



Research article

Exploring the effects of e-learning readiness and psychological distress on graduate students' e-learning satisfaction during the COVID-19 pandemic: A descriptive study from Lebanon

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ABSTRACT

The COVID-19 pandemic triggered a substantial surge in e-learning adoption, impacting students' lives and well-being. This study investigates factors influencing student satisfaction with e-learning in Lebanon during the pandemic, with a focus on disparities between public and private education sectors. Utilizing an online survey and convenience sampling techniques, we gathered data from 307 graduate students representing both sectors. Employing regression-based methods, our study identifies instructor readiness as the most influential factor affecting e-learning satisfaction ($\beta = 0.483$, $p < 0.001$). Moreover, it reveals that heightened psychological distress diminishes student satisfaction ($\beta = -0.189$, $p = 0.013$). Additionally, students exhibit varying learning preferences, with a clear preference for hybrid (66 %) and face-to-face (27 %) learning over online alternatives (7 %). Our study concludes by emphasizing the imperative of enhancing public education sector e-learning infrastructure and providing adapted psychological services to address the impact of the COVID-19 pandemic and future crises effectively.

1. Introduction

The COVID-19 pandemic has had wide-ranging effects on the lifestyle and working mode for most people and institutions, including education [1]. In response to the pandemic, educational institutions have implemented emergency remote learning (ERL) via online learning platforms to substitute most, if not all, face-to-face academic and practical classes [2–5].

Although online education has gained popularity in the global education ecosystem in recent years [6], the transition during COVID-19 was challenging not only for institutions, but also for students and instructors, particularly in developing countries. In fact, most educational institutions in developing countries lack the necessary information technology infrastructure and other technological advantages to transition to online platforms at the same rate as institutions in developed countries. This posed a challenge for instructors and students to familiarize themselves with the new learning system and overcome any obstacles that might obstruct the learning process [7].

A recent investigation carried out in Malaysia during the COVID-19 pandemic by Jafar and colleagues (2022) emphasized the critical need to enhance the e-learning infrastructure within the public education sector [8]. Their findings underscored the substantial impact of geographical location and residential settings on students' overall engagement and effectiveness in e-learning initiatives. Notably, students in rural areas were found to encounter a myriad of challenges, including technical and connectivity issues,

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diminished focus on learning, physical health concerns, social isolation, and lower levels of digital literacy when compared to their urban counterparts.

Similarly, a study conducted in China, led by Xia and associates (2022), delved into the complexities of online learning, particularly from the perspective of college students [9]. This comprehensive exploration revealed that online learning, while a vital alternative, exhibited challenges when compared to traditional learning methods. The success of online learning was found to hinge on several key factors: the extent of student-teacher interaction, opportunities for campus socialization, levels of technical proficiency, the suitability of learning content for online platforms, and the incorporation of collaborative group work.

Students' satisfaction with an online learning system is an indicator of its acceptance [10]. As a result, assessing the efficiency of an online learning system involves determining the factors affecting Students' satisfaction with e-learning. According to the literature, many factors, including engaged learning, agency, and assessment [11], perceived self-efficacy, perceived anxiety, interactive learning environments, perceived usefulness [12], and perceived ease are believed to affect students' satisfaction with online learning [13]. However, only a few studies have investigated online learning preparedness in terms of student satisfaction [10]. Therefore, further research is required to explore the factors influencing student satisfaction with e-learning, especially in developing country contexts.

Lebanon is a developing country that has recently experienced a series of crises. Since late 2019, Lebanon has been dealing with its worst economic crisis in decades, as well as civil unrest and political turbulence. In addition, upon the emergence of COVID-19 in 2020, a tremendous explosion ripped through the capital. The consequences of these crises had a significant impact on all systems, particularly education, which is a vital sector in Lebanon. Furthermore, this scenario had an impact on people's mental health and caused psychological distress, particularly among students. As a result, Lebanon is an appealing case study of developing countries to investigate the readiness and psychological aspects influencing students' satisfaction with online learning in response to the COVID-19 crisis. This can help instructors and educational institutions in better understanding students' readiness and perceptions in order to give more effective online education during a crisis. To the best of our knowledge, no studies from Lebanon have investigated students' satisfaction with e-learning preparedness aspects and COVID-19 psychological distress.

Drawing upon well-established theoretical frameworks such as the Social Cognitive Theory (SCT) and Self-Determination Theory (SDT), our aim is to unravel the intricate web of factors influencing students' satisfaction with e-learning in Lebanon.

In essence, our descriptive study embarks on a quest to shed light on the readiness of higher education institutions to embrace online learning within the unique context of a developing country. Furthermore, we will venture to discern any differentiating factors between the public and private education sectors in Lebanon. Given the diverse backgrounds, expectations, and attitudes that students from these two sectors may bring to the table, this comparative analysis holds the promise of unveiling valuable insights. Therefore, our research question is: How do e-learning readiness and psychological distress influence graduate students' satisfaction with e-learning during the COVID-19 pandemic in Lebanon?

The remainder of this paper is organized as follows: We present the theoretical framework, describe the study's methodology, which includes the study design, data collection methods, and statistical methods used. The empirical findings are then presented and discussed. Finally, we highlight the study's practical implications and limitations.

2. Theoretical framework

In this section, we provide an exploration of the theoretical frameworks that guide our study on factors influencing student satisfaction with e-learning in Lebanon during the COVID-19 pandemic.

2.1. Self-Determination Theory (SDT)

Self-Determination Theory (SDT), articulated by Deci and Ryan (2000) [14], posits that individuals are driven by three fundamental psychological needs: autonomy, competence, and relatedness. In the context of e-learning, SDT suggests that students' preferences for specific learning methods are influenced by their yearning for autonomy and their desire for a sense of connection with their learning environment. For example, students may prefer hybrid or face-to-face learning formats over fully online learning due to the opportunities these formats provide for autonomy in learning and meaningful interactions with peers and instructors.

2.2. Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT), proposed by Bandura (1986) [15], emphasizes the role of observational learning and modeling in the educational process. According to SCT, individuals learn by observing others' behaviors, attitudes, and the outcomes of those behaviors. In the context of e-learning and student satisfaction, SCT posits that students' perceptions of instructors' readiness and overall institutional preparedness significantly influence their satisfaction levels. By observing instructors' ability to deliver content effectively and engage students in the online learning environment, students form expectations and judgments that contribute to their overall satisfaction with e-learning.

3. Methodology

3.1. Study design

A convenience sample of 307 graduate students was collected via an online structured survey. Data was collected from two

universities in Lebanon, one a public university, the Lebanese University (LU), and the other a private university, the American University of Beirut (AUB). We chose these universities to represent Lebanon's public and private education sectors and to capture diverse student populations with varying e-learning readiness and psychological distress levels. LU serves a diverse student body, including low-income and rural students, while AUB caters to a more affluent population. These differences provide insights into factors influencing students' satisfaction with e-learning during the COVID-19 pandemic in a developing country context. As for the inclusion criteria, enrollment in a graduate program and active participation in online courses during the COVID-19 pandemic, spanning from spring 2019 to spring 2020, were the sole criteria for participation in this study. This selection process ensured that participants had direct experience with e-learning during the specified period, aligning with the study's focus on factors influencing students' satisfaction with e-learning in the context of the COVID-19 pandemic.

3.2. Data and ethical considerations

We obtained authorization to contact 800 graduate students from the private university AUB and utilized the Lime Survey Platform to create an online questionnaire, available in both English and Arabic. Upon accessing the link, participants were directed to a page explaining the study and seeking their informed consent. Confidentiality and privacy of participants' data were ensured throughout. For the public university, lacking direct access to student emails, we contacted department conveners who distributed the survey link to graduate students. The AUB Institutional Review Board (IRB) approved the data collection under case number SBS-2021-0088, which was conducted from May 1, 2021, to May 31, 2021. We received responses from 146 AUB students and 161 LU students by the end of the data collection period.

3.3. Instrumentation, validation, and reliability

We employed well-established and validated scales from the literature to measure various constructs related to e-learning satisfaction, psychological state during the pandemic, and readiness factors. Graduate students were primarily questioned about their satisfaction with e-learning (SAT), their psychological state during the pandemic (PSY), and readiness factors such as the institution's readiness to support e-learning (SUP), lecturer/instructor readiness (INS), students' computer competency (SCC), and content readiness (CON). We also collected data on sociodemographic factors such as age, marital status, gender, university sector (public/private), program type (full-time/part-time), and employment status. To measure readiness and satisfaction, we used the Readiness Scale and the Satisfaction & Loyalty Scale from Pham & Tran (2020) and Headar et al. (2013), respectively [16,17]. Each construct item is rated on a 5-point scale, with 1 denoting "strongly disagree" and 5 denoting "strongly agree."

For measuring psychological health, we employed the mental health scale used by Son et al. (2020) [18]. The scale's statements were about the influence of the COVID-19 pandemic on psychological health, with 0 indicating "none," 1 indicating "mild," 2 indicating "moderate," and 3 indicating "severe." More details on the construct's items are included in Appendix 1. To ensure the reliability of our measures, we conducted a reliability analysis using Cronbach's alpha, which indicated satisfactory internal consistency among the items in each construct. It's worth noting that the responses of a construct's Likert items were averaged to represent it. Additionally, the questionnaire was piloted to assess content validity and refine any ambiguities or unclear items before the main data

Table 1
Descriptive statistics for sociodemographic characteristics.

Variable	Frequency	(%) n = 307
Gender		
Male	80	26
Female	227	74
Age		
18–26 years	218	71
27–35 years	58	19
36–45 years	23	7
>45 years	8	3
Marital Status		
Single	186	60
Engaged	15	5
Married	58	19
In a relationship	40	13
Divorced	5	2
Other	3	1
Employment Status		
Yes	128	41
No	181	59
University Sector		
Private	146	48
Public	161	52
Program Type		
Full Time	219	71
Part Time	88	29

collection phase.

3.4. Statistical analysis

Summary statistics including mean, standard deviation, frequency, and percentages were calculated to describe the data. We employed linear regression analysis using SAT as the dependent variable to investigate the relationships between satisfaction and the predictors under consideration (e-learning readiness characteristics and psychological distress) while controlling for socio-demographic variables. We calculated the variance inflation factor (VIF) to check if there was a severe problem of multicollinearity. Furthermore, we used residuals plots to validate the regression analysis assumptions. Our statistical study was carried out using SPSS IBM Statistics V.25 and the R programming language.

4. Results

4.1. Descriptive statistics

A total of 307 graduate students were included in our study, with a mean age of 26 years and a standard deviation (SD) of 6.33 years. Table 1 shows that we had a higher percentage of females (74 %) than males, with the majority of the participants being single. Additionally, 48 percent of individuals who responded were enrolled in a private educational institution, while 52 % were enrolled in a public institution. Seventy-one percent of the respondents were full-time students. Moreover, 41 % of the participants were employed.

In addition, we provided in Table 2 summary statistics for the constructs considered in this study, as well as the Cronbach's alpha value for each.

Internal consistency refers to the degree to which a paradigm can be assessed using a set of questions. Cronbach's alpha was used to determine how closely each collection of questions is linked to a construct. In our study, all the alpha coefficients were greater than 0.7, indicating that the scale is reliable (Nunnally, 1978).

4.2. Linear regression analysis

The provided regression results in Table 3 reveal that the effects of instructor readiness dominated the other readiness elements, as this predictor was highly significant (P-value = 0). More specifically, there is a positive relationship between satisfaction with e-learning and instructor readiness.

However, there was a significant negative relationship between psychological distress in response to the COVID-19 pandemic and e-learning satisfaction. We did not notice any effect of sociodemographic characteristics when we adjusted for them. Furthermore, we did not find any severe multicollinearity issues because all VIF (s) were less than 5. It is also worth noting that we validated the linear regression assumptions and found no problems with normality or homoscedasticity, as shown by the residual's plots in Fig. 1.

4.3. Education sectors: public vs. private

In Lebanon, the public and private education sectors are very different. As a result, we developed a regression model for student satisfaction with e-learning at the Lebanese University and a model for students at AUB to highlight any differences. The results are shown in Tables 4 and 5, respectively.

According to the regression results, instructor readiness was a positive predictor of e-learning satisfaction in both the public and private education sectors (p-value 5 %). However, a distinction between the two sectors was observed in terms of institution readiness. SUP was statistically significant in public education but not in private education.

It is also worth noting that survey included a question about the type of e-learning that they prefer (Face to Face Learning, Hybrid Learning, and Online Learning).

As Fig. 2 shows, the highest percentage of students (66 %) favored the hybrid system.

5. Discussion

Online learning adoption during the COVID-19 pandemic, particularly in developing countries like Lebanon, presents unique

Table 2
Summary statistics of the constructs and Cronbach's alpha.

Constructs	Mean	SD	Min	Max	Alpha
SUP	3.16	1.07	1.00	5.00	0.85
INS	3.58	0.84	1.00	5.00	0.90
CON	3.61	0.86	1.00	5.00	0.87
SCC	3.97	0.75	1.00	5.00	0.79
PSY	1.82	0.73	0.00	3.00	0.80
SAT	2.79	1.03	1.00	5.00	0.92

Table 3
Factors affecting students 'satisfaction with e-learning.

	Beta	S.E.	t	P-value	VIF
SUP	-0.005	0.071	-0.066	0.947	2.110
INS	0.483	0.090	5.382	0.000	2.066
CON	0.010	0.110	0.091	0.928	3.266
SCC	0.101	0.086	1.164	0.245	1.544
PSY	-0.189	0.076	-2.486	0.013	1.125
Gender	0.110	0.127	0.866	0.387	1.136
Age	0.001	0.009	0.082	0.935	1.249
Marital Status	-0.139	0.121	-1.146	0.253	1.269
Employment Status	0.186	0.114	1.642	0.102	1.150
Program Type	-0.115	0.125	-0.923	0.357	1.167

Note: Beta(s) are regression coefficients; S.E. are standard errors; t is the test statistic; Full-time is used as a reference group for Program Type; Male is used as a reference group for gender; Marital Status categories were grouped into single and non-single, with non-single serving as a reference group; Values below 5 % are bolded in the P-value column.

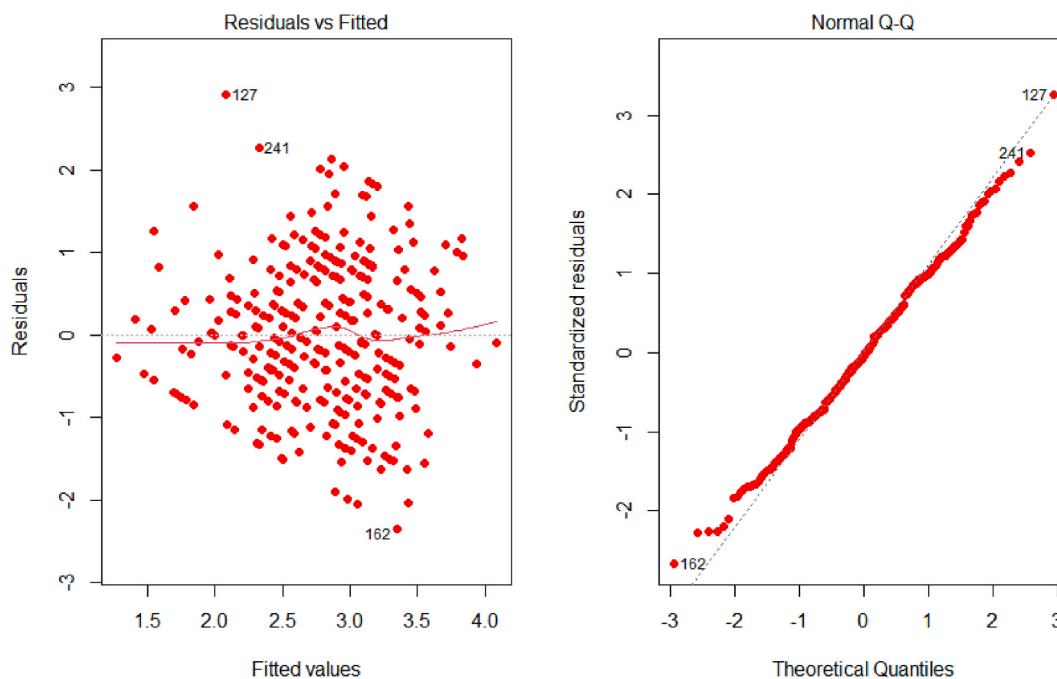


Fig. 1. Residual plots.

Table 4
Factors affecting students 'satisfaction with e-learning in the public education sector.

	Beta	S.E.	t	P-value
SUP	0.207	0.105	1.971	0.049
INS	0.337	0.113	2.971	0.003
CON	0.145	0.134	1.080	0.282
SCC	0.182	0.099	1.843	0.067
PSY	-0.105	0.102	-1.028	0.306
Gender	0.245	0.203	1.208	0.229
Age	0.004	0.011	0.368	0.713
Marital Status	-0.166	0.164	-1.013	0.313
Employment Status	0.156	0.149	1.047	0.297
Program Type	-0.277	0.154	-1.800	0.074

Note: Beta(s) are regression coefficients; S.E. are standard errors; t is the test statistic; Full-time is used as a reference group for Program Type; Male is used as a reference group for gender; Marital Status categories were grouped into single and non-single, with non-single serving as a reference group; Values below 5 % are bolded in the P-value column.

Table 5
Factors affecting students' satisfaction with e-learning in the private education sector.

	Beta	S. E.	t	P-value
SUP	0.122	0.150	0.813	0.417
INS	0.530	0.158	3.352	0.001
CON	-0.029	0.191	-0.152	0.879
SCC	-0.013	0.165	-0.076	0.939
PSY	-0.161	0.118	-1.365	0.175
Gender	0.000	0.169	0.002	0.999
Age	-0.008	0.018	-0.428	0.670
Marital Status	-0.185	0.187	-0.987	0.325
Employment Status	0.220	0.190	1.158	0.249
Program Type	0.001	0.224	0.003	0.998

Note: Beta(s) are regression coefficients; S.E. are standard errors; t is the test statistic; Full-time is used as a reference group for Program Type; Male is used as a reference group for gender; Marital Status categories were grouped into single and non-single, with non-single serving as a reference group; Values below 5 % are bolded in the P-value column.

challenges. These challenges are exacerbated by the country's pre-existing financial, economic, and social crises. Lebanon's political instability, economic meltdown, and social unrest have created an environment where the adoption of e-learning technologies and practices faces significant hurdles [19,20].

The goal of our descriptive study was to delve into students' perceptions regarding the acceptance and readiness for e-learning within this complex context. We recognize the importance of understanding students' perspectives, as their satisfaction with an online learning system serves as a critical indicator of its overall acceptance and effectiveness [10].

Our investigation focused on readiness factors that contribute to student satisfaction, including institutional readiness, instructor readiness, content readiness, and student readiness. These factors collectively shape the student's e-learning experience and ultimately influence their satisfaction levels. Our findings, supported by regression analysis, emphasize that e-learning readiness significantly impacts student satisfaction. Notably, among the readiness factors, instructor readiness emerged as the most influential. This outcome aligns with the research by Rokhman et al. (2022), who similarly observed that instructor ability plays a pivotal role in shaping students' satisfaction with online learning [21]. This underscores the crucial responsibility instructors bear in not only delivering content but also engaging and motivating students effectively, particularly in the online learning environment.

The COVID-19 pandemic introduced a new layer of complexity to the higher education landscape by introducing stressors related to health, social isolation, and lifestyle changes [18]. Students, already a vulnerable population, were particularly susceptible to these stressors [22]. In Lebanon, a country grappling with various crises, the implementation of e-learning was further complicated [19,20]. Our study underscores the negative impact of elevated psychological distress on student satisfaction with e-learning. This finding resonates with the work of Fawaz and Samaha (2021), who demonstrated that higher levels of psychological distress induced by the COVID-19 pandemic were associated with reduced satisfaction with online learning [23]. It highlights the pressing need for institutions to prioritize students' psychological well-being as they navigate online education during crises.

Our research also unveiled disparities in readiness perceptions between the public and private education sectors. While both sectors recognized the importance of instructor readiness, a noticeable distinction emerged in their perceptions of institutional readiness. In the public education sector, institutional readiness was deemed particularly significant, while this emphasis was less pronounced in the private sector. This disparity underscores the far-reaching consequences of Lebanon's economic downturn, which has disproportionately affected public services, including the Lebanese University. Financial constraints have hindered the university's ability to invest in and enhance its infrastructure for online learning (Bhasa, 2022). This trend aligns with Bhasa's findings, indicating that faculty and staff at public universities in low-income countries face challenges in adapting to digital learning due to insufficient investment in technology-mediated platforms [6].

Exploring students' preferences for learning methods revealed a clear trend. While our sample exhibited diverse preferences,

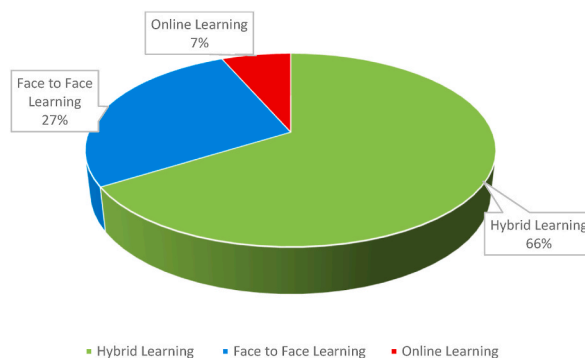


Fig. 2. Preferred methods of learning.

hybrid and face-to-face learning formats were consistently favored over fully online learning. This preference corroborates the findings of Hood et al. (2022) and Ritter et al. (2010), who concluded that face-to-face and hybrid classes fostered a stronger sense of community and connectedness compared to online classes [24,25]. However, it is noteworthy that a higher percentage of graduate students in our study expressed a preference for hybrid learning. This preference can be attributed to the fact that graduate students often juggle full- or part-time employment alongside their academic pursuits. Hybrid learning offers the flexibility needed for them to fulfill their job-related responsibilities while benefiting from valuable face-to-face interactions.

6. Conclusion

The global COVID-19 pandemic has left an indelible mark on various facets of society, profoundly impacting education. As we navigate the complexities of a rapidly changing educational landscape, it is imperative to reflect on the implications of our study in strengthening our collective response to future crises.

Our research has delved deeply into the intricate web of factors influencing students' satisfaction with e-learning, particularly within the context of a developing country. The findings underscore the pivotal role played by instructor readiness and reveal the adverse consequences of psychological distress on student satisfaction. This represents a valuable contribution to the field, offering tangible insights for educational institutions grappling with resource constraints and unforeseen disruptions.

In Lebanon, as in many developing nations, a confluence of economic and political challenges has created a unique educational landscape. Our study's relevance transcends geographical boundaries, as it offers practical guidance for institutions worldwide facing similar adversities. Recognizing the pressing need for instructor training and infrastructure enhancement, we present a roadmap for local authorities and international organizations, such as UNDP, to support the education sector during crises. Given the potential for future disruptions, proactive measures are paramount.

However, special attention should be paid to improving the infrastructure for e-learning in the public education sector. Due to Lebanon's unstable situation, future crises that prevent face-to-face learning are highly likely. As a result, our research can be viewed as a road map for the government to follow in order to save the futures of thousands of students who attend the public university by developing an appropriate infrastructure for e-learning. The study may also serve as a call to international organizations such as UNDP and others to assist Lebanon's public education sector in preparing for any crisis.

In addition to addressing the immediate challenges posed by the COVID-19 pandemic, it is imperative for universities to institute robust and adaptable psychological support services. These services should be thoughtfully designed to not only mitigate the psychological effects of the ongoing crisis but also to fortify students' emotional well-being in the face of any future unforeseen disruptions. Such comprehensive psychological services should encompass a range of initiatives. These may include easily accessible counseling and therapy resources, stress management programs, peer support networks, and education on psychological well-being.

7. Strengths and contributions of the study

This study provides a deep analysis of e-learning adoption in Lebanon amidst the COVID-19 pandemic and societal challenges, offering valuable insights into the complexities of online education in a crisis-ridden environment. Through regression analysis and detailed investigation, it identifies critical readiness factors influencing student satisfaction, particularly emphasizing the role of instructor readiness. Furthermore, the research sheds light on the negative impact of psychological distress on e-learning satisfaction, highlighting the importance of considering students' mental well-being in educational settings. By comparing readiness perceptions between public and private education sectors and exploring students' preferences for learning methods, especially the preference for hybrid learning among graduate students, this study offers a nuanced understanding of how institutional contexts and diverse student needs shape e-learning experiences. Moreover, the practical recommendations outlined in the conclusion provide a roadmap for stakeholders, including educational institutions and international organizations, to enhance infrastructure, provide robust psychological support services, and navigate future crises effectively, thus making a significant contribution to improving the e-learning landscape during challenging times.

8. Limitations and future work

Some of the study's limitations should be highlighted. We used an online survey to collect data during a regular semester, when students may well be preoccupied with assignments and exams. Even though students can complete the survey at their convenience and have been sent reminders, this may still result in a low response rate. A potential bias in the responses could also be caused by the fact that only students who are interested in the topic would respond to share their opinions. Another issue to consider is the high proportion of females (74 %). This can lead to a bias toward the psychological stress indicator examined in this study, as women's mental health is more susceptible to the influence of environmental stress than men's [26]. However, it is important to note that convenience sampling and online surveys are widely employed methodologies in COVID-19-related research. While this sampling technique may not always guarantee the generalizability of findings, it continues to be an efficient means of assessing the potential relationships between variables [27]. Consequently, our study is exploratory in nature and not conclusive, serving as a foundational platform for future research endeavors.

Our study focused on e-learning as a whole, rather than the various types of e-learning. Thus, an in-depth investigation into the diverse preferences for learning methods, with a specific focus on the viability and adaptability of hybrid learning, merits further attention. Understanding how graduate students balance work commitments and educational pursuits during crises is instrumental in

designing flexible and effective programs. Additionally, continuous research on the evolving post-COVID-19 educational landscape and its profound impact on students' behavior and lifestyle is essential. These insights will inform adaptive educational policies and practices.

Statements and declarations

- The authors have no relevant financial or non-financial interests to disclose.
- This study was reviewed and approved by the Institutional Review Board (IRB) of the American University of Beirut with the approval number: SBS-2021-0088
- All participants provided informed consent to participate in the study

CRedit authorship contribution statement

Imad Bou-Hamad: Writing – review & editing, Supervision, Methodology, Formal analysis, Conceptualization. **Mira El Danaoui:** Writing – original draft, Visualization, Investigation, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e33257>.

Appendix: Measurement Scales

Item	Agreement				
Lecturer/instructor readiness (INS)	1	2	3	4	5
My institution's lecturers were very excited to teach on e-learning platforms	1	2	3	4	5
My institution's lecturers were very interactive during the discussions on e-learning platforms	1	2	3	4	5
My institution's lecturers have presented the materials in a very interesting way	1	2	3	4	5
My institution's lecturers have encouraged questions during the sessions and requested continuous feedbacks to ensure students' satisfaction	1	2	3	4	5
My institution's lecturers have encouraged us to participate in class discussions on e-learning platforms	1	2	3	4	5
My institution's lecturers have encouraged us to use e-learning	1	2	3	4	5
Institution's readiness to support e-learning (SUP)					
My institution's Information Technology's Office was at our disposal when a problem related to e-learning is encountered	1	2	3	4	5
My institution has provided enough computers for use and practice	1	2	3	4	5
My institution has given us access to the central library website and search for materials	1	2	3	4	5
My institution was adequately capable to support e-learning	1	2	3	4	5
Students' computer competency (SCC)					
I enjoy using personal computers	1	2	3	4	5
I usually use my personal computer for work and gaming purposes	1	2	3	4	5
I am comfortable with using PC and software applications before the implementation of e-learning	1	2	3	4	5
My technological skills were efficient enough to help in e-learning	1	2	3	4	5
I am not intimidated by using e-learning based courses	1	2	3	4	5
Content readiness (CON)					
The online courses' materials were sufficient and relevant to the course's requirements through e-learning	1	2	3	4	5
The functions of e-learning system were easy to use	1	2	3	4	5
It was easy to navigate on e-learning system	1	2	3	4	5
The recordings of the sessions and other materials were always available online at the disposal of the students	1	2	3	4	5
The courses' materials were uploaded online on time	1	2	3	4	5
The user interfaces of the online learning system were well designed	1	2	3	4	5
Satisfaction with e-learning (SAT)					
I find the quality of the online learning system compares favorably with the face-to-face learning system	1	2	3	4	5
If I get the opportunity to involve in an online learning system I would gladly do so	1	2	3	4	5
I gained more interest in the courses' subject through e-learning	1	2	3	4	5
I feel that e-learning has served all my needs well	1	2	3	4	5
I am satisfied with the e-learning educational system	1	2	3	4	5
Psychological state during the pandemic (PSY)					
Difficulty in concentration (distracted by social media and video games, lack of accountability and motivation, home as a source of distraction)	0	1	2	3	
Sleeping habits (irregular sleep patterns, increased hours of sleep, staying up/waking up late)	0	1	2	3	

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Item	Agreement			
Academic performance (impacts of academic progress and future career, worry about grades, reduced motivation)	0	1	2	3
Social relation/Social isolation (reduced/lack of in person interactions with people, restricted outdoors activities)	0	1	2	3
Depressive thoughts (Loneliness, insecurity or uncertainty, hopelessness, overthinking, concerns about academic performance)	0	1	2	3
Your own health and the health of your loved ones (worry about families with higher vulnerabilities, families with more interpersonal contact)	0	1	2	3

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