a student's behaviour such as greater phone use, reduced physical activity, and being hesitant to visit many locations. They also suffered from limited contact with close family members and their social network. One study (Elmer et al., 2020) established female students had a greater risk of facing negative perceived mental health consequences than their male counterparts.

A few research studies (Dhawan, 2020; Sweetman and David, 2020; Cojocariu et al., 2014) stressed flexibility as an important aspect of online education. According to these studies, flexibility in the learning environment can facilitate the stronger learning potential of students. They can learn any-time and anywhere, unconstrained by location. Virtual learning provides the possibility of flexible learning due to the rapid development of technol-ogy. The synchronous virtual learning excludes students who lack access to the Internet and the required technology due to socioeconomic and loca-tional reasons. Such synchronous online classes will also not be effective for students in different time zones when classes are held for a global audience. In these cases, ensuring the flexibility of use of both synchronous and asyn-chronous approaches (sharing video-taped lectures and offering chat board interaction via the institution's learning management system) will make the learning process more effective. As such, the flexibility aspect of the online education offered may make the learning student-centric.

Another group of researchers (Bao, 2020; Hodges et al., 2020; Means et al., 2014; Nayak et al., 2021) studied the design aspect of virtual learning. They have found nine dimensions of the design and decision-making process of vir-tual learning, i.e. modality, pacing, student-instructor ratio, pedagogy, instruc-tor role, student role, online communication synchrony, role of online assess-ments, and sources of feedback. These studies explain how the design of the instructions and careful delivery of the lecture have an impact on the effec-tiveness and quality of virtual learning. A case study on students' perceptions of virtual learning in a university in India (Nayak et al., 2021) indicates that although the teaching efficiency in the online mode generally remained unaf-fected in terms of the content and acquisition of knowledge, other aspects like peer learning, the campus community, and physical interactions with fellow students and faculty were affected. It is contended that teaching is best made possible through learning experiences that are interactive (Bao, 2020).

Aspects such as the preparedness and composition of students partic-ipating in virtual, blended or hybrid modes of the learning process were highlighted by several research studies (Abdullah et al., 2021; Littenberg and Reich, 2020; Parkes and Reading, 2014). These studies show that stu-dents were insufficiently prepared to establish a balance in their work and social lives while pursuing an online education. They were ill prepared with respect to many of the competencies required for online education, and for using learning management systems.

Although the use of virtual technology is not completely new for some educational institutions in many countries, the assessment aspect in the vir-tual mode is under-developed (Timmis et al., 2016; Raaheim et al., 2019). Moreover, students who do not have a secured Internet connection clearly suffer a disadvantage while participating in the evaluation process,

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adversely affecting their grades (Alruwais et al., 2018). This makes it necessary to understand the challenges and impacts of online assessments of courses that were designed for face-to-face learning on the students' mental health during the COVID-19 pandemic.

Virtual learning also affects the compositions of students and their grade. A study shows there are more male students and students with post-graduate degrees in the blended programme. Further, students who studied in blended education programmes scored higher average grades than students of campus-based programmes. The hybrid approach was found to be good for assessing and evaluating academic performance and health interventions in terms of accuracy, precision and recall (Abdullah et al., 2021).

Three studies (Dhawan, 2020; Adnan and Anwar, 2020; Song et al., 2004) identified the challenges and limitations of the virtual learning, pointing to distance, scale, lack of access to digital technology, lack of peer learning, and personalised teaching-learning as the biggest challenges of online education. Some other issues are a lack of community feeling, and technical problems. A recent study (Abdullah et al., 2021) found that virtual learning can become a good practice if the ICT in education, the process and its principles are efficiently harmonised. However, another study conducted in Pakistan highlighted that online learning cannot produce the desired results in underdeveloped countries mainly due to the lack of access to ICT facilities, and money. The lack of physical interaction was another major problem experienced by students (Adnan and Anwar, 2020). This indicates the importance of peer-learning, which has been affected due to the online education introduced during the COVID-19 pandemic.

Thus, recent studies have indicated that virtual learning has several negative impacts on the perceived mental health of students during the COVID-19 pandemic. This study drew considerable inspiration from the article by P. Sahu entitled "Closure of universities due to Coronavirus disease 2019 (COVID-19): impact on education and perceived mental health of students and academic staff". In the article, Sahu notes the potential impact of the terrible COVID-19 outbreak on the education and perceived mental health of university students (Sahu, 2020). He reviewed various challenges such as shifting from face-to-face to online classes, assessment and evaluation, travel restrictions, difficulties faced by international students, mental health of students, and the support services of the universities.

The mentioned article provided direction for further studies to explore the parameters, types and causes of students' perceived mental health problems due to virtual learning and to discern whether there is any influence of the students' perception and their behavioural intentions to use the new virtual technology on their perceived mental health. It is interesting to determine whether there is any difference in the impact of virtual learning on

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perceived mental health among male and female students. It is also necessary to find out what students, faculty and the promoters of educational institutions should do in the case of the continuation of virtual learning during the pandemic and after it. Accordingly, this study attempts to address the ways virtual learning impacts the perceived mental health of students and the perspectives for transitioning from in-person to virtual learning in the current and future pandemic crises.

Conceptual framework

The conceptual framework of the study (Figure 1) is designed with reference to the modified version of the Technology Acceptance Model (TAM) propounded by Venkatesh and Davis (Venkatesh and Davis, 2000).

Figure 1: CONCEPTUAL FRAMEWORK
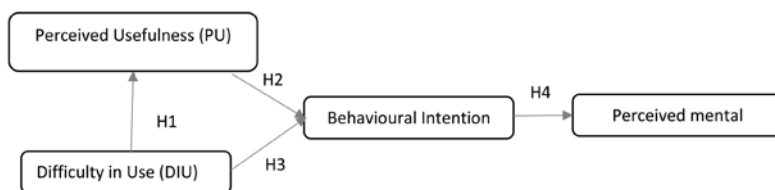
Source: Designed with reference to the modified version of the Technology Acceptance Model (TAM) propounded by Venkatesh and Davis (Venkatesh and Davis, 2000).

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TAM is a theory that models how users come to accept and use a given technology. This model is used in this study to understand how the *Behavioural Intention* (BI) of students to use technology-mediated teaching-learning can affect their perceived mental health. It also explains the effects of *perceived usefulness* (PU) and *perceived ease-of-use* (PEoU) on perceived mental health. *Perceived usefulness* (PU) is the degree to which a person believes that using a particular system would enhance their work performance, namely whether someone perceives that technology as being useful for the desired purposes. The degree to which an individual believes that using a certain system would not require much effort is called *perceived ease-of-use* (PEoU). Difficulty in use (DiU) of technology is experienced when PEoU is negative or it is not easy to use and the interface is complicated. Due to the COVID-19 pandemic and the abrupt change from face-to-face teaching to technology-mediated teaching, students and teachers had to use virtual learning technology without any scope for understanding their choice or acceptance of the new system. Here, PU and DiU may have influenced the BI of users towards the virtual learning system. In this article, an attempt is made to find out whether the PU and DiU of technology-mediated

virtual learning has any influence on BI. Further, it explores how BI impacts the perceived mental health of the students.

The model suggests that when users (students) are presented with a new virtual learning technology through Zoom or other online platforms/LMS, a number of factors may influence their decision to use it. Since the new system was abruptly adopted, the ease or difficulty of its use may influence the students' perceptions and intentions with respect to the new system. The perceived usefulness may influence the BI of students in the direction of virtual learning. This may depend on the nature of the learning environment such as that forced by the COVID-19 pandemic. The model also attempts to determine the possible impact of BI on the students' perceived mental health.

Data analysis and results

Descriptive statistics

At the outset, descriptive statistics[1] were evaluated to understand the patterns of the study indicators. The peripheral analysis presents an overall idea regarding the data properties through mean values. The primary purpose of descriptive statistics relates to reducing the data to a considerable number of summarised analytics. Thus, the assessment of descriptive measures helps to ascertain the normality distribution of the dataset. Table 1 shows descriptive values of the study items.

Table 1: DESCRIPTIVE STATISTICS

		Male Mean	Female Mean	Inference
MH1	Feeling stressed	3.60	3.88	Females feel more stressed than males
MH2	Boredom and Fatigue	4.07	4.05	Males get more bored and have greater fatigue than females
MH3	Frustration	3.63	3.97	Females were more frustrated than males
MH4	Irritation and Restlessness	3.47	3.90	Females felt more irritated and restless
MH5	Depression	2.70	3.13	Females were more affected by depression than males
MH6	Getting angry	3.16	3.72	Females got angrier than males
MH7	Feeling unproductive	3.65	3.60	Males felt slightly more unproductive than females
MH8	Unhappiness	3.51	3.72	Unhappiness occurred more among females

Source: Survey data collected from 102 student respondents through the questionnaire.

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[1] *According to Given (2008: 209), "Descriptive statistics constitutes a summarization of the data where a large number of observed values are mathematically converted to a few numbers".*

Based on the mean scores shown in Table 1, it was evident that the boredom and fatigue indicator is the most important according to the respondents' perceptions in the context of virtual classes. In this regard, males exhibit a slightly higher mean for the MH2 indicator than the females. This finding implies that male students tend to feel more fatigue and more bored during virtual classes than their female colleagues. In addition, the indicator for depression (MH5) shows the lowest mean scores for both male and female students.

Hypothesis testing

The present research carries out regression analysis to evaluate the link between the independent variables and the outcome. In the initial stage, the effect of ease of use of digital technology towards the usefulness of virtual classes was examined using a regression model (see Table 2). The results (std. coefficient = –242, t-value = –2.501, p<.05) reveal that difficulty of use negatively and significantly influences the usefulness of the virtual classes during the pandemic. Subsequently, the findings show that H1 is statistically validated and supported.

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Table 2: REGRESSION MODEL (STAGE 1)

		Unstandardised Coefficients		Standardised Coefficients	t-value	Sig.
		B	S.E.	Beta		
1.	(Constant)	-9.063E-017	.096		.000	1.000
	Difficulty in Use	-.242	.097	-.242	-2.501	.014

a. Dependent Variable: Usefulness, S.E.: Standard error

Source: Survey data collected from 102 student respondents through the questionnaire.

The second stage relates to evaluation of the predictors difficulty of use and usefulness with respect to the BI of the students in virtual class settings. Based on Table 3, usefulness emerges as a strong predictor of behavioural intention (std. coefficient = .535, t-value = 6.258, p<.01), thereby supporting H2. This finding implies that usefulness positively impacts the students' intention to attend virtual classes during the pandemic. Further, the difficulty in use construct does not significantly affect the students' behavioural intention. The results provide no statistical support for the relationship between difficulty in use and behavioural intention and H3 is hence rejected.

Table 3: REGRESSION MODEL (STAGE 2)

Model		Unstandardised Coefficients		Standardised Coefficients	t-value	Sig.
		B	S.E.	Beta		
1	(Constant)	2.874	.094		30.452	.000
	Difficulty in Use	-.089	.098	-.078	-.907	.366
	Usefulness	.612	.098	.535	6.258	.000

Note: Dependent Variable: Behavioural Intention, S.E.: Standard error
Source: Survey data collected from 102 student respondents through the questionnaire.

In the third stage, the role of behavioural intention on the students' perceived mental health was evaluated through regression analysis. Table 4 shows that the BI of the students to use the virtual mode of learning negatively impacts their perceived mental health, thereby empirically supporting H4. Further, the regression model exhibits an R^2 value of .312, which implies the indicators of BI explain 31% of the variability in perceived mental health. The adjusted R^2 is a modified measure and shows a value of .298 (close to the R^2 value), therefore indicating the generalisability of the model.

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Table 4: REGRESSION MODEL (STAGE 3)

Model		Unstandardised Coefficients		Standardised Coefficients	t-value	Sig.
		B	S.E.	Beta		
1	(Constant)	1.229	.342		3.599	.000
	Behavioural Intention	-.254	.083	-.290	-3.045	.003

Note: Dependent Variable: Perceived mental health, S.E.: Standard error
Source: Survey data collected from 102 student respondents through the questionnaire.

Figure 2 shows the results of the hypothesised model testing involving the study constructs.

Figure 2: RESULTS OF HYPOTHESISED MODEL
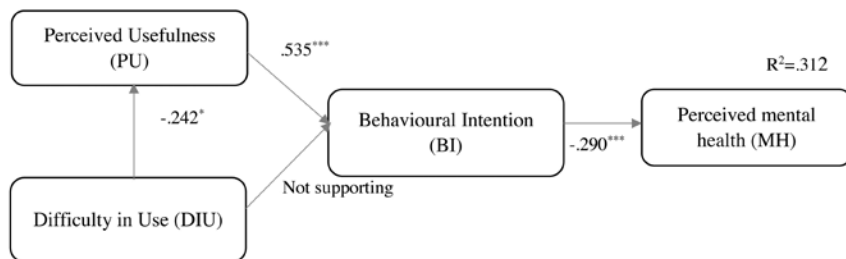
Source: Survey data collected from 102 student respondents through the questionnaire.

Findings

Students' perceptions of the usefulness of virtual learning technology during the COVID-19 pandemic were studied in terms of its effectiveness for acquiring knowledge, skills, practical exposure, and interaction with faculty members for the holistic development of students.

Effectiveness of online learning

After experiencing the seriousness of the first two consecutive waves of the COVID-19 pandemic, students felt that online learning was the best possible option. However, 86% of them (including 48% completely) found online learning to be less effective than the face-to-face classes. During the personal interviews, most students also expressed that online learning was far less effective than the offline mode. They missed their classroom learning experience. One student doing a Bachelor of Business Administration observed that online learning was a big setback when it came to the grasping power and concentration level of students compared to on-campus learning. Moreover, 51% of them (24% completely) found virtual learning to be less effective for acquiring conceptual knowledge and skills than the physical classroom and lab-based learning. They faced many difficulties in understanding numerical subjects in the online classes.

The virtual learning technology was seen as unsuitable by 82% of the respondents (50% completely), especially for developing skills through experiential learning, where 73% of them felt (49% to a great extent) that there were no adequate opportunities to develop leadership skills and teamwork in the online mode of learning. Further, 84% of them (including 50% completely) found their class participation to be less effective in the virtual classes than in the face-to-face classes, 60% faced difficulties in conducting group discussions (29% to a great extent). It was felt that group assignments/project work could not be undertaken properly by 67% of them (23% to a great extent). Similarly, the effectiveness of the faculty's contributions to the teaching-learning process was affected due to the online education according to 65% of the students (to a great extent by 20%). Only 6% of the students found the level of their satisfaction with their faculty involved in the online teaching as high. For just 33% of the students, the online proctored examination system was effective during the pandemic whereas 40% remained neutral and 27% did not like it.

While 42% of the students observed that their interaction with the faculty was effective during the online learning (13% completely), 34% found it ineffective (including 16% completely), whereas others remained neutral. Peer learning was greatly affected in the opinion of 60% of the students

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(including 35% to a great extent), whereas 71% found that their personal interactions with the faculty and fellow students had been badly affected (to a great extent for 46%). One respondent, a Bachelor of Commerce student, was deprived of in-person interaction with his professors to help understand certain difficult subjects and clear his doubts.

The above findings clearly show that the majority of students faced difficulties with the use of the virtual learning system and perceived its usefulness negatively. Such negative perceptions of the system's usefulness influenced the students' behavioural intentions as concerns the virtual learning system.

Impact of online teaching on students' perceived mental health

The students encountered several forms of perceived mental health problems. Due to negative behavioural intentions, 87% of them suffered from stress, boredom and fatigue whereas 91% felt frustrated. Out of those who felt stressed, 27% experienced it always, 49% sometimes, and 11% rarely. Of those who suffered from boredom and fatigue, 41% experienced it always, 41% sometimes, and 6% rarely; 91% felt frustrated (always 32%, sometimes 45%, and rarely 14%). Further, 87% felt irritated and restless: always 36%, sometimes 36% and rarely 15%. Fifty-six percent of respondents suffered from depression: always 15%, sometimes 30%, and rarely 21%; 82% suffered from a tendency to get angry: always 23%, sometimes 41%, and rarely 18%, while 84% felt unproductive: always 34%, sometimes 33%, and rarely 17%. Finally, 78% experienced unhappiness: always 29%, sometimes 36%, and rarely 13%.

Several factors contributed to different forms of perceived mental health issues. The COVID-19 pandemic itself, which created a number of socio-psychological, economic and health hazards in the family and in society generally, was a major factor for stress and a range of negative feelings among the students. Moreover, online education that required extensive use of digital technology created additional stress and negative impacts on the students' behaviour. Due to long screen times (i.e. working on a laptop or mobile phone), 82% of the students suffered from heavy strain on their eyes, a painful neck and back, headache etc. (59% to a great extent). Non-availability of an Internet connection was another major concern for 59% of the students, especially those from rural areas (23% of them suffered to a great extent), while 74% of the students suffered from disturbances during the online classes (37% to a great extent) due to other activities in the home environment. A lack of suitable space at home for online classes was suffered by 53% of them (23% to a great extent) when other family members depended on the same facilities due to their work-from-home assignments.

For 53% of the students (26% to a great extent) the setting up of Wi-Fi or a high-capacity data pack was unaffordable. Such difficulties faced by the students meant the perceived usefulness (PU) of the virtual learning technology was negative. Such negative perceptions further negatively influenced the behavioural intentions (BI) of the students. Instead of developing a positive attitude to this new virtual learning technology to manage the pandemic-related crisis, their BI regarding this became negative. As a result, it impacted their perceived mental health in several ways as found in this study. Further, various avenues conducive to relaxation and relieving from stress were also not available. The fun element in college life was missing according to 73% of the respondents (to a great extent by 65%), whereas 77% of the respondents (66% to a great extent) felt very deeply about missing out on the opportunities for the reduction of mental tensions through peer interactions and campus life experiences. It is thus clear that the online teaching during the pandemic produced negative impacts on the perceived mental health of the students.

Students' preferred mode of learning during and after the pandemic

Although virtual learning was the only possible mode of learning during the pandemic, 60% of the students would not like to continue with this mode, 40% of them preferred to learn in a hybrid mode (both synchronous and asynchronous) and 20% wanted the face-to-face mode with COVID-19 safety protocols. When the level of their agreement with such options was studied, 27% of them completely agreed and 25% generally agreed to have the hybrid mode whereas only 19% completely and 21% generally agreed to study only in the face-to-face mode. Meanwhile, 32% of the respondents completely and 26% generally agreed to continue with the virtual learning. Still, some suggested training be given to faculty so that they can acquire special skills to make virtual learning interesting and effective.

Similarly, only 17% of the interviewed faculty found virtual learning to be highly effective. Yet, considering the pandemic situation, about 80% had developed some innovative tools and techniques within 2–3 months to make the online classes effective.

In response to their preferred mode of learning post-pandemic, only 15% of the students and 17% of the faculty would prefer to have virtual learning whereas 44% of the students and 17% of the faculty would prefer the face-to-face and 41% of the students and 77% of the faculty hybrid modes of learning.

It is thus clear that most students and faculty members do not want the virtual mode of learning due to the lack of uninterrupted Internet services, lack of a proper environment at home to use such a system, the absence of

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opportunities for peer learning for students, the lack of practical/lab activities, poor personal faculty–student interaction etc. While there is no much difference between the students and faculty in their preference for virtual learning, there are significant differences regarding their preferences for face-to-face and hybrid learning. This is mainly because both faculty and students are fed up with the monotonous and boring online classes underway for about 2 years and that do not allow adequate face-to-face interaction. The preference for the face-to-face mode of learning is stronger among students than among the faculty. This preference is primarily because students are interested in receiving the personal attention of faculty and close interaction with their peers, whereas faculty want to take full advantage of the hybrid mode realistically with a mix of both face-to-face and online learning to ensure the optimal use of time and the available digital resources developed for virtual learning during the pandemic.

Discussion

The pandemic has compelled HEIs to switch to the virtual mode of teaching following the lockdown restrictions on physical classes. Such drastic changes in the overall teaching environment may significantly impact the attitude and behaviour of both students and teaching staff (Gomez et al., 2020; Gloria and Uttal, 2020; Murphy et al., 2020). HEIs should design programmes to support their students and staff during this transition to a virtual learning environment. Against this backdrop, this study carried out a sample survey in selected Indian regions to understand the opinion of students with regard to virtual classes. To meet these objectives, the study took cues from the literature review and conducted empirical testing to ascertain the nature of the relationship between the model constructs.

The findings of regression analysis provide in-depth understanding of the potent factors that influence the students' perceived mental health. According to the results, difficulty in use has a negative and significant impact on the perceived usefulness of virtual classes. This finding shows that students who find it tough to adopt the virtual mode of teaching perceive that online class are not useful from their learning perspective. They therefore tend to lack confidence and shy away from participating in virtual classes. Further, the relationship between perceived usefulness and behavioural intention was found to be positive and significant. This finding implies that students who believe technology-based learning can lead to better command over the subjects are willing to participate in virtual classes. Moreover, the behavioural intention to use virtual learning has impacts on the perceived mental health of the students. Due to a lack of technical resources and proper Internet facilities, a significant proportion of

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the students is unable to attend the online classes regularly. The lack of personal contact has also led to negative emotions, stress, and anxiety issues, which require psychosocial assistance (Sifat, 2020). College authorities and faculty must therefore design and prepare well for the effective use of digital technology so as to ensure the virtual learning is stress-free. Adequate fun elements should be added to virtual classes. Counselling services should also be available to deal with students' perceived mental health issues on a regular basis while in the future adapting to virtual learning in a crisis like the COVID-19 pandemic.

On the theoretical level, the study findings contribute to the existing literature on perceived mental health among students, particularly in a pandemic-related crisis. The identification and validation of the significant factors affecting perceived mental health duly extend the conceptual knowledge of the domain. Based on the empirical findings, academics can draw relevant insights about student perceptions of virtual classes. In addition, this study provides cues to educational policymakers, institutional committees and other related stakeholders to develop strategies for reducing excessive stress and fatigue among students, thereby improving their overall perceived mental health. In addition, the study underlines the importance of addressing perceived mental health issues among students in a pandemic. Since there is considerable uncertainty surrounding career opportunities in the coming years, students are burdened by excessive stress and restlessness. This means it is becoming imperative for educational institutions to understand the student viewpoint on the virtual mode of learning and to come up with solutions like counselling services, engagement modules etc. to address the perceived mental health issues.

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The study clearly shows that virtual learning was a necessity and not the most preferred option during the COVID-19 pandemic. Transferring the contents of classroom lectures to online sessions through Zoom or other online platforms with a few cosmetic changes was unable to make the online teaching effective, as the students in this study observed. This resembles what Dr Vijay Govindarajan, Coxe Distinguished Professor, Tuck School of Business at Dartmouth College, USA stated during a webinar on 20 May 2020: "if you put lipstick on a pig, the pig will still look like a pig".

An important aspect of virtual learning is flexibility, facilitating the stronger learning potential of students and unconstrained by location (Dhawan, 2020). Effective virtual learning is the outcome of instructional design and planning. The design of the instructions and careful delivery of the lecture impact the lecture quality and the classroom experience (Hodges, Moore, Lockee Trust and Bond, 2020). Yet, this did not happen in most cases in India, making online learning stressful for many students, as revealed by this study. The findings here are quite similar to those of one

study (Means, Bakia and Murphy, 2014) on how the nine dimensions of the design and decision-making process of online education – modality, pacing, student-instructor ratio, pedagogy, instructor role, student role, online communication synchrony, the role of online assessments, and sources of feedback – could not be ensured by virtual learning. Development of the knowledge, skills and abilities of students was constrained in the virtual mode compared to face-to-face learning. This means the content, delivery, engagement modes, use of technology, and the entire learning process must be transformed to ensure they are student-centric. The biggest challenges with virtual learning the students faced during the pandemic were difficulty in use of digital technology, distance, scale, and personalised attention of faculty to students' learning needs. Similar observations were made by another study (Dhawan, 2020). Therefore, universities should focus on upgrading the digitisation of teaching resources to make them user friendly and to develop faculty for student-centric virtual teaching such that the gap between face-to-face and virtual learning can be minimised, in turn reducing the negative impacts on the students' perceived mental health.

The impact of online education on the perceived mental health of the students during the pandemic was high. This was due to the students lacking in preparedness and competencies to adapt to the new virtual learning system. In another research study (Parkes, Stein and Reading, 2014), students were found to be insufficiently prepared to use the learning management systems, to balance out their work and social lives, thus making the online education ineffective. Similar to findings of a previous research study (Adnan and Anwar, 2020), this study observed the non-availability of peer group interactions as a major setback during the pandemic, thereby rendering the virtual education less effective and more stressful. This indicates that the personal warmth of peers and faculty members is an important aspect of the learning process and its absence impacts the perceived mental health of both the students and faculty. This study has focused on the perceived mental health of the students, and not of the faculty. However, during an interaction with a small number of faculty members it was felt that the virtual learning and lack of physical interaction with students in a normal college environment was stressful and monotonous. This points to the need for further research work to ensure a deeper understanding of the impact of the behavioural intentions of faculty and other staff members to use virtual learning on their perceived mental health.

Most students opted for the face-to-face or blended mode of learning once the pandemic is over. A research study (Littenberg-Tobias and Reich, 2020) shows that students who studied in the blended education programme scored higher average grades than those in the campus-based programme. This aspect was not studied in detail in this study. Future research

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work could also seek to determine the impacts of blended or virtual learning on the academic performance and grades of students.

Conclusion

This study shows that although online teaching-learning was necessary during the COVID-19 pandemic, most students regarded it as an ineffective mode of learning for their holistic education. It could not fulfil the students' need for experiential learning, peer learning, and leadership skills development. Hence, adequate preparation and training is required for the faculty and students to make virtual learning effective in similar crises. The virtual learning had a significant impact on the perceived mental health of the students. As this study reveals (Table 1), female students feel more stressed, frustrated, irritated, restless, unhappy and angry than their male counterparts while participating in virtual classes. Male students become more bored and have greater fatigue, and are more unproductive than their female counterparts. This is largely due to the difficulty in use, negative perceived usefulness and behavioural intention of students with respect to virtual learning. Still, the reasons of such behaviour have not been studied in depth. Therefore, further research is required to probe deeper to discern how gender plays a role in terms of virtual learning's impact on the students' perceived mental health and how differently male and female students cope with such perceived mental health problems.

The students are divided in their preferences for virtual learning during and after the COVID-19 pandemic. Although most consider virtual learning to be a viable option during the pandemic, the blended or face-to-face mode of learning is the option they most prefer in the post-pandemic period. This situation is considered to be a temporary phenomenon and not a permanent viable mode of teaching-learning, especially for the post-COVID era. The integration of technology into education will continue to receive special attention in future, notably in crises like the COVID-19 pandemic. University management must provide well-designed teaching-learning systems and well-trained faculty with necessary tools and competencies to implement the system. Adequate care needs to be taken to prevent several perceived mental health problems while implementing a virtual learning system. There is accordingly a need to train both faculty and students to ensure the virtual or blended mode is effective in any new situation. It seems that the magic of making virtual, offline or blended modes of education effective and stress-free lies in a student's positive perception and behavioural intentions along with a well-designed and well-supported virtual learning system.

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