

Student Satisfaction with Online Learning: A Study Among Medical Students at a Medical School in Northern Morocco During the COVID-19 Pandemic

La satisfaction étudiante à l'égard de l'apprentissage en ligne : une étude auprès des étudiants d'une école de médecine du nord du Maroc durant la pandémie de COVID-19

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Résumé de l'article

Introduction. La pandémie de COVID-19 a imposé l'utilisation de l'apprentissage en ligne. Le but de cette étude était d'évaluer l'expérience des étudiants en médecine vis-à-vis de la méthode d'apprentissage en ligne. **Méthodes.** Nous avons mené une étude transversale, en utilisant le questionnaire *Google-Forms*. **Résultats.** Sur un total de 303 participants, 75,2 % d'entre eux ont évalué l'expérience de ce type d'apprentissage comme bonne à excellente; plus de 46 % considèrent que l'apprentissage à distance peut être équivalent à l'apprentissage en face à face. **Conclusion.** L'expérience de l'apprentissage en ligne devrait nous motiver et nous encourager à améliorer nos compétences technologiques afin d'adopter une pédagogie moderne et pratique.



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Abstract

Introduction: The COVID-19 pandemic has forced the use of e-learning. The aim of this study was to assess medical students' experience with e-learning methods. **Methods:** We conducted a cross-sectional study, using a Google Forms questionnaire. **Results:** From a total of 303 participants, 75% of them rated the e-learning experience as good to excellent, and more than 46% considered that distance learning can be equivalent to face-to-face learning. **Conclusion:** The experience of e-learning should motivate and challenge us to improve our technological skills in order to adopt a modern and practical pedagogy.

Keywords

E-learning, distance learning, medical education, student satisfaction, COVID-19

Résumé

Introduction. La pandémie de COVID-19 a imposé l'utilisation de l'apprentissage en ligne. Le but de cette étude était d'évaluer l'expérience des étudiants en médecine vis-à-vis de la méthode d'apprentissage en ligne. **Méthodes.** Nous avons mené une étude transversale, en utilisant le

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questionnaire *Google-Forms*. **Résultats.** Sur un total de 303 participants, 75,2 % d'entre eux ont évalué l'expérience de ce type d'apprentissage comme bonne à excellente; plus de 46 % considèrent que l'apprentissage à distance peut être équivalent à l'apprentissage en face à face. **Conclusion.** L'expérience de l'apprentissage en ligne devrait nous motiver et nous encourager à améliorer nos compétences technologiques afin d'adopter une pédagogie moderne et pratique.

Mots-clés

Apprentissage en ligne, enseignement à distance, enseignement médical, satisfaction des étudiants, COVID-19

Introduction

According to a report by UNESCO, the COVID-19 pandemic has had a significant impact on education worldwide, affecting more than 1.5 billion students in over 190 countries due to the closure of institutions (Meinck et al., 2022). This situation has posed unprecedented challenges for governments and educational institutions, which have had to strive to continue with educational programs while ensuring the safety of students, teachers, and staff. Therefore, many schools and universities had to quickly implement online learning methods to ensure continuity of education (Gill et al., 2020; Hodges et al., 2020).

In many countries, the COVID-19 pandemic has forced educational institutions to turn to online courses as an alternative to in-person learning (Stojan et al., 2022). Morocco has not escaped this trend, with the government deciding to suspend classes in all schools and universities as part of the national system of epidemiological monitoring and tracking to limit the spread of the virus (Ouahmi, 2023). In response to this situation, teachers at the Faculty of Medicine in the northern region of Morocco have implemented various online learning methods to ensure the continuity of teaching.

E-learning is an educational approach where the learner is physically distant from the teacher. It is also known as online learning, distance learning, computer-assisted instruction, or Internet-based learning (Ruiz et al., 2006). The development of e-learning is linked to technological advancements, information and communication technology, and has gained increased importance during the COVID-19 pandemic (Hubackova, 2015).

Several studies have examined the impact of distance learning on medical education in different specialties, and have concluded that distance learning is perceived as having a positive effect on medical education (Letterie, 2003; Stojan et al., 2022). Several advantages have been identified, including flexibility, the possibility for students to take courses at their own pace, and the availability of online learning resources (Almoayad et al., 2020; Mahdy & Sayed, 2022; Thom et al., 2021). However, some challenges have also been identified, such as the difficulty of maintaining student engagement and motivation, the need to create an interactive, high-quality online learning environment, and the importance of effective evaluation of online learning (Arain et al., 2022; Thom et al., 2021).

In the current context of the COVID-19 pandemic, where e-learning was the norm in many countries (Stojan et al., 2022), it was crucial to understand how students perceive this sudden change and how it affects their learning experience. Our study specifically focuses on online learning among medical students, providing an in-depth insight into this specific population. Furthermore, our research takes place in the Moroccan context, which is particularly important

due to the cultural, organizational, and technological specificities inherent to each educational setting, influencing the perception and effectiveness of online learning. Given that e-learning culture is still new in our country, our study carries significant implications for action research, as the majority of institutions discovered this teaching method for the first time during the pandemic. Thus, our faculty seized this opportunity to implement online teaching techniques and concurrently launch this study to evaluate them.

By addressing this gap in the existing literature and considering the specific Moroccan context, our research contributes to improving online learning methods and practices among medical students. The data and findings from our study may also have broader value for other countries, as medical students' experiences in an online learning environment may be similar across various contexts. Teachers and policymakers from other countries can draw insights from our results to enhance their own online teaching practices. By sharing our results and conclusions with the international education community, we contribute to the exchange of best practices and innovative ideas, enriching the existing literature on online learning, particularly in the field of medical education. Combining findings from different studies conducted in different countries enables us to obtain a more comprehensive understanding of best practices and effective strategies in online teaching.

The purpose of this study is to assess medical students' experience with online learning by evaluating their satisfaction with each of the teaching methods considered by the teachers, identifying their difficulties, and incorporating their suggestions for future improvement.

Methods

We conducted a cross-sectional study during the COVID-19 pandemic lockdown based on a survey consisting of 49 questions divided into five sections covering the following topics:

- Socio-demographic data
- Assessment of students' attitudes
- Technological difficulties
- Non-technological difficulties (especially pedagogical)
- Suggestions for improving the quality of learning

The questionnaire was distributed to all students of the Medical School, namely first-, second-, third-, fourth- and fifth-year students, via email and social media groups (WhatsApp and Facebook) created by the student representatives for each level.

Questions were presented in different formats (multiple choice, check boxes, linear scales, and short answers).

Teaching methods used by the faculty:

- Video-recorded courses
- Videoconference courses
- Courses with Power Point presentations
- Communication with students via social media

Student participation in the study was entirely voluntary and confidential. From the beginning of the questionnaire, participants were informed that they were free to participate or not. They were also informed of the study's purpose by means of a clear question asked at the beginning of the questionnaire. By opting for this ethical approach, we sought to respect the participants' rights while collecting meaningful data for our research.

Collected data was entered and processed in Microsoft Excel 2016, and analyzed with SPSS version 21. Quantitative variables were described in terms of means with standard deviation and qualitative variables in percentages. Univariate analysis was performed using Pearson's chi-square test. *P* values of < 0.05 were considered statistically significant at the 95% confidence level.

Results

Socio-Demographic Data

The survey was distributed to 734 students. The overall response rate was 41.3%, with 303 students completing the entire survey. The response rates for the five levels of study were as follows: 67.5% for the first year, 32.1% for the second year, 21.6% for the third year, 34.3% for the fourth year, and 28.4% for the fifth year. The average age of the participants was 19.4 ± 1.6 years. First-year students (50.8%) and female students (sex ratio of 0.74) predominated. About 55% lived with their families and 82% had a personal study space. Among the respondents, 48.6% were originally from Tangier, while 51.4% resided outside of Tangier.

Table 1

Socio-demographic characteristics of students

Variable	Value	N	%
Age (mean \pm SD)	19.4 \pm 1.6	—	—
Gender	Female	174	57.4%
	Male	129	42.6%
Year of study	First year	154	50.8%
	Second year	61	20.1%
	Third year	25	8.3%
	Fourth year	36	11.9%
	Fifth year	27	8.9%
Accommodation	In a family	167	55.1%
	In a university residence	1	0.3%
	In a shared flat	87	28.7%
	Renting alone	18	15.8%
Personal study space	Yes	53	15.5 %
	No	250	82.5%

Assessment of Students' Attitudes

Most participants (97.0%) used social media and 49.8% browsed the Internet for between 2 and 4 hours per day. Of the 25.7% of respondents working in groups, only 35 students used social media to work in groups. Nearly half (44.2%) of the students followed the live course remotely, with 92 of them stayed connected to social media during the online course session.

Table 2*Assessment of students' attitudes*

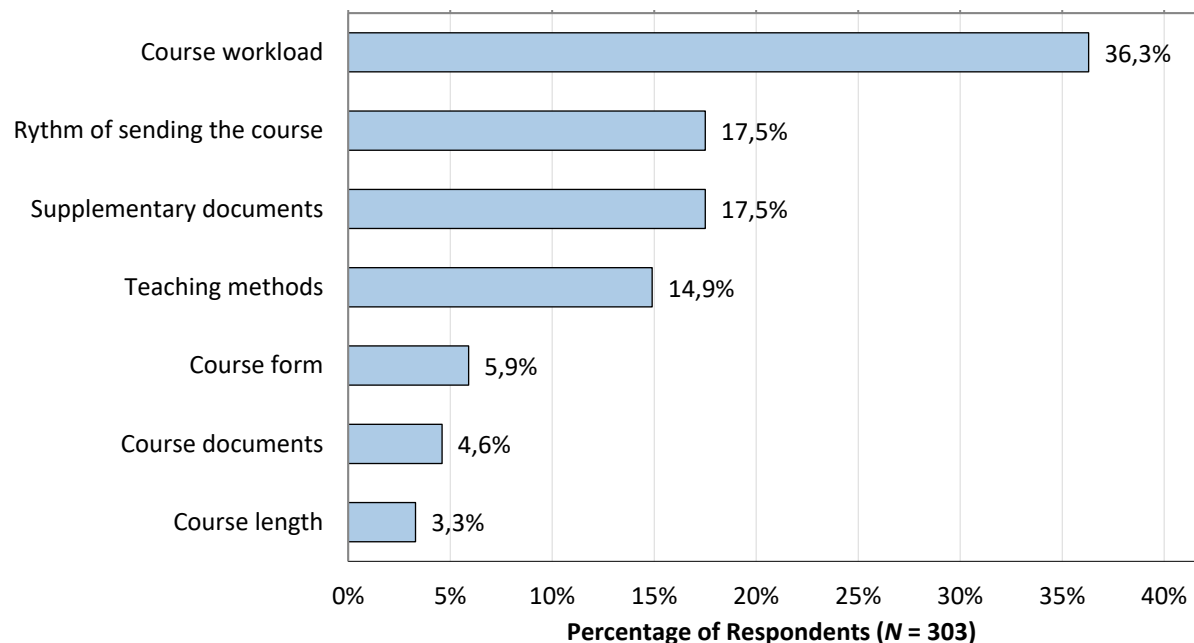
Variable	Value	N	%
Use of social media	Yes	9	3.0%
	No	294	97.0%
Average time spent on the Internet	At least one hour	13	4.3%
	2 to 4 hours	151	49.8%
	5 to 7 hours	100	33.0%
	8 hours or more	39	12.9%
Working in a group	Yes	225	74.3%
	No	78	25.7%
Taking a distance learning course	Offline	134	44.2%
	Live	169	55.8%

Regarding Internet access, almost all students (97.0%) have Internet access (optical fiber (19.7%), ADSL (62.0%), mobile Internet (18.3%).

The majority of students have a personal computer and a smartphone, except for one student who has no computer equipment.

Technological and Non-Technological Difficulties

Of the 303 students who participated in the study, 63.4% considered Internet network outages as the main technological difficulty encountered in this e-learning experience, while 36.3% of the students stated that the course workload was the main pedagogical difficulty. Indeed, 43.2% of the students rated the course workload as very important.

**Figure 1***Main pedagogical difficulty faced in this distance learning experience*

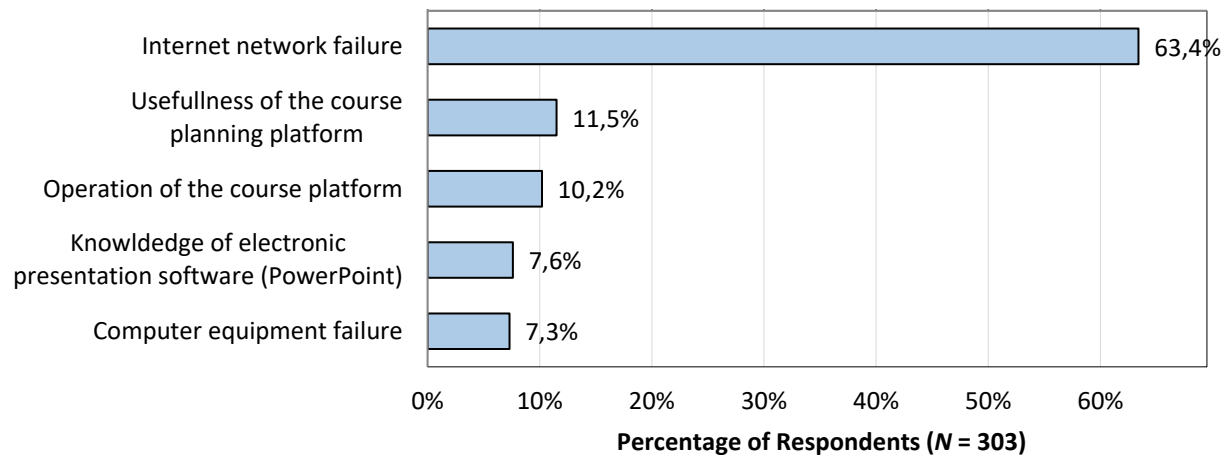


Figure 2
Main technological challenge

Satisfaction Rating

Overall, most students were satisfied with the level of teacher proficiency in the teaching methods used by the faculty, with the exception of the direct online interaction method, which has been mastered by only a minority of professors.

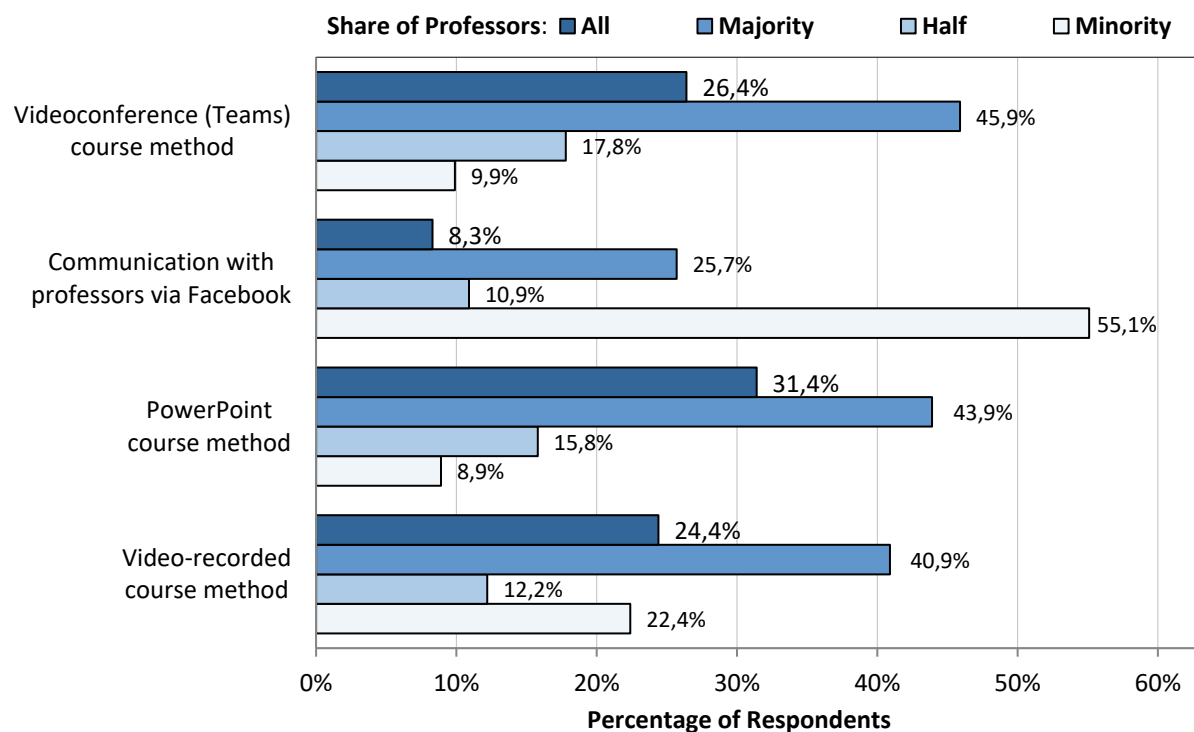


Figure 3
Students' Perception of Professors' Mastery in Teaching Methods

There was a statistically significant association between the students' perceived overall satisfaction with the e-learning experience and the following factors: the quality of the course material ($p < 0.001$), the attractiveness of the course format ($p < 0.001$), and the satisfaction with the four teaching methods addressed by the FMPT (different pedagogical approaches used) ($p < 0.001$).

Table 3

Relationship between overall learner satisfaction and the following factors: quality of learning materials, attractiveness of course format, satisfaction with the four learning methods

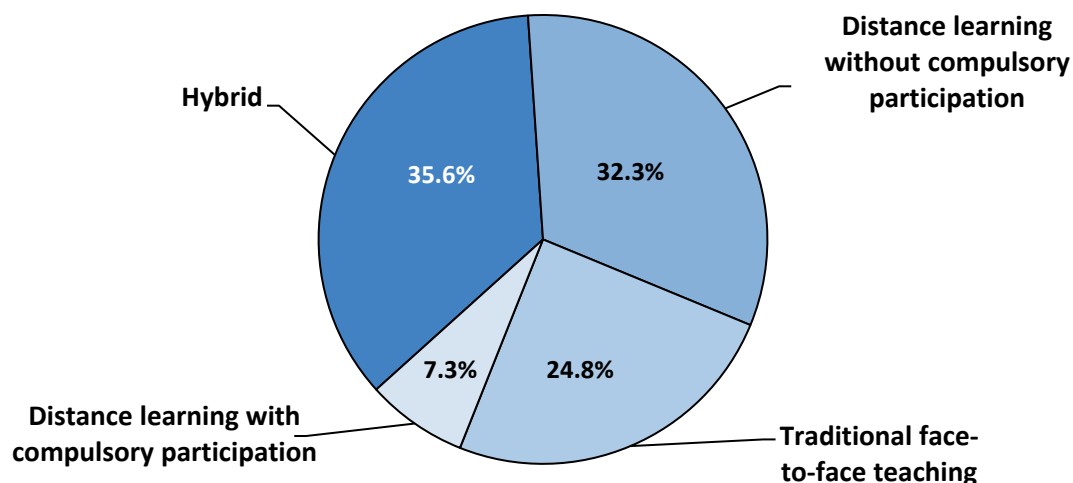
Factor	General satisfaction (<i>p</i> value)
Quality of learning materials	0.001
Attractiveness of course format	0.001
Satisfaction with video-recorded course method	0.001
Satisfaction with PowerPoint course method	0.004
Satisfaction with videoconference course method (Teams)	0.001
Satisfaction with communication with professors via Facebook	0.001

The video-recorded courses were rated as good by 55.1% of the students, and fairly good by 37.3%; 23 participants rated them as poor. Moreover, 77.5% of the students preferred more than one teaching method for each course.

In terms of overall satisfaction, 75.2% of students rated the e-learning experience as good to excellent and 24.2% rated it as average.

Blended learning was chosen by the majority of students (35.6%), followed by distance learning without compulsory participation (32.3%). For 46.5% of the participants, distance learning can be considered as equivalent to face-to-face learning.

Students who preferred distance learning consider it to be more flexible, suitable for all learning speeds, and more convenient (52.1%). Students who preferred face-to-face learning consider the lack of direct communication between students, the lack of interaction and an unsuitable home environment to be the main disadvantages of distance learning.

**Figure 4**

The preferred mode of learning for students

Suggestions for Improving the Quality of Learning

We list in ascending order the video teaching methods suggested by the students, from the most to least preferred by the students:

Pen Tablet: 40.6% (The professor uses an interactive pen tablet to direct the progress of the presentation, with the ability to mark directly on the slides).

Traditional Classroom: 32% (The professor stands by a screen displaying the slides with a board for further explanation).

Talking Head: 31.7% (The professor's camera feed is inserted into the bottom corner of the screen displaying the presentation, and the professor can mark the slides using a pen tablet).

Weatherman: 26.7% (The professor is in front of a green screen and the slides scroll in the background).

Learning Glass: 22.1% (The professor reproduces the course presentation directly on the Learning Glass lightboard).

Interview: 6.6% (Traditional classroom with some students present).

Towards the end of the questionnaire, students were required to answer a free question to express their own suggestions for possible future improvement of the level of learning. The main ideas that the students liked are listed below:

- Creation of a specific platform for the Faculty of Medicine and Pharmacy, independent from the university site.
- Creation of a Moodle platform (10-minute video-recorded sequences with compulsory quizzes to get from one sequence to another).
- YouTube channel for medical courses with private access for medical students.
- Medical School forum for discussions among students.

When it comes to organizing the courses organization, some students want to be involved in the choice of method for each subject, and suggest that the professors prepare courses together based on a logical plan in order to facilitate the students' learning. In the same context, they suggest sending the material out before the course session.

Other students suggested equipping lecture theatres with cameras to broadcast online courses for those who wish to pursue distance learning and to create a virtual library (courses and exams from previous years). They also suggested training professors and students in the use of the various distance learning devices and insisted on adequate Internet access for teachers.

Discussion

The objective of this study was to assess the experience of medical students with online learning during the COVID-19 pandemic, which forced professors to quickly adapt to new ways of teaching online. The Moroccan Ministry of Higher Education, Research and Innovation issued a circular mandating the use of distance learning, but many teachers were not adequately prepared for this shift and used various methods based on their own skills and preferences. This presented an opportunity for evaluation and improvement, and the study examines the evaluation process of these methods, the satisfaction of students with the methods used, their opinions about the professors' level of proficiency with technical tools, the challenges encountered during this experience, and their general perceptions regarding future improvement.

The interest of this evaluation is even more relevant in view of the particularity of medical studies. In fact, medical education involves hospital training, but this was affected by the pandemic.

Hospital training was removed from the medical curriculum on the one hand because medical students were seen as vectors of the disease (Ahmed et al., 2020), and on the other, because it was decided not to expose them to excessive risk (Edigin et al., 2020). Thus, during the lockdown the teaching staff must also take this practical component into consideration.

However, the transition to online learning for medical students does not appear to be any less beneficial. In fact, a study summarizing the effect of online learning on medical education found that both methods were similar in terms of effectiveness (Cook et al., 2008). Another meta-analysis also showed that online learning is not less effective than traditional methods (McCutcheon et al., 2015). This systematic review was based on empirical studies and student opinions. In our context, regarding the effectiveness of online learning, we relied on student opinions, and found that 46.5% of students reported that distance learning can be considered equivalent to face-to-face learning and rated the distance learning experience as good. Furthermore, other studies evaluating the perceptions of medical students and teachers towards online learning generally reveal a positive perception of online learning (Arain et al., 2022; Bączek et al., 2021; Bashier et al., 2020).

The majority of our students preferred blended learning (36.5% compared to 32.34% for distance learning without mandatory participation, 24.75% for face-to-face learning and 7.26% for distance learning with mandatory participation), and it should be noted that articles comparing blended learning and online-only learning have reported a statistically significant difference, with blended learning being more efficient and effective (Bauer et al., 2001; Kaveevivitchai et al., 2009; McCutcheon et al., 2015).

A study evaluating the effectiveness of online learning found that this effectiveness was significantly related to the quality of course materials and their attractiveness to students (Tseng et al., 2011). Our results show a statistical association between students' overall perceived satisfaction with online learning and the following factors: appreciation of the course material, attractiveness of the course format and satisfaction with the four teaching methods covered in this e-learning experience (video-recorded courses; videoconference courses; courses with using PowerPoint presentations; communication with students via social media). This was very similar to the results of the previous study conducted by the FMPT evaluating the strategy for managing the various challenges in medical education during the COVID-19 pandemic. Indeed, their statistical analysis revealed a statistically significant association between students' perceived overall satisfaction with e-learning and students' study levels, as well as the type, content and quality of learning materials (El Bahloul et al., 2020). In the same context, a study assessing medical students' engagement in distance learning found that low overall satisfaction with the distance learning experience was significantly associated with lower study engagement rates (Hjiej et al., 2022). His findings provide recommendations for teachers about developing high-quality instructional materials and using methods that could increase attractiveness to learners.

In our study, participants expressed their overall satisfaction with the level of teacher competence regarding the proposed teaching methods, except for the direct online interaction method. Teachers have trouble mastering this method, and their low interaction with students on social media may be due to resistance from an older generation of teachers who are not as flexible as the younger generation in terms of social media use. Therefore, it is crucial to provide adequate training for teachers to better understand online learning tools and adapt them to online learning requirements (Alladatin et al., 2020; Arain et al., 2022). Students also suggested that teachers should be trained in better use of technology and the creation of more developed online educational resources.

To address these issues, we suggest the creation of a learning management system that includes a forum or online video and social media sharing platform. Additionally, all educational institutions must improve the technological skills of their teachers and students in order to effectively manage any interruption to education continuity in the event of a health emergency or disaster (Zayapragassarazan, 2020). Furthermore, successful online learning depends on teachers who are competent in technology (Ruiz et al., 2006). Major obstacles to effective online learning include inadequate technology, improper use of technological equipment, and lack of teacher skills (Alladatin et al., 2020; Childs et al., 2005; Mastafi et al., 2018).

Although students appreciated the distance learning experience, they reported a number of difficulties, the most prevalent in our study being Internet network outages (63.37%), which conforms with the literature (Adnan & Anwar, 2020; Benaldjia et al., 2021). This difficulty can be explained by the problem of the digital divide in the Middle East and North Africa (MENA) region, as measured by several determinants such as the Internet access rate and broadband penetration (Aissaoui & Ben Hassen, 2016). These are responsible for unequal access to training and, most notably, difficulties in online education. Other issues needing improvement, according to the students, are interaction with professors, as well as the possibility of communication between students in virtual classrooms, which are also strongly emphasized in the literature (Adnan & Anwar, 2020; Attarabeen et al., 2021; Goh & Sandars, 2020). Therefore, the authors consider that it is necessary to create innovative pedagogical devices to facilitate discussion between professors and students, making the course interactive and allowing them to think together about the solutions of the exercises (Goh & Sandars, 2020; Stojan et al., 2022; Zayapragassarazan, 2020). Also, in our study the students suggest the creation of a learning management system platform that contains 10-minute recorded video sequences with mandatory assessment quizzes to move from one sequence to another, with a discussion forum between the professor and the students for each sequence.

Among the interests of this study is the improvement of educational programs for better continuing education in the future. Indeed in the context of the requirement for health personnel to be on the cutting edge of science, which requires continuous training, a study dictates that educational programs must evolve to meet the demands of health professionals (Narang et al., 2018). Therefore, according to the authors of this article, learning with conventional methods has become difficult and have proposed three new didactic means to adapt with the working conditions of physicians namely: Personalized learning, adaptive learning and flipped classroom (Narang et al., 2018). For this reason, it is important to prepare medical students and teachers to be able to adapt to the evolution of information technology, which offers the possibility of changing the nature of continuing education and requires more flexible modern learning methods (Harden, 2005; Marchand, 2002).

Strengths and Limitations of the Study

Our study is one of the few to shed light on online learning in medical education and allow students to have a say in improving conditions in their faculty in the future.

However, this is an observational study based on voluntary participation and our results are derived from student opinions, that is, we did not use objective methods to support our results.

The Implications

The implications of our study are significant for medical education. Firstly, the results of our study could allow medical program administrators to gain a better understanding of the learning needs

of students in online settings, thereby improving the quality of teaching. By identifying areas where students struggle with online learning, educators can adapt their teaching methods to address these challenges.

Secondly, the study results could be used to develop more effective teaching strategies for medical students based on their specific needs. By tailoring teaching strategies to individual learning styles, educators can help students achieve better outcomes.

Finally, our study highlights the potential of online learning to improve access to medical education, particularly for students who face personal or professional constraints that prevent them from attending in-person classes on campus. Although our survey was conducted in the context of the transition to online learning due to the pandemic, the results are of great importance to disseminate because our country's new strategy aims to train an increasing number of health care professionals from various regions. Thus, online learning has become a necessity to support students who cannot participate in face-to-face classes for various reasons. For example, in our study, we found that 51% of students are not from Tangier, indicating the diversity of our student population.

It is worth noting that online learning is not limited to a single approach. The challenges and benefits of different formats of online learning discussed in our study, which was conducted within our faculty, help identify approaches that are suitable for specific contexts. By recognizing students' varied needs and circumstances, we can adapt online learning methods to optimize their effectiveness and ensure fruitful results.

Conclusion

Medical School students were satisfied with the experience and judged their preference for e-learning primarily by its flexibility. However, there are still some challenges, including Internet outages. Those who did not choose distance learning justified their choice by the lack of direct communication and interactivity between faculty and students.

The current conditions make the implementation of technology in teaching indispensable to ensure pedagogical continuity in all situations. Furthermore, the students suggested that teachers should receive skills upgrading to make better use of modern teaching materials, and that new, modern teaching resources specific to the Medical School should be created. Obviously, further studies are needed to improve the use of e-learning in the training of medical students, taking into account both the level of study and the discipline to be taught, since each situation has its own particularities and requirements.

Conflict of Interest

We have no conflicts of interest regarding this work.

References

- Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students' perspectives. *Journal of Pedagogical Sociology and Psychology*, 2(1), 45-51. <https://doi.org/10.33902/JPSP.2020261309>
- Ahmed, H., Allaf, M., & Elghazaly, H. (2020). COVID-19 and medical education. *The Lancet Infectious Diseases*, 20(7), 777-778. [https://doi.org/10.1016/S1473-3099\(20\)30226-7](https://doi.org/10.1016/S1473-3099(20)30226-7)

- Aissaoui, N., & Ben Hassen, L. (2016). Diffusion technologique et inégalités numériques: Une exploration de la fracture numérique dans l'espace MENA. *Statéco*, (110), 105-121. <http://insee.fr/...>
- Alladatin, J., Gnanguenon, A., Borori, A., & Fonton, A. (2020). Pratiques d'enseignement à distance pour la continuité pédagogique dans les universités béninoises en contexte de pandémie de COVID-19: les points de vue des étudiants de l'Université de Parakou. *Revue internationale des technologies en pédagogie universitaire*, 17(3), 163-177. <https://doi.org/10.18162/ritpu-2020-v17n3-16>
- Almoayad, F., Almuwais, A., Alqabbani, S. F., & Benajiba, N. (2020). Health professional students' perceptions and experiences of remote learning during the COVID-19 pandemic. *International Journal of Learning, Teaching and Educational Research*, 19(8), 313-329. <https://doi.org/10.26803/ijlter.19.8.17>
- Araïn, S. A., Ali, M., Arbili, L., Ikram, M. F., Kashir, J., Omair, A., & Meo, S. A. (2022). Medical students and faculty perceptions about online learning during COVID-19 pandemic: Alfaisal University experience. *Frontiers in Public Health*, 10. <https://doi.org/10.3389/fpubh.2022.880835>
- Attarabeen, O. F., Gresham-Dolby, C., & Broedel-Zaugg, K. (2021). Pharmacy student stress with transition to online education during the COVID-19 pandemic. *Currents in Pharmacy Teaching and Learning*, 13(8), 928-934. <https://doi.org/10.1016/j.cptl.2021.06.011>
- Bączek, M., Zagańczyk-Bączek, M., Szpringer, M., Jaroszyński, A., & Woźakowska-Kapłon, B. (2021). Students' perception of online learning during the COVID-19 pandemic. *Medicine*, 100(7), e24821. <https://doi.org/10.1097/MD.00000000000024821>
- Bashier, L., Sail, N., Elmossad, Y., & Waggiallah, H. (2020). Students' perception on E. learning and remote exams during COVID 19 outbreak 2020. *International Journal of Pharmaceutical and Phytopharmacological Research*, 10(5), 142-148. <http://eijppr.com/...>
- Bauer, M., Geront, M., & Huynh, M. (2001). Teaching blood pressure measurement: CD-ROM versus conventional classroom instruction. *Journal of Nursing Education*, 40(3), 138-141. <https://doi.org/10.3928/0148-4834-20010301-10>
- Benaldjia H., Bouhidel J. O., & Guedjati M. R. (2021). Enseignement médical à distance au temps de la pandémie COVID-19 à la faculté de médecine de l'Université Batna 2 en Algérie. *Algerian Journal of Health Sciences*, 3(2), 43-51. <http://ajhs.atrss.dz/...>
- Childs, S., Blenkinsopp, E., Hall, A., & Walton, G. (2005). Effective e-learning for health professionals and students – Barriers and their solutions. A systematic review of the literature – Findings from the HeXL project. *Health Information & Libraries Journal*, 22(s2), 20-32. <https://doi.org/10.1111/j.1470-3327.2005.00614.x>
- Cook, D. A., Levinson, A. J., Garside, S., Dupras, D. M., Erwin, P. J., & Montori, V. M. (2008). Internet-based learning in the health professions: A meta-analysis. *JAMA*, 300(10), 1181-1196. <https://doi.org/10.1001/jama.300.10.1181>

- Edigin, E., Eseaton, P. O., Shaka, H., Ojemolon, P. E., Asemota, I. R., & Akuna, E. (2020). Impact of COVID-19 pandemic on medical postgraduate training in the United States. *Medical Education Online*, 25(1), Article 1774318. <https://doi.org/10.1080/10872981.2020.1774318>
- El Bahloul, M., Belafki, H., A.Najdi, Madani, M., & Ahlat, M. (2020). Assessment of medical education in the time of Covid 19: Experience of Tangier Medical School in Morocco. *Journal of Medical and Surgical Research*, 7(2), 844-849. <https://doi.org/10.46327/msrjg.1.000000000000180>
- Gill, D., Whitehead, C., & Wondimagegn, D. (2020). Challenges to medical education at a time of physical distancing. *Lancet*, 396(10244), 77-79. [https://doi.org/10.1016/S0140-6736\(20\)31368-4](https://doi.org/10.1016/S0140-6736(20)31368-4)
- Goh, P.-S., & Sandars, J. (2020). A vision of the use of technology in medical education after the COVID-19 pandemic [version 1]. *MedEdPublish*, 9. <https://doi.org/10.15694/mep.2020.000049.1>
- Harden, R. M. (2005). A new vision for distance learning and continuing medical education. *Journal of Continuing Education in the Health Professions*, 25(1), 43-51. <https://doi.org/10.1002/chp.8>
- Hjiej, G., Idrissi, F. E. E., Janfi, T., Bouhabs, M., Hnaifi, H., Belakbyer, H., Gabri, M., Touissi, Y., Hajjioui, A., Bentata, Y., Abda, N., & Fourtassi, M. (2022). Distant education in Moroccan medical schools following COVID-19 outbreak at the early phase of lockdown: Were the students really engaged? *Scientific African*, 15, Article e01087. <https://doi.org/10.1016/j.sciaf.2021.e01087>
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020, March 27). The difference between emergency remote teaching and online learning. *EDUCAUSE Review*. <http://er.educause.edu/...>
- Hubackova, S. (2015). History and perspectives of elearning. *Procedia – Social and Behavioral Sciences*, 191, 1187-1190. <https://doi.org/10.1016/j.sbspro.2015.04.594>
- Kaveevivitchai, C., Chuengkriankrai, B., Luecha, Y., Thanooruk, R., Panijpan, B., & Ruenwongsa, P. (2009). Enhancing nursing students' skills in vital signs assessment by using multimedia computer-assisted learning with integrated content of anatomy and physiology. *Nurse Education Today*, 29(1), 65-72. <https://doi.org/10.1016/j.nedt.2008.06.010>
- Letterie, G. S. (2003). Medical education as a science: The quality of evidence for computer-assisted instruction. *American Journal of Obstetrics and Gynecology*, 188(3), 849-853. <https://doi.org/10.1067/mob.2003.168>
- Mahdy, M. A. A., & Sayed, R. K. A. (2022). Evaluation of the online learning of veterinary anatomy education during the Covid-19 pandemic lockdown in Egypt: Students' perceptions. *Anatomical Sciences Education*, 15(1), 67-82. <https://doi.org/10.1002/ase.2149>
- Marchand, L. (2002). Pour une éducation médicale avec apprentissage en ligne. *Pédagogie Médicale*, 3(3), 180-187. <https://doi.org/10.1051/pmed:2002029>

- Mastafi, M., Mabrou, A., & Balle, F. (2018). Intégration des TIC dans l'enseignement : quels déterminants de résistance au changement chez les enseignants? *Revue scientifique internationale de l'éducation et de la formation*, 3(6), 13-23.
<https://hal-amu.archives-ouvertes.fr/hal-02048881>
- McCutcheon, K., Lohan, M., Traynor, M., & Martin, D. (2015). A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education. *Journal of Advanced Nursing*, 71(2), 255-270.
<https://doi.org/10.1111/jan.12509>
- Meinck, S., Fraillon, J., & Strietholt, R. (Eds). (2022). *The impact of the COVID-19 pandemic on education: International evidence from the Responses to Educational Disruption Survey (REDS)*. UNESCO. <http://unesdoc.unesco.org/...>
- Narang, A., Velagapudi, P., Rajagopalan, B., LeBude, B., Kithcart, A. P., Snipelisky, D., & Sinha, S. S. (2018). A new educational framework to improve lifelong learning for cardiologists. *Journal of the American College of Cardiology*, 71(4), 454-462.
<https://doi.org/10.1016/j.jacc.2017.11.045>
- Ouahmi, F. (2023). Communication publique de crise à l'épreuve de la pandémie « COVID 19 » : cas du Département marocain de l'Éducation nationale. *Journal of Performance Management*, 2(1), 43-64.
<https://doi.org/10.34874/IMIST.PRSM/jpm-v2i1.39543>
- Ruiz, J. G., Mintzer, M. J., & Leipzig, R. M. (2006). The impact of E-learning in medical education. *Academic Medicine*, 81(3), 207-212.
<https://doi.org/10.1097/00001888-200603000-00002>
- Stojan, J., Haas, M., Thammasitboon, S., Lander, L., Evans, S., Pawlik, C., Pawilkowska, T., Lew, M., Khamees, D., Peterson, W., Hider, A., Grafton-Clarke, C., Uraiby, H., Gordon, M., & Daniel, M. (2022). Online learning developments in undergraduate medical education in response to the COVID-19 pandemic: A BEME systematic review: BEME Guide No. 69. *Medical Teacher*, 44(2), 109-129.
<https://doi.org/10.1080/0142159X.2021.1992373>
- Thom, M. L., Kimble, B. A., Qua, K., & Wish-Baratz, S. (2021). Is remote near-peer anatomy teaching an effective teaching strategy? Lessons learned from the transition to online learning during the Covid-19 pandemic. *Anatomical Sciences Education*, 14(5), 552-561.
<https://doi.org/10.1002/ase.2122>
- Tseng, M., Lin, R., & Chen, H. (2011). Evaluating the effectiveness of e-learning system in uncertainty. *Industrial Management & Data Systems*, 111(6), 869-889.
<https://doi.org/10.1108/02635571111144955>
- Zayapragassarazan, Z. (2020). COVID-19: Strategies for online engagement of remote learners [version 1; not peer-reviewed]. *F1000Research*, 9, Article 246.
<https://doi.org/10.7490/f1000research.1117835.1>