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The Satisfaction of Online Learning among Dental Students in Three Dental Public Institutions in Malaysia during COVID-19 Pandemic

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ABSTRACT

Online learning is the use of electronic media for various learning purposes ranging from add-on functions in conventional classrooms to full substitution for face-to-face meetings by online encounters. It is widely employed in the COVID-19 pandemic era. This study was conducted to determine the students' satisfaction towards online learning and its associated factors in three public dental institutions in Malaysia. It was a cross-sectional study among undergraduate dental students. An online, validated, self-administrated questionnaire was distributed via Google Forms by a key person from each university. It consists of three sections, namely Section 1 (sociodemographic information); Section 2 (three domains): (a) Learner's dimension (9 items); (b) Instructors' characteristics (9 items); and (c) Technological characteristics (7 items); and Section 3 (Self-rated satisfaction). The duration of data collection was within three weeks with reminders given between the weeks. The Chi-squared test for differences and the Chi-squared test for association were used for statistical analysis at $p \leq 0.05$. About 179 students responded; the response rate was (74.6%), and the majority of the respondents were female (74%). All students used their internet data to access online learning, and there was a significant difference in satisfaction towards online learning between the three dental institutions. The academic year was associated with satisfaction towards online learning. The students from each institution revealed different degrees of online learning satisfaction, and learning experiences differed in each institution. This study offers insights into how educational institutions may better support students at different academic levels so they can succeed in online learning environments and feel more satisfied with their education.

Keywords: *Dental students, e-learning, Online learning, Satisfaction*

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INTRODUCTION

In the current educational environment, two unique pedagogical techniques that have gained popularity are blended learning and online learning. Blended learning is a hybrid training approach that combines online digital components with conventional in-person classroom techniques. This method offers students some choice over the schedule, environment and speed of their learning while still requiring the physical presence of the teacher and students. Conversely, online learning is a completely digital teaching approach that occurs online and does not generally involve any in-person communication (1, 2). The key distinction between the two learning techniques lies in the degrees of physical interaction and learner autonomy. In blended learning, digital components are merged with a physical classroom component to improve the learning process. In contrast, online learning is a completely virtual experience in which all teaching, resources and tests are made available through digital channels (3). Online learning, also known as e-learning, uses electronic media for various learning purposes, ranging from add-on functions in conventional classrooms to complete substitution of face-to-face meetings with online encounters (2). Although both approaches adopt technology, blended learning aims to combine the advantages of digital and in-person training, while online learning only uses remote, computer-mediated learning (4).

Currently, most educational institutions have adopted online education to provide flexible and student-centred learning. In addition, most students possess the necessary computer skills and internet access (3, 5), helping them explore, discover and publish online tutorials with ease (6). Furthermore, online learning can give students the opportunity to obtain education at their leisure, both in terms of time and location (7, 8). Online learning manifests in various forms, including blended, technology-enabled, e-learning, adaptive, flipped classrooms, massive open online courses and open educational resources (9). These modalities offer students greater flexibility, information accessibility and opportunities for personalised learning, all of which are highly valued by modern learners (10, 11). A previous study that assessed students' satisfaction with online learning reported that students are more satisfied with online courses, which include both asynchronous and synchronous components (12). Online learning allows for convenient access to educational materials and personalised assessments, fostering a more engaging and self-directed learning experience. The COVID-19 pandemic further accelerated the adoption of online and blended learning modalities, prompting fundamental pedagogical and organisational changes in tertiary education. While online learning presents certain challenges, such as the need for self-discipline and technological constraints, it continues to gain traction as a viable and relevant learning approach in the post-pandemic "next normal" (13).

In the era of a digital revolution, many sectors are transforming systems, including the higher education system. In higher education, especially during this COVID-19 era, students have already been exposed to digital and technology teaching and learning. Under the limitations of social lockdowns during the pandemic, universities proceeded with the teaching and learning process through online platforms. These dramatic changes might have caused a significant impact, especially on students. According to teachers and students, online learning is a flexible and successful method of teaching and learning, as it facilitates distance learning through easy administration and accessibility as well as the efficient use of resources and time (14). Students can effortlessly access the study content regardless of the time constraints (15). However, switching to online education comes with its challenges. For example, students have to navigate distractions, a possible lack of a sense of connection and belonging and technological limitations because all of them can affect the educational process (13). Online learners who are proficient in self-disciplined time management have a strong sense of self-motivation and possess fundamental technological abilities (13).

During the pandemic, online learning was seen as a backup and emergency strategy to prevent the spread of the virus among university students (16). Using online learning solutions allowed educational institutions to avoid mass gatherings of university students (16). However, students had to be motivated and were expected to be capable enough to accept and cope with online learning to improve their learning during the pandemic. As the world adapts to the "next normal" in the post-pandemic era, online learning is expected to continue playing a pivotal role in the delivery of educational content and the facilitation of learning experiences. In a previous study, about 67% of students indicated that online classes could be used as a substitute for classroom teaching to cover the syllabus; however, this comes with several limitations, including internet infrastructure issues (lack of connectivity, data limit and data speed) and lack of interaction with students and learners (17). The assessment of satisfaction with learning experiences in higher education provides feedback on students' experiences and educational institutions' performances (14–19).

The landscape of dental education has undergone significant transformations in recent years, with the growing prominence of online learning platforms playing a crucial role. Evaluating students' satisfaction with online learning can reflect on institutional performance in providing good online education. However, there is a lack of data assessing the satisfaction with online learning and its association with online learning among undergraduate dental students. Therefore, this study aimed to determine undergraduate dental students' satisfaction with online learning and its associated factors in three public dental institutions in Malaysia. By identifying and addressing these challenges, dental schools can optimise the online learning experience, leading to improved student learning outcomes, enhanced workforce preparedness and, ultimately, better-equipped dental professionals to serve the evolving needs of diverse patient populations.

METHODS

Study Context and Sample

We conducted a cross-sectional study to determine students' satisfaction with online learning and its predictors among undergraduate dental students at Universiti Sains Malaysia (USM), Universiti Teknologi MARA (UiTM) and Universiti Sains Islam Malaysia (USIM). The study was conducted from March 2022 to September 2022, with the inclusion criterion being that all students must be undergraduate dental students and the exclusion criterion involving elective or attachment students. The estimated number of undergraduate dental students in USM, UiTM and USIM are 250, 400 and 196, respectively. These three universities were selected with the aim of capturing a diverse representation of undergraduate dental education in Malaysia. These universities differ in their student demographics, academic environments and possibly their approach to online learning, which enrich the study's findings by reflecting broader perspectives. A total of 240 students were included in the sample, determined using a single proportion formula. This calculation was based on the population proportion identified in a previous study, in which 41% of medical and science students expressed overall satisfaction with online learning (20). A precision level of 7% was set, with a confidence level of 95%, factoring in an estimated 25% dropout rate. Three local dental institutions were deliberately chosen, and an equal proportion of 80 students was sampled from each institution. This method was chosen because of practical reasons, such as accessibility and ease of data collection. It allowed for representation from each university and across different stages of the undergraduate dental curriculum, providing

insights into potential differences in satisfaction based on academic progression. We sampled students from Year 1 to Year 5 from each institution using convenience sampling, which is often used in studies where researchers have practical constraints, such as time, budget or access to participants. In this study, this sampling facilitated data collection from specific undergraduate dental cohorts across three major universities in Malaysia.

Research Instrument

We adopted questionnaires from Sharma et al. (21) with the approval of the original author. The Cronbach's alpha for the questionnaire was 0.89 (21). The questionnaire was chosen because it measured multiple dimensions of satisfaction, including learners, instructors and technology; however, we excluded one domain—course management and coordination—because of its lack of relevance in our study. The research instrument used in this study comprised three sections. Section 1: sociodemographic information such as gender, academic years, university, type of data used, availability of gadgets and background income. Section 2: satisfaction with online learning questionnaire (21). This section comprised three domains: learner's dimension (9 items), measuring the students' characteristics; instructors' characteristics (9 items), measuring teachers' characteristics, frequency of interaction, feedback and way of content delivery; and technological characteristics (7 items), measuring the effectiveness of electronic media during content delivery. Each item of the domains was rated on a 5-point Likert scale (strongly disagree: 1, disagree: 2, neutral: 3, agree: 4 and strongly agree: 5). Section 3: self-rated satisfaction consists of two items (rated on a 1 to 5 scale) at the end of the questionnaire, which measures the students' overall perception of the helpfulness of online classes in context with the learning process and overall satisfaction towards online learning (1 = fully dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied and 5 = fully satisfied). The instrument was converted into an online Google Forms. The time taken to complete all sections of the instrument was 10 to 15 minutes.

Data Collection

The online Google Forms were distributed among the students through key persons from each university. Google Forms is widely accessible and user-friendly, allowing students to complete the survey easily using various devices (computers, tablets and smartphones) (22, 23). We provided the study information as an introduction to the online questionnaire. Informed consent was obtained from the respondents online by ticking into the provided box as an agreement to participate in this study, and assurance of confidentiality was given to them. Anonymity was guaranteed by coding all the data. The students were made aware that their participation was entirely voluntary and that they could withdraw from the study at any time without any consequences. The duration of the data collection was within three weeks. We also reminded the key person to respond to the questionnaire every week (in total, there were two reminders).

Data Analysis

The online responses were downloaded as Excel sheets and transferred into Statistical Package for Social Sciences (SPSS). Data analysis was performed using SPSS (IBM SPSS Statistics for Windows, Version 28.0, IBM Corp., Armonk, NY, USA). Descriptive statistics were used to determine the proportion of students' satisfaction and its characteristics. We used the chi-squared test for differences to analyse satisfaction differences among

undergraduate dental students in the three public institutions. This test was chosen because it aligns with the categorical nature of the study variables (institution and satisfaction levels), allows for a straightforward comparison of proportions across institutions and avoids unnecessary assumptions or complexity associated with regression analysis. The students were divided into two groups: a satisfied group (fully satisfied and satisfied) and an unsatisfied group (fully dissatisfied, dissatisfied and neutral). We used the chi-square test to measure the associated factors for satisfaction with online learning. The independent variables included gender, academic year, dental institution, availability of gadgets and background family income. For the academic year, students in Years 1 and 2 were clustered as preclinical years, and those in Years 3 to 5 were clustered as clinical years. This clustering was based on the dental curriculum, which involved students seeing patients during their clinical year. The *p*-value, less than 0.05, was interpreted as significant at $\alpha = 0.05$ confidence interval.

RESULTS

A total of 179 students responded, yielding a response rate of 74.6%; the characteristics of these students are described in Table 1. Table 2 depicts the proportion of student satisfaction according to the learners' dimensions, instructors' characteristics and technological characteristics. Table 3 depicts the proportion of students' overall perception of the helpfulness of online classes and overall satisfaction with online learning.

There was a significant difference in satisfaction with online learning among the three dental institutions (Table 4); however, the difference between USIM and UiTM was insignificant. The academic year was associated with satisfaction with online learning (Table 5).

Table 1: The characteristics of the undergraduate dental students (n = 179)

Variable	Frequency	%
Gender		
Male	47	26.3
Female	132	73.7
Academic year		
1st	34	18.9
2nd	52	29.1
3rd	62	34.6
4th	12	6.7
5th	19	10.6
Dental institution		
USM	80	44.7
USIM	65	36.3
UiTM	34	18.9
Background family income		
< RM5,000	70	39.1
RM5,000–RM10,000	81	45.3

(*Continued on next page*)

Table 1: (*Continued*)

Variable	Frequency	%
> RM10,000	28	15.6
Type of data used		
Own data	179	100.0
Institutional data	0	0.0
Availability of gadget		
Laptop	51	28.5
Handphones	68	37.9
Tablet; iPad/others	60	33.5

Table 2: The proportion of students for satisfaction according to the learner's dimension, instructors' characteristics and technological characteristics (n = 179)

Domains	SD	D	N	A	SA
1: Learner's dimension					
I feel confident and enjoy using the online platform applications	0 (0)	4 (2.2)	44 (24.6)	83 (46.4)	48 (26.8)
I feel students need to be trained before undergoing online learning activities	4 (2.2)	12 (6.7)	42 (23.5)	68 (38.0)	53 (29.6)
I feel students need to be updated with the latest technology	0 (0)	3 (1.7)	8 (4.5)	66 (36.9)	102 (57.0)
I feel online learning orients my study plan and enhances students' motivation, creativity, cognitive skills, and problem-solving skills	2 (1.1)	25 (14.0)	56 (31.3)	61 (34.1)	35 (19.6)
I feel online learning is comfortable and enjoyable	1 (0.6)	17 (9.5)	56 (31.3)	62 (34.6)	43 (24.0)
I frequently interacted with other students and instructors during the courses	10 (5.6)	40 (22.3)	66 (36.9)	41 (22.9)	22 (12.3)
I got enough time to study on my own, enhancing my self-studying habit	0 (0)	10 (5.6)	54 (30.2)	63 (35.2)	52 (29.1)
Online classes are effective in bridging the gap of the missed academic period	2 (1.1)	5 (2.8)	37 (20.7)	71 (39.7)	64 (35.8)
The advantages of taking classes via the Internet outweighed the disadvantages during college lockdown	2 (1.1)	9 (5.0)	42 (23.5)	69 (38.5)	57 (31.8)
2: Instructions' characteristic					
I like the way my instructor makes students feel a sense of belonging	0 (0)	5 (2.8)	63 (35.2)	65 (36.3)	46 (25.7)
I feel the instructor's sorganisation and preparation for classes provide a comfortable learning environment	0 (0)	6 (3.4)	37 (20.7)	75 (41.9)	61 (34.1)
I like the instructor's teaching ability with the use of various communication techniques	0 (0)	5 (2.8)	30 (16.8)	78 (43.6)	66 (36.9)
I like it when the instructor semphasises maintaining distraction-free classes	0 (0)	2 (1.1)	37 (20.7)	83 (46.4)	57 (31.8)
I am satisfied with instructors providing clear instructions about the course prior to the classes	1 (0.6)	6 (3.4)	24 (13.4)	81 (45.3)	67 (37.4)

(*Continued on next page*)

Table 2: (*Continued*)

Domains	SD	D	N	A	SA
I am satisfied with the instructor's accessibility and professional behaviour during the class	0 (0)	2 (1.1)	17 (9.5)	91 (50.8)	69 (38.5)
I am satisfied with the instructor's pace of punctuality in starting the class	0 (0)	3 (1.7)	25 (14.0)	82 (45.8)	69 (38.5)
I am satisfied with the instructors reviewing the topic covered in the previous sessions	2 (1.1)	5 (2.8)	31 (17.3)	77 (43.0)	64 (35.8)
I am satisfied with the instructor's supportiveness and responsiveness towards my questions	0 (0)	2 (1.1)	18 (10.1)	77 (43.0)	82 (45.8)
3: Technological characteristic					
I feel the online applications are easy to use	1 (0.6)	1 (0.6)	26 (14.5)	80 (44.7)	71 (39.7)
I am satisfied with the quality of graphic aids such as sound and picture being displayed	0 (0)	9 (5.0)	23 (12.8)	85 (47.5)	62 (34.6)
I feel confident that classes will not be cancelled due to weather	4 (2.2)	13 (7.3)	31 (17.3)	63 (35.2)	68 (38.0)
I feel the response time from teachers is quicker in online courses	7 (3.9)	17 (9.5)	59 (33.0)	63 (35.2)	33 (18.4)
I feel internet connection strength determines our effective learning opportunity	0 (0)	4 (2.2)	11 (6.1)	45 (25.1)	119 (66.5)
I feel charges to connect to the internet are expensive	8 (4.5)	19 (10.6)	65 (36.3)	54 (30.2)	33 (18.4)
I feel sudden interruptions in delivering the information due to technological errors (internet) hinder the learning process	3 (1.7)	4 (2.2)	15 (8.4)	71 (39.7)	86 (48.0)

Note: SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree

Table 3: The students' overall perception of the helpfulness of online classes and overall satisfaction towards online learning (n = 179)

Item	Frequency	%
Overall perception of helpfulness of online classes		
Fully satisfied	22	12.3
Satisfied	107	59.8
Neutral	45	25.1
Dissatisfied	3	1.7
Fully dissatisfied	2	1.1
Overall satisfaction towards online learning		
Fully satisfied	24	13.4
Satisfied	97	54.2
Neutral	46	25.7
Dissatisfied	10	5.6
Fully dissatisfied	2	1.1

Table 4: The comparison of overall satisfaction among dental students in three dental institutions (n = 179)

Institution	Overall satisfaction, n (%)		χ2 (df)	*p*-value
	Satisfied	Unsatisfied		
USM	58 (72.5)	22 (27.5)	13.702 (2)	0.001
USIM	38 (58.5)	9 (41.5)		
UiTM	25 (73.5)	27 (26.5)		
Total	121 (67.6)	58 (32.4)		

Notes: df = degrees of freedom; *p*-value < 0.05; Pairwise comparison for differences: USM vs USIM vs UiTM, USM vs USIM, USM vs UiTM, USIM vs UiTM; USM vs USIM, *p*-value = 0.041 (4.167, 1); USM vs UiTM, *p*-value < 0.001 (13.120, 1); USIM vs UiTM, *p*-value = 0.101 (2.683, 1)

Table 5: Satisfaction towards online learning and its associated factors by chi-squared test for association (n = 179)

Variable	Satisfaction, n (%)		χ2 (df)	*p*-value
	Unsatisfied	Satisfied		
Gender				
Male	11 (19.0)	36 (29.8)	2.356 (1)	0.125
Female				
Academic year				
Preclinical (1st and 2nd year)	35 (60.3)	51 (42.1)	5.200 (1)	0.023*
Clinical (3rd, 4th and 5th year)	23 (39.7)	70 (57.9)		
Dental institution				
USM	22 (37.9)	58 (47.9)	3.901 (2)	0.142
UiTM	9 (15.5)	25 (20.7)		
USIM	27 (46.6)	38 (31.4)		
Availability of gadget				
Laptop	17 (29.3)	34 (28.1)	5.567 (2)	0.062
Handphone	28 (48.3)	40 (33.1)		
Tablet; iPad/others	13 (22.4)	47 (38.8)		
Background Income				
< RM5,000	22 (37.9)	48 (39.7)	0.174 (2)	0.917
RM5,000–RM10,000	26 (44.8)	55 (45.5)		
> RM10,000	10 (17.2)	18 (14.9)		

Note: *p-value < 0.05

DISCUSSION

The COVID-19 pandemic accelerated the adoption of information technology in education to overcome the resulting disruptions and ensure continuity in dental education. This study evaluated students' satisfaction with online learning and its predictors among undergraduate dental students at three public dental institutions in Malaysia. Most of the students were female (73.7%), and all used their internet data for online learning. Females comprised

about 62% to 71% of bachelor's study enrolment, particularly in science, health or welfare-related courses and at public and private higher education institutions (24, 25). Even though most of the students had family incomes between RM5,000 and RM10,000, they could use their internet data for online learning.

The results showed that 67.6% of the students were satisfied with online learning, and 25.5% gave a neutral perspective. In addition, the satisfaction rate was slightly higher than that obtained in a previous study (53.5%) (21) but in agreement with the studies conducted in India and Malaysia (17, 26). Students in the health sciences (such as medicine, dentistry, pharmacy and allied medical sciences) reported extremely low levels of satisfaction (14.0%) with online learning when compared to traditional learning (27). However, nursing students' satisfaction levels have been reported as high as 93.4% (28). A study in a Malaysian private university found differences in online learning satisfaction between the health and medical science discipline and the innovation and technology discipline (29).

Compared to lecturing and role-playing, online learning was significantly less satisfying for nursing students (30). This finding may be due to the students feeling isolated in the virtual learning environment because of being unfamiliar with it and being more comfortable with the traditional learning environment. Dental education presents unique challenges, requiring practical skills and hands-on training; online learning platforms might not be able to provide the same level of experience. Apart from clinical and laboratory requirements, a lack of practice in interpersonal skills development during online learning may be another limitation of online learning, making it less appealing for dental students. Learners' characteristics significantly impact how satisfied the students are with online learning. Students can continue their studies smoothly and become more satisfied when equipped with the latest technology (21). Studies have shown that to meet their learning objectives, students must stay updated with the latest technology; however, a lack of technical assistance prevents users from using the system to its maximum potential, which impacts learners' satisfaction (31). The e-learning method significantly helps by raising students' accountability for maintaining their knowledge and abilities (32). In addition, these valuable digital skills are essential for their academic pursuits and highly transferable to future careers as the demand for digital literacy continues to grow across industries. Most dental students are from Generation Z and have grown up in a technology-driven world, thus possessing a natural affinity towards digital tools and platforms. The fact that these students have positive attitudes towards technology use, in general, was one of the factors contributing to the satisfaction (33). The students also agreed that online classes effectively bridge the gap of missed academic periods; thus, they can manage their time effectively.

In our study, most students expressed satisfaction with the instructors' encouragement, professionalism and attempts to keep the classroom distraction-free. A well-structured learning environment and systematic, well-organised course materials, instructions and learning activities are essential for student satisfaction. Teachers' teaching effectiveness significantly impacts how satisfied students are with the online learning environment (17, 34). Favourable interactions with teachers positively impact learning outcomes and satisfaction. Online learning environments require instructors to communicate clearly, quickly and responsively with students to develop a sense of connection and engagement. Additionally, instructors who demonstrate adaptability and flexibility in their teaching approach contribute to higher satisfaction among students. However, a previous study showed that, although a teacher's performance on an online platform does not significantly impact students' satisfaction levels, students are the happiest with the teacher's performance on an online platform, followed by online learning quality (35). The students in our study

agreed that the instructors maintain professional behaviour during online classes and provide clear instructions about the course before the classes. This finding shows that online learning can be as effective as traditional learning.

One of the most important aspects in determining whether students will accept and succeed in the learning process is how efficiently and effectively the course's e-learning-based components are delivered (36). Technological characteristics that involve accessibility and reliability considerations collectively contribute to a seamless and satisfying online learning experience for students. In a previous study, most students felt satisfied with the quick responses from the concerned faculty and department via the internet and the course material (21). Perceived ease of use and student motivation were factors that were found to be significantly associated with online learning among postgraduate students (37).

A significant proportion of the students felt that internet connection strength determines their effective learning opportunities. Students' acceptance of online learning is favourably influenced by the simplicity of the use of online courses and their satisfaction with the technological assistance provided. They improve their view of the organisation of an online course, the clarity of the workload requirements, the diversity of activities and the teacher's comments in particular (36). The use of educational technology in the future of medical education should go beyond just using it for instruction and instead focus on designing, using and maintaining systemic ways that support learning (38). However, a study showed that online learning caused students to feel more isolated in the virtual learning environment since they are more used to the traditional learning environment (39). Our study also showed that the availability of gadgets, such as laptops and handphones, was not associated with students' satisfaction. Perhaps all the gadgets they already had provided them enough support for online learning. Many variables must be considered for the effective delivery of an online learning environment. First, online learning system designers must make the system easy to use. In order to support the gradual transition from traditional learning to online learning, authorities must create new educational laws and regulations to encourage online learning among students and instructors.

This study did not examine the factors related to peer influence and interaction, which were found to be significant in previous studies (26, 40, 41). A small sample size was another limitation of this study. A more realistic picture of the subject matter could be achieved by integrating more dental institutions, increasing the sample size, and using a systematic sampling technique in future studies.

CONCLUSION

The students in the three dental institutions had different satisfaction levels with online learning. In addition, online learning was more successful than traditional education in terms of the information and abilities obtained. Designing suitable and appropriate online learning activities that are relevant to students' academic year can improve learning satisfaction. Even though the availability of the students' gadgets and good internet access were not found to be significant associated factors, they are still an essential element in ensuring online learning satisfaction.

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REFERENCES

1. Abdullah W. Model blended learning dalam meningkatkan efektifitas pembelajaran. Fikrotuna: J Pendidik dan Manaj Islam. 2018;7(1):855–66. https://doi.org/10.32806/jf.v7i1.3169

2. Guri-Rosenblit S. "Distance education" and "e-learning": not the same thing. High Educ. 2005;49(4):467–93. https://doi.org/10.1007/s10734-004-0040-0

3. Fionasari R. Blended learning environments: a systematic review of effective strategies in educational settings. Int J Multidiscip Approach Sci Technol. 2024;1(2):120–32. https://doi.org/10.62207/gn00ce77

4. Cahapay MB. Rethinking education in the new normal post-COVID-19 era: a curriculum studies perspective. Aquademia. 2020;4(2):ep20018. https://doi.org/10.29333/aquademia/8315

5. Link TM, Marz R. Computer literacy and attitudes towards e-learning among first year medical students. BMC Med Educ. 2006;6:34 https://doi.org/10.1186/1472-6920-6-34

6. Asiry MA. Dental students' perceptions of an online learning. Saudi Dent J. 2017;29(4):167–70. https://doi.org/10.1016/j.sdentj.2017.03.005

7. Hamad AL, Abouelnaga HM, metwally AB mohamed, Shan HS, Moawad NF. The importance of e-learning to the students and teachers. J Lang Linguist Stud. 2022;18(2):952–68.

8. Lau CY, Shaikh JM. The impacts of personal qualities on online learning readiness at Curtin Sarawak Malaysia (CSM). Educ Res Rev. 2012;7(20):430–44. https://doi.org/10.5897/ERR09.229

9. Mohee R, Rampersad RD, Chadeea TK, Patten V, Ittea R. Strengthening and sustaining online and blended learning in the aftermath of COVID-19 through quality assurance measures: the case of public higher education institutions in Mauritius. Tenth Pan-Commonwealth Forum 2022; 10: 2963. https://doi.org/10.56059/pcf10.2963

10. Kulikowski K, Przytuła S, Sułkowski Ł, Rašticová M. Technostress of students during COVID-19 – a sign of the time? Hum Technol. 2022;18(3):234–49. https://doi.org/10.14254/1795-6889.2022.18-3.3

11. Mollenkopf D, Gaskill M, Nelson RM, Diaz CC. Navigating a "new normal" during the COVID-19 pandemic: college student perspectives of the shift to remote learning. Revue internationale des technologies en pédagogie universitaire. 2020;17(2):67–79. https://doi.org/10.18162/ritpu-2020-v17n2-08

12. Zeng X, Tingzeng Wang S. College student satisfaction with online learning during COVID-19. Int J Multidiscip Perspect High Educ. 2021;6(1):182–95.

13. Xie X, Siau K, Nah FF. COVID-19 pandemic–online education in the new normal and the next normal. J Inf Technol Case Appl Res. 2020;22(3):175–87. https://doi.org/10.1080/15228053.2020.1824884

14. Bolliger DU, Wasilik O. Factors influencing faculty satisfaction with online teaching and learning in higher education. Distance Educ. 2009;30(1):103–16. https://doi.org/10.1080/01587910902845949

15. Mukhtar K, Javed K, Arooj M, Sethi A. Advantages, limitations and recommendations for online learning during COVID-19 pandemic era. Pakistan J Med Sci. 2020;36(COVID19-S4):S27–31. https://doi.org/10.12669/pjms.36.COVID19-S4.2785

16. Hantash ROA, Younis MA, Assaf M, Hantash ROA, Younis MA, Assaf M. Online learning satisfaction and acceptance among Al-Quds University dental students. Creat Educ. 2020;11(10):2002–13. https://doi.org/10.4236/ce.2020.1110146

17. Muthuprasad T, Aiswarya S, Aditya KS, Jha GK. Students' perception and preference for online education in India during COVID-19 pandemic. Soc Sci Humanit Open. 2021;3(1):100101. https://doi.org/10.1016/j.ssaho.2020.100101

18. Kanwar A, Sanjeeva M. Student satisfaction survey: a key for quality improvement in the higher education institution. J Innov Entrep. 2022;11(1):27. https://doi.org/10.1186/s13731-022-00196-6

19. Dharmadjaja PN, Tiatri S. The effect of online interaction types and acceptance of technology factors on student satisfaction with online learning during the COVID-19 pandemic. In: International Conference on Economics, Business, Social, and Humanities (ICEBSH 2021) 2021 August 8. Atlantis Press; 2021. p. 936–42. https://doi.org/10.2991/assehr.k.210805.148

20. Elshami W, Taha MH, Abuzaid M, Saravanan C, Al Kawas S, Abdalla ME. Satisfaction with online learning in the new normal: perspective of students and faculty at medical and health sciences colleges. Med Educ Online. 2021;26(1):1920090. https://doi.org/10.1080/10872981.2021.1920090

21. Sharma K, Deo G, Timalsina S, Joshi A, Shrestha N, Neupane HC. Online learning in the face of COVID-19 pandemic: assessment of students' satisfaction at Chitwan Medical College of Nepal. Kathmandu Univ Med J. 2020;18(2):40–7. https://doi.org/10.3126/kumj.v18i2.32943

22. Mondal H, Mondal S, Ghosal T, Mondal S. Using Google forms for medical survey: a technical note. Int J Clin Exp Physiol. 2018;5(4):216–8. https://doi.org/10.5530/ijcep.2018.5.4.26

23. Vasantha Raju NN, Harinarayana NS. Online survey tools: a case study of Google Forms. In: National Conference on Scientific, Computational & Information Research Trends in Engineering, GSSS-IETW, Mysore 2016 January 30.

24. Da WC. The changing gender disparity in Malaysian higher education: where are the boys? Bulletin of Higher Education Research. National Higher Education Research Institute, Universiti Sains Malaysia; 2012. p. 4–8.

25. Yong J. The gender gap in Malaysian public universities: examining the "Lost Boys." J Int Comp Educ. 2017;6(1):1–16. https://doi.org/10.14425/JICE.2017.6.1.0116

26. Saleh NS, Rosli MS, Ali AM, Isa K. Exploring students satisfaction towards online learning in the midst of COVID-19. Innov Teach Learn J. 2020;4(2):37–48.

27. Zhao J, Xiao H, Li Y, Wen D, Xu P, Fu Y, et al. Experience of massive distance online education for medical colleges and universities in China to counter the COVID-19 pandemic. 2020. https://doi.org/10.21203/rs.3.rs-29678/v1

28. Seada AI, Mostafa MF. Students' satisfaction and barriers of e–learning course among nursing students, Mansoura University. IDOSI Publ. 2017;3(3):170–8.

29. Lim CL, Jalil HA, Ma'rof AM, Saad WZ. Differences in self-regulated learning (SRL) and online learning satisfaction across academic disciplines: a study of a private university in Malaysia. Int J Learn. 2020;6(2):62–7. https://doi.org/10.18178/ijlt.6.2.62-67

30. Pourghaznein T, Sabeghi H, Shariatinejad K. Effects of e-learning, lectures, and role playing on nursing students' knowledge acquisition, retention and satisfaction. Med J Islam Repub Iran. 2015;29:162.

31. Pei L, Wu H. Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. Med Educ Online. 2019;24(1): 1666538. https://doi.org/10.1080/10872981.2019.1666538

32. Bahramnezhad F, Asgari P, Ghiyasvandian S, Shiri M, Bahramnezhad F. The learners' satisfaction of e-learning: a review article. Am J Educ Res 2016;4(4):347–52.

33. Rahamat R, Shah PM, Din R, Puteh SN, Aziz JA, Norman H, Embi MA. Measuring learnersperceived satisfaction towards e-learning material and environment. WSEAS Trans Adv Eng Educ. 2012;9(3):72–83.

34. Sultana T, Khan RH. Investigating university students' satisfaction on online class: Bangladesh perspective. Bangladesh Educ J. 2019;18(2):23–32.

35. Dawadi S, Giri RA, Simkhada P. Impact of COVID-19 on the education sector in Nepal: challenges and coping strategies. Advance. 2020 May 21. https://doi.org/10.31124/advance.12344336.v1

36. Keržič D, Tomaževič N, Aristovnik A, Umek L. Exploring critical factors of the perceived usefulness of blended learning for higher education students. PLoS One. 2019;14(11):e0223767. https://doi.org/10.1371/journal.pone.0223767

37. Hadi NH, Zulkiffli SN, Mohamed WN. Students' satisfaction towards online learning in a public university in Malaysia during COVID-19 pandemic. J Bus Soc Dev. 2022;10(1):1–4. https://doi.org/10.46754/jbsd.2022.03.001

38. Han H, Resch DS, Kovach RA. Educational technology in medical education. Teach Learn Med. 2013;25:39–43. https://doi.org/10.1080/10401334.2013.842914

39. Burger PHM, Neumann C, Ropohl A, Paulsen F, Scholz M. Development of depression and deterioration in quality of life in German dental medical students in preclinical semesters. Ann Anat. 2016;208:183–6. https://doi.org/10.1016/j.aanat.2016.05.011

40. Nasir MK. The influence of social presence on students' satisfaction toward online course. Open Praxis. 2020;12(4):485–93. https://doi.org/10.5944/openpraxis.12.4.1141

41. Lim CL, Ab Jalil H, Ma'rof AM, Saad WZ. Self-regulated learning as a mediator in the relationship between peer learning and online learning satisfaction: a study of a private university in Malaysia. Malays J Learn Instr. 2020;17(1):51–75. https://doi.org/10.32890/mjli2020.17.1.3