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The rise and drop of online learning: adaptability and future prospects

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The landscape of higher education is continuously evolving, with online learning emerging as a prominent educational modality. This cross-sectional study, conducted at the Holy Spirit University of Kaslik (USEK) in Lebanon from January to October 2023, aimed to assess Lebanese students' perceptions regarding the effectiveness of online learning as a mode of education and to develop strategies and recommendations for enhancing online learning in Lebanon. Using a convenience-sampling method, we collected 309 responses, focusing on educators' preparedness, student satisfaction, adaptability in online learning, and preferences for future learning modalities. The results highlighted a pressing demand for innovative course design strategies that promote engagement and interactivity, with 41.4% of respondents expressing this need. Additionally, 34.6% of learners emphasized the need for accessible technical support. Furthermore, 38.8% of participants underscored the necessity of comprehensive training programs for educators and learners in navigating online learning environments effectively. Moreover, the preference for online or hybrid learning models (55%) emphasized the importance of flexibility while preserving the value of in-person interactions. The study also highlighted the potential of educational advances to further enhance online learning environments. These technologies could provide opportunities for personalized learning experiences, tailoring course content, delivery methods, and assessments to meet the diverse needs of students, thus fostering a more adaptable and inclusive learning ecosystem. These insights are crucial for refining online education strategies and addressing the evolving needs of students in Lebanon.

KEYWORDS

online learning, hybrid learning, educational technology, students' perceptions, higher education, learning adaptability

1 Introduction

The spread of the infectious disease caused by the coronavirus (COVID-19) has presented a massive global challenge, resulting in significant transformations in various aspects of life, particularly in the field of education (Mushtaha et al., 2022). The virus's sudden and rapid emergence caught the entire world unprepared, leaving a deep and lasting impact (Bozkurt et al., 2022). In response, educators, students, and all members of the educational community were compelled to adapt to the crisis by shifting from traditional to online learning (Mohd Basar et al., 2021). This disruption has not only reshaped global education but also ushered in

a new era marked by the implementation of innovative technological tools and platforms (Mushtaha et al., 2022; Saputra et al., 2023).

While the global shift to online learning has impacted educational systems worldwide, Lebanon faces unique challenges that make this transition particularly significant. The country's educational infrastructure, which was already struggling with political, economic, and social instability before the pandemic, exacerbated the difficulties posed by the shift to digital learning. In Lebanon, the sudden move to online education revealed deep disparities in access to technology, the digital divide, and the limited preparedness of both educators and students to fully embrace this new mode of learning.

Online learning, widely recognized as a useful educational tool, utilizes digital platforms and the internet to enable students to access lessons remotely (Adebo, 2018). In contrast to the traditional teaching approach, where teachers play a central role in imparting knowledge (Tularam and Machisella, 2018), online learning places a greater emphasis on a student-centered educational philosophy (Sun and Liu, 2021). It offers several advantages, such as cost-effectiveness, flexibility, and accessibility. However, it also poses certain disadvantages, including a lack of social interaction, technical problems, and the potential for cheating (Naseer, 2023; Zaki, 2022). Therefore, understanding the adaptability of online learning is crucial for its continued development. Technological advancements play a crucial role in this adaptability, offering solutions like personalized learning experiences, automate administrative tasks, and intelligent tutoring systems, which address inherent challenges in online learning (Seo et al., 2021; Pawar, 2023).

While various perspectives on the learning process exist, including those focusing on learning achievement and teachers' and faculty perspectives, students' viewpoints play a pivotal role in education since they are the ultimate beneficiaries (EBSCOhost, 2024). These perspectives offer first-hand insights into their experiences and expectations, providing a nuanced understanding of the strengths and challenges of online learning (Dawson et al., 2019). This significance is amplified in the context of advancing technology and the implementation of new teaching approaches, underscoring the importance of the student perspective on online learning (EBSCOhost, 2024).

Assessing the perceptions of students contributes to the ongoing improvement of online learning environments, ensuring that the educational experience aligns with the diverse needs of learners. Recognizing the potential and progress in online learning, this study aims to gain comprehensive insights into the dynamics of online learning in Lebanon from the perspective of Lebanese students. Our objectives involve a multifaceted examination of their experiences and viewpoints, particularly in the face of fluctuations and adaptability challenges. Specifically, we aim to:

- Evaluate Lebanese students' perceptions regarding the effectiveness of online learning as a mode of education, focusing on its advantages and disadvantages.
- Identify the challenges and limitations they face in the online learning environment.
- Explore how Lebanese students perceive the adaptability of online learning.
- Develop strategies and recommendations for enhancing online learning in Lebanon.

Therefore, the present study seeks to answer the following research questions:

- How do Lebanese students perceive the effectiveness of online learning as a mode of education?
- What are the primary challenges and limitations faced by Lebanese students in the online learning environment, particularly within the context of Lebanon?
- How do Lebanese students perceive the adaptability of online learning, and what insights can be gained from their perspectives?
- What strategies and recommendations do Lebanese students propose for enhancing the adaptability and overall effectiveness of online learning in Lebanon?

The remainder of the paper is structured as follows: the subsequent section offers a comprehensive literature review, addressing online learning, its associated advantages and disadvantages, accompanied challenges, student satisfaction, and their preferences regarding online learning. Following this, our research methodology applied in the study is outlined in the next section. The following section elucidates the findings and analysis obtained from our survey. Finally, the last section presents a discussion and conclusion, along with insights and recommendations for the future of online learning in Lebanon.

2 Literature review

2.1 Overview of online learning

Advancements in technology have simplified distance learning, making it a vital part of 21st-century education, equipping learners with valuable skills needed in the modern era and reshaping conventional teaching methods (Ratheeswari, 2018). Technology has shifted education from teacher-centered instruction to a more student-centered approach, with educators now serving as motivators and facilitators, guiding students to become independent learners (Almahasees et al., 2021).

Terms such as "online learning, open learning, web-based learning, computer-mediated learning, and distance learning" share a fundamental characteristic: dependence on computers connected to networks. This connectivity has revolutionized education, offering learners the flexibility to engage in learning experiences from any location, at any time, and through various methods (Cojocariu et al., 2014).

In online learning, two fundamental learning approaches are often compared: synchronous and asynchronous learning. These two approaches differ in terms of the location of instruction, timing, and nature of learning activities (Fabrizz et al., 2021). Synchronous learning, driven by instructors, takes place in real-time through interpersonal communication, offering immediate feedback and employing natural language (Blau et al., 2017). In contrast, asynchronous learning operates as a self-paced system that is not bound by constraints of time and place (Fernandez et al., 2022).

Furthermore, online learning utilizes internet-based platforms and advanced technological tools to enhance learning and provide access to various online services. Various online platforms have emerged to facilitate interactive classes and minimize student disengagement. Tools such as Ding Talk, Hangouts Meet, Teams, Skype, WeChat Work, WhatsApp, and Zoom have revolutionized the way educators and students connect in the digital learning environment (An Ed-Tech

Tragedy?, 2024). These platforms offer a range of interactive features, including whiteboards, chat rooms, polls, quizzes, discussion forums, and surveys. Moreover, these tools create opportunities for real-time collaboration and engagement, making online learning a dynamic and effective educational method (Mukhtar et al., 2020).

2.2 Benefits of online learning

Online learning has a wide range of advantages, making it the preferred choice for contemporary education. One significant advantage is the flexibility to progress at one's own pace, reducing stress and boosting learning effectiveness (Gautam and Tiwari, 2016). Moreover, online learning prioritizes accessibility and convenience, allowing learners to easily access instructors and course materials, which creates a manageable, convenient, and user-friendly learning environment. This is particularly beneficial for individuals with hectic schedules or geographical limitations (Naseer, 2023). However, the effectiveness of online learning relies heavily on the availability of physical resources, such as devices and internet connectivity, which are essential to ensuring equitable access for all students.

The cost-effectiveness of online learning eliminates the need for physical resources and transportation expenses, making education more affordable (Fatoni et al., 2020). Additionally, online courses enhance time management skills. In fact, students are required to submit assignments and complete tasks within set deadlines, teaching them valuable time-management skills (Roper, 2007). This skillset is transferable and benefits students not only in their education but also in their professional and personal lives.

Flexibility remains a hallmark of online learning, empowering students with a student-centered approach. Distractions can be minimized, and lectures can be scheduled to align with students' availability and feasibility. This approach allows students to take more responsibility for their learning journey, as they can access lectures and materials at their convenience (Mukhtar et al., 2020). Furthermore, online learning provides a unique opportunity to connect students across geographical boundaries, facilitating global collaboration and exposure to diverse perspectives.

2.3 Disadvantages of online learning

While online learning offers numerous benefits, it also presents several disadvantages. A notable disadvantage is the absence of face-to-face interaction with both peers and educators, which can hinder the development of vital social and communication skills (Salarvand et al., 2023). Additionally, online courses often lack hands-on activities and practical experiences such as laboratory work and hands-on training (Santiago et al., 2022). This creates a gap between theoretical knowledge and practical application, especially for fields requiring hands-on expertise.

Another disadvantage is that online students are sometimes more prone to procrastination and may miss class discussions, which can negatively affect their learning progress (Elvers et al., 2003). Additionally, the isolation inherent in virtual classes can lead to feelings of loneliness and isolation, which can extend to the point where they experience depression, and sadly, some even contemplate thoughts of suicide (Rutkowska et al., 2022). Moreover, technical

issues such as poor internet connectivity or software glitches can disrupt a student's ability to access course materials, attend virtual classes, and complete assessments on time, potentially resulting in lower academic performance and increased stress (Erlangga, 2022).

Prolonged screen exposure can lead to health problems, including eye strain, poor posture, and other physical issues, as reported by Shah Zaki (2022). There is also an increased temptation to cheat during online assessments, which can undermine the integrity of the learning experience (Dendir and Maxwell, 2020). Lastly, maintaining motivation can be a challenge for students who lack self-motivation and independence, potentially leading to reduced success rates in online courses (Rawashdeh et al., 2021).

2.4 Challenges affecting online learning

Numerous obstacles and challenges related to online teaching have been identified, including educator preparedness, assessment and feedback, and issues of equity (Ezra et al., 2021; Xia et al., 2022). A primary concern is the readiness of educators to teach online effectively (Paliwal and Singh, 2021). Online learning requires specific pedagogical content knowledge, primarily focused on designing and organizing effective online courses (Rapanta et al., 2020). Therefore, educators must employ various social communication channels to foster robust student–student and student–teacher interactions. Additionally, they must engage learners in critical thinking about the course content and employ tools that replicate the efficacy of face-to-face instructions and mentorship (Seetal et al., 2021).

Additionally, assessment in online learning has garnered attention due to concerns about plagiarism, cheating, and dishonesty (Al-Moqbali and Raja Hussain, 2022). Osman (2020) highlighted the persistent challenge of evaluating the performance of students in online environments, particularly concerning practical skills, technical competencies, and teaching practicum. Similarly, Bensaid and Brahimi (2020) commented on the challenges associated with examining student outcomes and evaluating the applied assessment processes. Furthermore, feedback plays a pivotal role in any learning environment, enabling students to correct misconceptions, reconstruct knowledge, improve their performance, and enhance their motivation (Wang and Wu, 2008). Several studies have reported that learners lack feedback during online learning, which has detrimental effects on students' learning and development (Mukhtar et al., 2020).

Equity, a central concern in online education, is crucial to ensuring inclusive educational opportunities for all students. Individuals with special needs are identified as a vulnerable group facing various obstacles to accessing online education. These obstacles may stem from reliance on equipment and professional support only available in schools and universities (Verulava et al., 2022). Equity issues are also linked to technology and internet connectivity (Graves et al., 2021). Indeed, children from disadvantaged backgrounds may lack access to necessary devices, reliable internet connections, and digital resources that can facilitate their learning.

2.5 Online learning and student satisfaction

Student satisfaction refers to the degree of contentment, fulfillment, and enjoyment students experience in their educational

journey (Weerasinghe and Fernando, 2017). This sentiment is influenced by various factors, including academic success, social interactions, and the quality of teaching and resources offered by the educational institution. Recognizing and ensuring student satisfaction is a crucial aspect of the online education experience, as it directly impacts retention rates and academic achievements (Martin and Bolliger, 2022). Therefore, adopting an environment that prioritizes student satisfaction is vital for the success and efficiency of online learning. Numerous studies have explored the factors that influence student satisfaction in online learning environments. For example, El Zein et al. (2023) have identified five factors that hinder students' satisfaction with online education. These encompass student interaction, technology, course structure, instruction, and the instructor. Additionally, other factors, including organization skills for teaching activities, knowledge reserves, and proficiency in teaching design, significantly impact students' satisfaction with online education (Yu, 2022). Therefore, accepting and addressing these factors is imperative for fostering a positive and effective online learning environment. Such efforts ultimately contribute to students' engagement, motivation, and overall success in their academic journey.

2.6 Adaptability in education

The human attention span is evolving, with a growing preference for short, personalized content. This trend makes online learning one of the most efficient methods for distributing, acquiring, and retaining important information (King, 2020). In Lebanon, overcoming various barriers is essential to ensuring the success of eLearning, with adaptability playing a crucial role. Adaptable eLearning ensures that all learners have access to educational opportunities, regardless of their circumstances, thus promoting equity and inclusivity while reducing learning barriers. Moreover, it enhances learner engagement and motivation, as students are more likely to stay involved with content that is relevant and personalized to their needs.

Adaptable learning systems are designed to accommodate diverse learning styles, preferences, and paces. Instructors should offer a variety of instructional strategies that cater to the broad spectrum of learners. By integrating different media formats, such as videos, readings, and interactive modules, educators can engage students more effectively and prevent disengagement. Additionally, giving learners the flexibility to choose between different learning activities—whether it is watching a video, reading a textbook, participating in discussions, or engaging in hands-on practice—helps address individual learning preferences and promotes deeper engagement (Emma, 2024).

Moreover, offering personalized learning paths based on students' prior knowledge, proficiency, and interests can significantly enhance the learning experience. This flexibility allows students to progress at their own pace, revisit challenging content, and move ahead when they feel confident. A learner-centered approach that values autonomy and choice can foster motivation, allowing students to feel in control of their educational journey.

In Lebanon, an adaptable education model is especially valuable in ensuring inclusivity and accessibility. It allows for the consideration of students with diverse backgrounds, including those from disadvantaged regions or with special educational needs. By providing options that meet these learners' unique needs—such as alternative

formats for students with visual or auditory impairments, or language support for non-native speakers—educational institutions can minimize barriers and foster a more equitable learning environment.

3 Materials and methods

3.1 Study design, period, and setting

A cross-sectional study was conducted to collect data from undergraduate and post-graduate students at Holy Spirit University of Kaslik (USEK) in Lebanon between January 2023 and October 2023.

3.2 Sampling technique

We employed a convenient sampling technique to recruit participants for this study. This method was chosen for its feasibility in accessing a broad range of students within the limited timeframe of the study. A link to the online questionnaire was sent via email to all undergraduate and postgraduate students at the Holy Spirit University of Kaslik (USEK). The email included a clear description of the study's objectives and an informed consent form. Students who voluntarily agreed to participate completed the survey at their convenience using Microsoft Forms. To ensure the quality of the data, only completed questionnaires were included in the final analysis. Any responses that were partially completed or showed signs of inconsistencies or unclear data were excluded from the analysis. In total, 22 participants were excluded due to incomplete responses, thus ensuring the reliability and accuracy of the data set.

3.3 Inclusion and exclusion criteria

For our study, we have established specific inclusion and exclusion criteria to define the eligible study population. The inclusion criteria encompass:

- 1 Undergraduate and postgraduate students with different majors at USEK (ensuring a broad representation of the student population).
- 2 Students who have actively engaged in online learning.
- 3 Students who have provided informed consent to participate in the research.

On the other hand, the exclusion criteria are applied to:

- 1 Students who were not engaged in online learning.
- 2 Students who did not provide informed consent to participate in the study.

3.4 Instrument for data collection

The authors developed the questionnaire based on a thorough review of the existing literature, aiming to assess students' experiences and perceptions of online learning references (Xia et al., 2022; Alqahtani et al., 2023; Stecuła and Wolniak, 2022; Peres and Mesquita,

2014). It comprehensively covers various critical aspects of online education, including the evaluation of user-friendliness, communication opportunities, overall satisfaction levels, course material quality, and the effectiveness of technical support. Moreover, the questionnaire meticulously explores both the challenges and advantages encountered by students in the online learning environment, providing them with a platform to contribute valuable suggestions for improvement. Additionally, it seeks to gain insights into students' preferences for future learning modalities, thereby offering essential guidance to educators and institutions in adapting to evolving educational needs. This questionnaire is structured into four distinct sections: socio-demographic characteristics, experiences with online learning, suggestions for enhancement, and future preferences. Before implementation, it underwent a pilot test involving 25 participants, which played a vital role in eliminating irrelevant content, resolving contradictions, rectifying spelling errors, addressing offensive language, and rectifying discrepancies. To assess the reliability of the questionnaire, Cronbach's alpha was calculated for the entire questionnaire, yielding a value of 0.714, indicating an acceptable level of internal consistency across all sections. Additionally, to assess validity, content validity was ensured by consulting subject matter experts. Measures were also in place to ensure data integrity, such as preventing multiple completions of the questionnaire by the same individual.

3.5 Ethical considerations

The study adhered to the ethical standards outlined in the Declaration of Helsinki of 1964 and its later amendments. The study protocol underwent thorough review and approval by the Ethical Committee at the Holy Spirit University of Kaslik (EC 90010141). Participants in the study were not subjected to any form of physical or psychological harm. Furthermore, the personal information and credentials of the participants were treated with the utmost confidentiality. All data collected was anonymized, ensuring that individuals could not be identified from the responses. To maintain confidentiality during data analysis, any identifying information was removed, and the data was stored in a secure database with access limited to the research team. The results obtained from the study were solely utilized for academic purposes.

3.6 Statistical analysis

The data for this study were analyzed using SPSS version 20.0 (IBM SPSS Statistics 20). Descriptive statistics were used to summarize participants' characteristics and responses, and categorical variables were presented using frequencies and percentages.

4 Results

4.1 Participants' demographic characteristics

In total, 309 participants were involved in the study, of whom 55% identified as female. The age distribution within the sample was

diverse, with a significant proportion (62.1%) falling within the 18–20-year-old age bracket. When examining their academic backgrounds, we found that 92.2% were enrolled in bachelor's programs and 7.8% in master's programs. The study also encompassed participants with a wide range of academic majors. Notably, the largest group specialized STEM disciplines (43.0%), followed by those in Social Sciences (37.9%) and Humanities (19.1%). A summary of the socio-demographic information is provided in [Table 1](#).

4.2 Students' perceptions and experiences with online learning

4.2.1 Platform quality and experience

Most participants expressed positive perceptions regarding various aspects of the online learning experience, as summarized in [Table 2](#). Notably, 67% found online learning platform to be user-friendly. Nearly three-quarters of participants (71.8%) rated the quality and relevance of course materials as either "Excellent" or "Good," indicating their satisfaction with the learning materials.

TABLE 1 Participants' demographic characteristics.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	170	55.0
	Male	137	44.3
	Prefer not to say	2	0.7
Age	18–20	192	62.1
	21–24	100	32.4
	25–29	11	3.6
	30 or above	6	1.9
Level of education	Bachelor degree	285	92.2
	Master degree	24	7.8
Major of study	STEM: Engineering, Architecture, Computer Sciences, Medicine, Biochemistry, Agriculture, Chemistry	133	43.0
	Humanities: Law, Journalism, Translation, Psychology, Education	59	19.1
	Social sciences: Business Administration, Nursing Sciences, Cinema and TV, Nutrition and Dietetics	117	37.9

Similarly, the clarity and quality of narration in online learning materials received positive feedback, with 70.9% of participants giving them high marks. Furthermore, the quality of audio during online learning sessions was generally well received, with a majority (63.4%) evaluating it as either “Excellent” or “Good.”

4.2.2 Time management and organization

Participants were asked to self-assess their time management and organizational skills in the context of online learning, and their responses revealed varying levels of effectiveness, as illustrated in Table 3. Notably, 31.7% demonstrated high proficiency, describing themselves as very effective in managing their time and maintaining organization—an indication of commendable adaptability and self-discipline. Additionally, 38.2% reported managing their time and organization somewhat effectively, reflecting reasonable skills in juggling their online learning commitments. A group of 18.4% maintained a neutral stance on this matter, while 8.7% found it somewhat challenging, and a smaller percentage, comprising 3%, encountered a very challenging experience.

TABLE 2 Platform quality and experience.

Questions	Frequency (n)	Percentage (%)
How user-friendly do you find the online learning platform?		
Very user-friendly	104	33.7
Somewhat user-friendly	103	33.3
Neutral	82	26.5
Somewhat difficult to use	17	5.5
Very difficult to use	3	1.0
How would you rate the quality and relevance of the course materials provided in the online learning courses?		
Excellent	72	23.3
Good	150	48.5
Average	68	22.0
Poor	14	4.6
Very poor	5	1.6
How would you rate the clarity and quality of narration in online learning materials (recorded lectures, videos, etc.)?		
Excellent	79	25.6
Good	140	45.3
Average	70	22.6
Poor	14	4.5
Very poor	6	2.0
How would you rate the quality of audio during online learning sessions?		
Excellent	63	20.4
Good	133	43.0
Average	80	25.9
Poor	25	8.1
Very poor	8	2.6

4.2.3 Student isolation and attendance experience

It was evident that students’ experiences of isolation during online learning spanned a spectrum, with the majority reporting feeling “somewhat isolated” (35.6%) or “moderately isolated” (29.8%) (Table 4). A smaller yet noteworthy percentage expressed feelings of “very isolated” (6.8%) or “extremely isolated” (2.6%). These feelings of isolation were closely linked to their academic performance, with many students indicating that their sense of disconnection negatively impacted their motivation and engagement, ultimately contributing to a decline in their academic outcomes. The isolation reported by students led to reduced participation in online activities and decreased interactions with instructors and peers, which further exacerbated their sense of disconnection and disengagement.

In terms of attendance, 72.5% of students reported missing at least one online learning class. The primary reasons for their absences included technical issues (59.8%), followed by a lack of motivation (16.1%) and work-related commitments (14.3%). The challenges related to maintaining consistent attendance, combined with the feelings of isolation, appear to correlate with the significant proportion of students (59.2%) reporting a severe decline in their academic performance. The lack of motivation and the challenges posed by technical issues contributed to disengagement, which further undermined students’ academic progress. This highlights the critical need for strategies to mitigate isolation and improve attendance to enhance overall academic performance.

4.2.4 Student motivation for digital learning approaches

The highest motivation was observed for visualizing whiteboard and picture activities, with 32.7% of students expressing a strong interest. Listening to a lecture also garnered substantial motivation, with 23.9% of students finding it compelling. Additionally, group discussions were motivating for 24.6% of students. In contrast, participating in a game competition and submitting a written assignment appeared to be less motivating, with 5.8 and 10.7% of students, respectively, favoring these approaches (Table 5).

4.2.5 Overall satisfaction and impact of online learning

A significant proportion of students expressed satisfaction with various aspects of online learning, with 39.5% reporting satisfaction with the online learning experience, 46.3% finding technical support satisfactory, and 42.7% expressing satisfaction with assessment

TABLE 3 Students’ feedback on the efficacy of time management and organization.

Question	Frequency (n)	Percentage (%)
How effectively are you able to manage your time and stay organized in online learning?		
Very effectively	98	31.7
Somewhat effectively	118	38.2
Neutral	57	18.4
Somewhat challenging	27	8.7
Very challenging	9	3

TABLE 4 Student sentiments and class attendance in online learning.

Questions	Frequency (n)	Percentage (%)
To what extent do you feel isolated during online learning?		
Not at all isolated	76	24.6
Somewhat isolated	110	35.6
Moderately isolated	92	29.8
Very isolated	21	6.8
Extremely isolated	8	2.6
No response	2	0.6
Have you ever missed an online learning class?		
Yes	224	72.5
No	85	27.5
If you have missed an online learning class, please indicate the reason		
Technical issues (e.g., internet connectivity, electricity issues, software problems...)	134	59.8
Personal	16	7.1
Health-related issues	6	2.7
Work	32	14.3
Lack of motivation	36	16.1

methods, as shown in Table 6. However, it is essential to note that a substantial number of students (59.2%) reported a severe decline in their academic performance attributed to online learning, and 30.1% were dissatisfied with the overall effectiveness of online education in meeting their educational goals. Additionally, there was a notable diversity in students' self-assessed mastery levels, with 34.9% achieving "good mastery" and 27.2% achieving "better mastery," indicating competence in their studies. Nonetheless, a significant proportion also acknowledged "general mastery" (13.9%) and "60% or less proficiency" (6.5%).

4.2.6 Advantages, challenges, and disadvantages of online learning

Participants reported a range of benefits of online learning, as illustrated in Table 7. In fact, 32.7% of respondents cited convenience as a key advantage, appreciating the flexibility it offers in terms of study schedules. Additionally, 49.2% of participants highlighted the benefit of easy access to information and learning materials that online courses provide. Moreover, 20.1% of participants identified value in the opportunities for interaction with teachers within the online learning environment. 11.7% of participants appreciated the chance to interact with their peers, emphasizing the importance of a sense of community. The capability to review and revisit course content garnered noteworthy attention, with 89.6% of participants highlighting the flexibility and thorough understanding that online learning facilitates. Additionally, 43% of participants recognized the practical advantage of reduced commuting time and expenses associated with online learning.

Technical difficulties, including problems related to internet connectivity and software, were the most commonly reported

TABLE 5 Motivation levels for different digital learning approaches.

Question	Frequency (n)	Percentage (%)
Which of the digital approaches motivates you to learn?		
Listen to a lecture	74	23.9
Visualizing whiteboard and picture activities	101	32.7
Discussing in groups	76	24.6
Take part in game competition	18	5.8
Submitting a written assignment	33	10.7
No response	7	2.3

challenge, affecting 73.8% of respondents, as shown in Table 7. Additionally, 43.4% of participants expressed the limitations of face-to-face interaction with instructors and peers. Staying motivated and maintaining self-discipline were noted as challenges by 35.9% of students, while 30.7% reported increased distractions in their home or learning environments. Furthermore, 10.7% of learners faced issues related to the lack of access to specialized equipment or facilities, while 9.4% expressed concerns about the sufficiency of tools for student assessment.

Online learning presented several significant disadvantages, as shown in Table 7. One notable drawback was the inefficiency of learning, reported by 7.1% of learners, which can result from distractions at home or difficulties in staying motivated. Moreover, 7.4% highlighted increased feelings of isolation or disengagement, highlighting the lack of in-person interactions. Another concern, raised by 12.3% of students, revolves around the challenge of receiving immediate feedback from instructors. Additionally, 12.9% expressed difficulties in forming study groups or collaborating on projects, making it harder to foster a sense of teamwork and shared learning experiences. Furthermore, 13.3% of participants pointed out the limited opportunities for hands-on learning or practical applications, which are vital for certain subjects. Lastly, a significant number of learners (38.8%) mentioned reduced personal interaction and social connections as a notable downside.

4.2.7 Recommendations for improvement

To enhance the online learning experience, participants offered various recommendations that were categorized into short-term and long-term strategies for clarity, as shown in Table 7. In terms of short-term strategies, a significant number of respondents emphasized the importance of elevating interactivity and engagement within online courses, with 41.4% of participants highlighting the demand for more dynamic and participatory learning opportunities. Furthermore, 32.4% of respondents stressed the value of clear instructions and guidance, advocating for well-structured course materials and effective communication to ensure students can follow the learning process seamlessly. Additionally, 34.6% of participants underscored the necessity of accessible and reliable technical support, emphasizing the importance of timely assistance to address any issues that may arise during online learning. On the other hand, long-term strategies focused on creating sustainable improvements. A total of 38.8% of respondents identified the need for comprehensive teacher and

TABLE 6 Student satisfaction and perceptions of online Learning.

Questions	Frequency (n)	Percentage (%)
How satisfied are you with online learning?		
Very satisfied	62	20.1
Satisfied	122	39.5
Neutral	89	28.8
Dissatisfied	27	8.7
Very dissatisfied	9	2.9
How satisfied are you with the technical support provided for online learning?		
Very satisfied	51	16.5
Satisfied	143	46.3
Neutral	96	31.1
Dissatisfied	11	3.6
Very dissatisfied	8	2.5
How satisfied are you with the assessment methods used in online learning courses?		
Very satisfied	58	18.8
Satisfied	132	42.7
Neutral	99	32.0
Dissatisfied	15	4.9
Very dissatisfied	3	1.0
No response	2	0.6
How would you rate the overall effectiveness of online learning in meeting your educational goals?		
Very satisfied	23	7.4
Satisfied	67	21.7
Neutral	99	32.0
Dissatisfied	93	30.1
Very dissatisfied	22	7.1
No response	5	1.7
Does online learning affect your performance?		
Severe decline	183	59.2
Definite decline	123	39.8
None	3	1.0
Definite upgrade	0	0.0
Significant upgrade	0	0.0
How well did you master your knowledge during online study?		
90–100% (Proficient mastery)	50	16.2
80–90% (Good mastery)	108	34.9
70–80% (Better mastery)	84	27.2
60–70% (General mastery)	43	13.9
60% or less	20	6.5
No response	4	1.3

student training programs, aimed at equipping both educators and learners with essential digital skills and effective pedagogical strategies. Furthermore, 27.2% of learners called for supplementary resources to support their academic journey, advocating for the availability of additional learning materials to reinforce their understanding of course content. Regular feedback was another long-term recommendation, with 21.4% of respondents stressing the importance of providing consistent and constructive feedback to help students track their progress and improve their performance. Another suggestion from 16.2% of participants was the promotion of collaboration through group projects and interactive discussions, which could foster a more engaging and cooperative learning environment. Finally, 23.6% of respondents suggested the provision of virtual office hours to enable direct communication between students and instructors, further enhancing the learning experience by offering personalized support and guidance.

4.2.8 Preferred learning mode

When asked about their preferred learning modes, students offered a range of choices, as shown in Table 8. The majority of respondents, comprising 43.7%, favored the traditional campus learning experience, valuing the in-person interactions and structure it offers. Hybrid or blended learning, a combination of both online and in-person instruction, was preferred by 45% of students, reflecting the appeal of a balanced approach. Furthermore, 10% of students expressed a preference for online learning, citing the flexibility and convenience it provides.

5 Discussion

Our study examined the perceptions of Lebanese students regarding online learning and reported several advantages and disadvantages associated with this mode of education. Notably, participants highlighted a significant reduction in commuting time and associated expenses for online learning. This underscores the potential cost-effectiveness of online learning, presenting it as a viable alternative to traditional classroom-based instruction. The financial benefits extend to both educational institutions and students, with institutions able to reduce costs related to facilities and equipment maintenance, while students can mitigate expenses related to commuting, housing, and textbooks (Admin, 2022). This finding gains particular significance in light of Lebanon's array of challenges, including traffic congestion, limitations in transportation infrastructure, and the enduring economic crisis, which exacerbate the barriers to in-person learning and make the flexibility and cost-effectiveness of online education especially appealing in the Lebanese context (Ilic and Violeta, 2012). Moreover, the ongoing political instability and frequent disruptions to daily life further emphasize the importance of flexible learning modes that do not rely heavily on physical presence, making online learning an attractive alternative for many Lebanese students.

Moreover, distance learning offers flexible opportunities in terms of time, location, and learning speed (Turan et al., 2022). Students have the flexibility to study from anywhere and at any time, as long as they have an internet connection. This convenience enables them to balance their academic pursuits with other commitments. A study conducted by Kokoç (2019) revealed that students who experience

TABLE 7 Summary of key findings and recommendations for online learning (multiple answer).

Key findings and recommendations	Frequency (n)	Percentage (%)
Positive outcomes of online learning		
Reduced commuting time and expenses	133	43.0
Ability to review and revisit course content	227	89.6
Opportunities to interact with classmates	36	11.7
Opportunities to interact with teachers	62	20.1
Access of information	152	49.2
Convenience in studying	101	32.7
Challenges faced by students in online learning environment		
Insufficient tools for student assessment	29	9.4
Lack of access to specialized equipment or facilities	33	10.7
Increased distractions at home in your learning environment	95	30.7
Difficulty in staying motivated and self-disciplined	111	35.9
Limited opportunities for face-to-face interaction with instructors and peers ⁶	134	43.4
Technical difficulties (e.g., internet connectivity issues, software problems)	228	73.8
Negative outcomes of online learning		
Insufficient learning	22	7.1
Increased feeling of isolation or disengagement	23	7.4
Challenges in receiving immediate feedback from instructors	38	12.3
Difficulties in forming study groups or collaborative projects	40	12.9
Limited opportunities for hands-on learning or practical applications	41	13.3
Reduced personal interaction and social connections	120	38.8
Key recommendations for enhancing online learning		
Offer virtual office hours	73	23.6
Promote collaboration among students	50	16.2
Offer technical support	107	34.6
Improve audio and video quality	0	0
Provide regular feedback	66	21.4
Offer additional resources	84	27.2
Train teachers and students	120	38.8
Provide clear instructions and guidance	100	32.4
Increase interactivity and engagement	128	41.4

high levels of flexibility in online learning exhibit greater engagement in learning activities and achieve higher academic performance. Therefore, it is imperative that online courses facilitate flexible access to course content and accommodate variations in study pace and scheduling constraints. To achieve this, greater efforts are necessary to develop innovative approaches that integrate flexibility into online learning. Consequently, instructors should provide e-learning environments with rich and diverse learning resources, such as interactive multimedia content, digital libraries, real-world case studies, adaptive learning tools, educational podcasts, and virtual labs (Koblyakov, 2024; Yadav, 2024; Using Diverse Resources to Promote

Equity in Online Courses, 2024). Additionally, they should incorporate student-centered learning activities, flexible navigation options, and support self-pacing of learning (Kokoç, 2019). Moreover, students emphasized another benefit of online learning: the accessibility of resources and information, along with the opportunity to review course content. This finding supports independent learning and enhances comprehension of course materials (Stecula and Wolniak, 2022; Russ and Hamidi, 2021). The flexibility inherent in online learning also resonates with the context of Lebanon's ongoing sociopolitical and economic challenges. During times of crisis, students may experience disruptions in their education due to national

TABLE 8 Students' preferred learning modes.

Preferred learning modes	Frequency (n)	Percentage (%)
Campus learning	135	43.7
Online learning	31	10.0
Hybrid learning	139	45.0
No response	4	1.3

strikes, political instability, or regional conflicts. Online learning offers them the ability to continue their studies regardless of such interruptions, ensuring that their educational pursuits are not derailed.

On the other hand, students reported numerous disadvantages associated with online learning, citing distractions at home and difficulties staying motivated. [Kostaki and Karayianni \(2022\)](#) found that students frequently facing distractions at home, particularly from cell phones and social media, tended to exhibit lower engagement scores. Similarly, [Chhetri \(2020\)](#) identified distractions as a prominent challenge mentioned by online learners, especially during the COVID-19 pandemic. Another notable concern is the increased sense of isolation or disengagement in online learning environments ([Kaufmann and Vallade, 2020](#)). This highlights the value of in-person interactions and the social dimension of traditional classrooms. The absence of face-to-face communication and physical presence can lead to a sense of disconnection from peers and instructors, ultimately affecting overall engagement and satisfaction ([Foltz and Brown, 2022](#)). Furthermore, forming study groups or collaborating on projects can also be challenging in the online learning environment, hindering the development of teamwork skills and shared learning experiences ([Herriott and McNulty, 2022](#)). Additionally, online learning may lack opportunities for hands-on learning or practical applications, particularly in subjects that require laboratory work or physical demonstrations. Practical experience is crucial for a comprehensive understanding of certain topics, and its absence can be a significant disadvantage ([Reeves et al., 2021](#)). Students also encountered challenges related to the delay in receiving feedback from instructors in online courses. Feedback plays a pivotal role in scaffolding for learning, offering insights into learners' progress and helping them improve self-regulated skills. In online courses, where instructors and students are geographically and physically separated, timely feedback becomes even more critical ([Cavalcanti et al., 2021](#)). Lastly, students have noted reduced personal interaction and fewer opportunities for building social connections in the online learning environment. Traditional classrooms provide a platform for social interactions, networking, and personal relationship building. The virtual nature of online education may limit these opportunities, potentially affecting the overall student experience and personal development ([Shah Zaki, 2022](#)). Additionally, despite the advantages of online learning, the technological divide in Lebanon exacerbates the challenges of remote education. Students from lower socio-economic backgrounds may lack access to reliable internet or necessary devices, limiting their ability to participate fully in online courses. This divide underscores the need for targeted measures from both educational institutions and the government to bridge these gaps, ensuring equitable access to technology and educational resources.

Additionally, our results revealed that Lebanese students preferred the hybrid-learning model, an innovative educational

approach that combines both virtual and in-person modalities ([Anggrawan, 2021](#)). This approach offers customized learning activities tailored to the needs of different study groups and enhances active learning within the classroom by employing the flipped model. Furthermore, hybrid learning encourages the development of self-regulated and self-directed learning skills among students. This means that learners take greater responsibility for their own learning process, managing their time effectively, setting goals, and autonomously monitoring their progress ([Linder, 2017](#)). However, implementing hybrid learning poses its own set of challenges. One significant obstacle is ensuring equitable access to technology and internet connectivity for all students. In Lebanon, disparities in access to reliable internet and digital devices further highlight the importance of addressing these barriers to ensure that all students benefit from hybrid learning opportunities. Addressing this challenge requires proactive measures from educational institutions and policymakers to invest in improving technology infrastructure, including upgrading internet connectivity and providing digital devices to students who lack access ([OCDE, 2023](#)). Additionally, institutions should invest in training programs and professional development to equip educators with the necessary tools and techniques for designing and delivering engaging online courses. Similarly, students can enhance their online learning experience through targeted training in digital literacy and self-regulated learning strategies ([Mondragon-Estrada et al., 2023](#)). Moreover, the successful implementation of hybrid learning relies heavily on effective pedagogical strategies and instructional design principles that aim to equip students with critical thinking, teamwork, and a deeper understanding of the subject matter—skills that are invaluable in the 21st-century workforce. One such recommendation is the incorporation of problem-based learning (PBL) into hybrid learning environments. PBL encourages active engagement with real-world problems, fostering critical thinking, problem-solving skills, and collaboration ([Yew and Goh, 2016](#)). Furthermore, the flipped learning model presents an opportunity to enhance hybrid learning by promoting student-centered instruction and active learning. In a flipped classroom, students engage with course content outside of class time, allowing for more interactive and collaborative sessions ([El Miedany, 2019](#)). Additionally, game-based learning offers a creative approach to fostering critical thinking, decision-making, and collaboration in hybrid learning environments. Integrating gamified elements into hybrid courses can enhance student motivation, foster a sense of competition, and encourage collaborative learning experiences both online and in-person ([Tobias et al., 2014](#)). Lastly, embracing holistic education principles can further enrich the hybrid learning experience by promoting a comprehensive approach to student development. Holistic education emphasizes the interconnectedness of mind, body, and spirit, nurturing students' emotional intelligence, empathy, and resilience alongside academic knowledge. By integrating holistic learning activities, such as mindfulness exercises, reflective journaling, and community service projects, instructors can support students' holistic growth and wellbeing, preparing them for success in diverse personal and professional contexts ([Miseliunaite et al., 2022](#)). The hybrid learning model is particularly relevant in Lebanon's unique context, as it offers a balanced approach to addressing the challenges posed by the country's ongoing socio-political instability. By combining the

flexibility of online learning with in-person interactions, hybrid learning ensures that students continue to have access to quality education despite potential disruptions caused by strikes, political events, or economic instability.

The preference for hybrid learning among Lebanese students signals a shift toward innovative educational approaches that prioritize flexibility and active engagement. However, realizing the full potential of hybrid learning required concerted efforts to address technological, pedagogical, and socio-emotional challenges, ultimately fostering an enriched and inclusive learning environment. Incorporating advanced educational technologies into hybrid learning environments can significantly enhance the educational experience for Lebanese students. These technology-driven solutions such as personalized learning paths, intelligent tutoring systems, content recommendation algorithms, adaptive assessments, emotional intelligence support, enhanced collaboration tools, and continuous improvement analytics offer transformative possibilities (Lange, 2023). For instance, adaptive learning platforms like DreamBox and Knewton can analyze students' learning styles and progress, dynamically adjusting course content to meet their individual needs (AI TRUSEC eLearning Industry, 2023). Intelligent tutoring systems, such as Carnegie Learning or Squirrel AI, can provide personalized feedback and assistance, mimicking the support of human tutors in virtual settings. These systems help bridge the gap in online learning environments where immediate instructor feedback may be lacking, ensuring students remain engaged and on track (The Princeton Review, 2024). Additionally, content recommendation algorithms can suggest relevant resources, such as videos, articles, and exercises, catering to diverse learning preferences and objectives, thus promoting a more personalized and enriching learning experience (AIContentfy, 2023). Adaptive assessments like ALEKS can accurately gauge students' knowledge and skills, offering immediate insights for personalized instruction and targeted interventions, which helps prevent students from falling behind (Raja et al., 2024). Moreover, emotional intelligence support systems, such as those powered by Affectiva, can detect signs of student distress or disengagement through facial expressions, tone of voice, or engagement patterns, prompting timely interventions to enhance wellbeing and learning outcomes (Thakkar et al., 2024). These systems are particularly valuable in addressing the issue of student isolation and disengagement in virtual settings. Furthermore, analytics enable educators to derive actionable insights from vast amounts of data, informing evidence-based decision-making and instructional design. By leveraging these advanced technologies such as IBM Watson Education, Lebanese educational institutions can continuously refine their teaching strategies based on real-time student performance data, ensuring that teaching methods remain effective and responsive to student needs. Additionally, these technologies can enhance collaboration among students through platforms like Microsoft Teams, which integrates tools like Standuply to streamline group work and peer engagement. This addresses the challenge of social isolation by fostering an interactive and connected online community. By incorporating these educational technologies, Lebanese educational institutions can create adaptable, personalized, and engaging learning experiences that empower students to thrive in the digital age, while also supporting educators in overcoming the challenges presented by online and hybrid learning environments (Abbas, 2024).

5.1 Limitations and future directions

This study has limitations that merit acknowledgment. While shedding light on online learning experiences at USEK, it is crucial to recognize that the university's context may not fully represent the spectrum of technological universities in Lebanon. Given the potential disparities in technological infrastructures and resources across institutions, the applicability of findings beyond USEK's environment might be constrained. Hence, future research initiatives should consider broadening the scope to encompass perspectives from students in high-tech universities. These institutions, equipped with advanced technological support and substantial budgets for faculty training, offer a distinct educational landscape warranting exploration. Furthermore, the utilization of a self-administered questionnaire introduces another layer of limitation. Dependence on participant responses raises valid concerns regarding data quality and reliability, as responses could be rushed, dishonest, or inattentive. To mitigate this challenge, future studies could adopt mixed-methods approaches. By integrating quantitative questionnaire data with qualitative insights gleaned from interviews or focus groups, researchers can foster a more nuanced and comprehensive understanding of students' online learning experiences. Additionally, the reliance on convenience sampling as a method for participant selection introduces potential bias. While convenient, this sampling approach may not fully represent the broader population of online learners, limiting the generalizability of the findings. This bias should be considered when interpreting the results, and future studies might benefit from utilizing a more randomized sampling strategy to ensure a more diverse and representative sample. Future research could also benefit from further exploration of faculty perspectives on online learning. Understanding how instructors navigate online education, including challenges they face and strategies they use, would provide a more holistic view of the online learning environment. Moreover, conducting longitudinal studies that track students' experiences over time could provide valuable insights into the evolving nature of online education, the impact of technological advancements, and the long-term effects of online learning on student outcomes. Such studies could help to better understand how online learning adaptations influence student engagement, satisfaction, and achievement across different stages of their academic journeys.

6 Conclusion

In conclusion, our study provided valuable insights into the online learning landscape as perceived by Lebanese students at USEK, offering a comprehensive understanding of their educational experiences, challenges, motivations, and preferences. Our findings emphasize several actionable insights for stakeholders, such as policymakers and educators, to enhance the effectiveness of online learning.

First, the importance of refining course design is evident, with students highlighting the need for user-friendly interfaces, clear instructional materials, and engaging interactive elements. Stakeholders should prioritize the development of courses that

facilitate ease of use and active participation to foster better learning outcomes. Furthermore, robust support services are crucial, as students rely on timely technical assistance and seamless connectivity during online classes. For policymakers, this means ensuring that institutions are equipped with the necessary infrastructure and support teams to promptly address issues, enhancing the overall learning experience.

Moreover, the study underscores the importance of continuous digital skill development for both educators and students. Educators should be regularly trained in digital teaching strategies, and students should be provided with resources to enhance their digital literacy. This ongoing training is essential for ensuring the success of online learning and should be considered a priority for educational institutions.

Students also expressed a strong preference for hybrid learning models, indicating a clear demand for flexible educational formats. Policymakers should consider integrating hybrid options into the curriculum, balancing in-person and online components to address students' varied learning preferences and promote greater accessibility.

Looking beyond our study's immediate findings, the transformative potential of innovative technologies in education warrants attention. While the role of such technologies in online learning is still evolving, evidence suggests that they can offer personalized learning experiences, improving student engagement and outcomes. To implement these technologies effectively, educational institutions should adopt tools such as personalized content delivery platforms and predictive analytics. These tools can support tailored learning paths, enabling educators to provide more responsive and individualized instruction. For example, technology systems can analyze student progress in real time, flagging areas of difficulty and suggesting timely interventions. Additionally, these technologies can optimize administrative tasks such as grading and student performance tracking, freeing up educators to focus on more meaningful pedagogical activities.

Incorporating innovative educational technologies requires a strategic, evidence-backed approach. Stakeholders should focus on pilot programs to test technology-driven solutions, evaluate their effectiveness, and scale successful initiatives. Furthermore, collaboration between educational institutions, technology providers, and policymakers is essential to ensure that technological integration aligns with the broader goals of improving educational access, inclusivity, and quality.

In navigating the future of online education, embracing innovative technologies is not just aspirational but a necessary step toward building a more adaptable, inclusive, and effective learning environment. By leveraging the potential of technological innovations alongside improved course design and support systems, stakeholders can create a more resilient and responsive educational ecosystem that empowers students to thrive in the digital age.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

NN: Conceptualization, Data curation, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. MR: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft. TB: Conceptualization, Data curation, Investigation, Methodology, Supervision, Writing – review & editing. WH: Conceptualization, Data curation, Investigation, Methodology, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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