Hindawi
Education Research International
Volume 2021, Article ID 5547821, 9 pages
https://doi.org/10.1155/2021/5547821

Research Article

Implementation of Online Teaching in Medical Education: Lessons Learned from Students' Perspectives during the Health Crisis in Marrakesh, Morocco

Majda Sebbani[1,2], **Latifa Adarmouch**[1,2], **Adil Mansouri**[1,2], **Ouassim Mansoury**[1,2], **Sarah Michaud**[1,2], **Ahmed Rhassane ElAdib**[3], **Mohamed Bouskraoui**[4] and **Mohamed Amine**[1,2]

[1]*Community Medicine and Public Health Department, Research Laboratory, Biosciences and Health, School of Medicine, Cadi Ayyad University, Marrakech, Morocco*
[2]*Clinical Research Unit, Mohammed VI University Hospital, Marrakech, Morocco*
[3]*Simulation and Innovation in Health Sciences Center, Anesthesia and Critical Care in Gynecology-Obstetrics Department, School of Medicine, Cadi Ayyad University, Marrakech, Morocco*
[4]*School of Medicine, Cadi Ayyad University, Marrakech, Morocco*

Correspondence should be addressed to Majda Sebbani; dr.sebbani@gmail.com

Received 4 February 2021; Revised 7 March 2021; Accepted 27 March 2021; Published 16 April 2021

Academic Editor: Harco Leslie Hendric Spits Warnars

Background. On the announcement of the COVID-19 health emergency, the Marrakesh School of Medicine accelerated the digitization and the establishment of courses available to students through the faculty platform. We aimed to describe the students' perspectives toward the online educational approach implemented during the COVID-19 pandemic and to investigate the factors that might affect the implementation of online teaching in the future. *Methods*. This was a cross-sectional study among medical students in Marrakesh during June-July 2020. Data collection was based on a self-administered electronic questionnaire distributed via the student platform. We studied the knowledge and previous practices of virtual technologies and students' appreciation of distance learning during the lockdown. Univariate and multivariate analyses were performed using SPSS16.0 software. *Results*. A total of 111 students participated. The female-to-male sex ratio was 2.2 with an average age of 20.6 ± 1.8. The majority of students felt that they had a good knowledge of virtual technologies (on a scale of 1 to 10, 81% ≥ 5/10), and two-thirds reported using them in medical studies. Before the COVID-19 lockdown, 16.2% of the students used the platform and 39.6% did not attend in-person courses (16.0% in 1st cycle versus 49.2% in 2nd cycle, $p = 0.01$). During the pandemic, 79% of the students appreciated the virtual learning (54.0% in 1st cycle versus 89.0% in 2nd cycle, $p < 0.001$) and 80.2% thought that the online courses were understandable. Regarding to student's preferences, 41.4% preferred blended education and 68.5% of the students would recommend continuing distance learning after the pandemic. Regarding satisfaction, previous use of the educational platform (OR = 66.3, CI 95% [1.9; $2.2*10^3$]), improvement of learning during distance learning (OR = 22.6, IC 95% [4.1, 123.7]), and professor support (OR = 7, IC95% [1.3, 38]) seemed to be the most powerful factors in the multivariate analysis. *Conclusion*. Our results will contribute to the implementation of actions by taking advantage of the experience during the health crisis. The institutionalization of virtual learning with more interaction in addition to the in-person courses is the main recommendation of this study.

1. Introduction

With the advent of the COVID-19 pandemic with the new coronavirus, the Faculty of Medicine and Pharmacy of Marrakesh (FMPM) was called upon, like all training institutions, to quickly adapt to the circumstances imposed by the epidemic in Morocco following the ministerial decision to suspend, until further order, the classes in all schools and

universities from Monday March 16, 2020 [1, 2]. In order to ensure the continuity of education and in accordance with the directives of the Ministry of Higher Education, the FMPM has accelerated the digitization, recording, and the establishment of courses available to students through the educational platform (Theia) of the faculty. This platform was adopted at the institution level for distance education before the pandemic. However it was until then underused. The orientation of the FMPM was having a smooth transition to active pedagogy to anchor a learning paradigm through several pedagogical innovation projects such as the competency-based approach, the flipped classroom, tutoring, or simulation. Before this period, distance learning—defined as "using computer technology to deliver training, including technology-supported learning either online, offline, or both" [3]—was not considered in Moroccan universities as a modality for education. The literature suggests that this is effective, and in some contexts, more effective than in-person learning [4]. While this health crisis presents major challenges for medical education, it also gives an opportunity for innovation for countries still in the phase of exploring these solutions [5]. Other countries that encountered health crises in the past have experienced a disruption in medical education that requires learning lessons and anticipating public health crises [6]. During the COVID-19 pandemic, the lack of visibility on the evolution of this epidemic means that we now have to draw on online solutions in Moroccan medical education. Innovations in e-learning technologies indicate a revolution in education, making it possible to individualize learning (adaptive learning), improve learner' interactions with others (collaborative learning), and transform the role of the teacher [4].

Indeed, these innovative solutions in health science education are a necessity nowadays in the digital age and in the face of a new generation of hyper-connected "Y" students known as the millennial generation which refers to individuals born between 1982 and 2005 [7]. Generation Y does not highly value reading and listening to lectures as it has been traditionally in medical education. They want their education to be creative, interactive, and fun with technology [8]. Medical educators need to stay abreast of new technologies and incorporate them into teaching during and after the pandemic. So better preparation of our teaching teams, our students, and the system stands out as an essential alternative during and posterior to the pandemic. The literature suggests that key barriers which affect the development and implementation of online learning in medical education include time constraints, poor technical skills, inadequate infrastructure, absence of institutional strategies and support, and negative attitudes [9].

The description of the current approach of the experience from the user's point of view will therefore make it possible to improve it and to draw from it extremely constructive lessons for the life after the pandemic. The entire teaching team—the majority of the double-hatted persons are teachers and doctors—has been put to the test during this health crisis because they are called upon to manage the health and educational challenge of COVID-19.

An assessment of student satisfaction with the system deployed (courses, questionnaires, forums, etc.) in achieving learning objectives is also useful and must be understood in order to highlight the achievements and gaps and target possible levers of action.

This study aimed to explore the situation of distance institutional e-learning among medical students during the pandemic and to identify possible challenges, limitations, and satisfaction as well as perspectives for this approach of learning and to investigate the factors that might affect students' preference for virtual learning in the future. Through an action research project at the FMPM, we aim to develop practical recommendations to promote institutional projects in educational innovation in our faculty.

2. Methods

We carried out a cross-sectional observational study based on the experience of the Faculty of Medicine and Pharmacy of Marrakesh following the declaration of the COVID-19 pandemic in Morocco in March 2020. The period of the study was the end of the academic year 2019–2020 (months of June and July 2020). All students in grades 1 through 5 were included in an online self-administered survey. Students enrolled in the 6th or 7th year have been excluded due to the absence of a course schedule for these students under normal circumstances. The questionnaire was distributed via the FMPM educational platform inviting students to participate on a voluntary and anonymous basis.

The data collected included (1) age, sex, and year of study; (2) knowledge and practices of Information and Communication Technology in education (ICT) and outside training for personal use; (3) overall assessment of teaching remotely during the lockdown; (4) any difficulties experienced; and (5) suggestions for improvement through an open-ended question to the participants. The questions were open-ended, single or multiple choice, and we had evaluation questions on a scale of 0 to 10. The data were extracted by Excel and then analyzed by SPSS version 16 fr. Statistical analyzes were descriptive, univariate and multivariate. Qualitative variables were presented by numbers (n) and percentages (%), and quantitative variables by means (m) and standard deviations SD ($\pm$). The answers to the open-ended questions were analyzed separately according to a content analysis guide then regarding the quantitative results.

The comparison of responses between year of study was made between the 1st cycle (students enrolled in 1st or 2nd year of medicine) and the 2nd cycle (students in 3rd or 4th or 5th year). Fisher's exact test compared two proportions of two independent samples. The comparison of means used the Student's t-test. The study of the factors associated with the satisfaction was carried out in two stages: (1) in univariate analysis by the Fisher Exact test, Khi square test, and Student's t-test and (2) in multivariate analysis utilizing a binary logistic regression to estimate the impact of the explanatory variables (gender, student's

year of study, previous use of virtual tools for medical studies, having followed in-person courses before, previous use of the educational platform, having a laptop or computer to follow the courses, access quality Internet, understanding and assimilation of courses, interactivity of courses, improvement of learning, technical difficulties encountered, support in learning by the faculty/teachers) on the students' satisfaction for distance learning during the COVID-19 outbreak. The Forward Stepwise method was used with 5% entry and 20% exit thresholds. The Hosmer and Lemshow test made it possible to test the final model retained after adjustment for the different significant factors in a multivariate analysis. The significance level for all statistical analyzes was 5%.

Ethically, confidentiality and anonymity were respected during data collection and analysis. Participation was voluntary. Participants were previously given an information note on the purpose of the study and the possibility of refusing to participate without any consequences or harm. This study was safe for the participants, and its results may lead to the improvement and promotion of active and digital pedagogy.

3. Results

3.1. Students' Description. A total of 111 students responded to the questionnaire. The average age was 20.6 ± 1.8 years and the female/male sex ratio was 2.2. More than half were enrolled in the 2nd cycle (3rd to 5th year of initial medical studies), and one-third resided outside the city of Marrakech during the survey (Table 1).

3.2. The Students' Use of the Virtual Technologies. During the lockdown, 82% had a computer for distance learning (DL) and 74% had a good Internet connection to attend classes. Participants had a good knowledge of information and communication technology (ICT) with a score $\geq 5/10$ (median 7) in 82% with very frequent use in 91%. 66% responses reported their current use for medical studies (researching information, preparing or reviewing courses) (Figure 1). The proportions of ICT use were similar whether they were used for or outside medical studies for the two cycles of study. However, the utilization of the teaching platform was more reported by the 2nd-cycle students (77.8% versus 22.2, $p = 0.029$).

3.3. Students' Perceptions and Satisfaction toward the Virtual Learning. For 79.3% of the students, it was the first experience in virtual learning. During the lockdown, 79% of the students appreciated the DL (54.0% in 1st cycle against 89.0% in 2nd cycle, $p < 0.001$). They followed more than half of the courses provided via the platform in two-thirds of the responses. They were satisfied with the online education. The notable difference between the two cycles concerns the follow-up of the courses, the satisfaction, and the comprehension of the lectures which were higher among the students of the 2nd cycle (Table 2). Of those surveyed, 83% experienced difficulties with distance learning (Table 3).

3.4. Factors Associated with the Students Satisfaction

3.4.1. Bivariate Analysis. Satisfaction with distance learning was significantly different between the 2 education cycles, and between men and women. Factors associated with higher satisfaction were the previous use of ICT for medical studies, the availability of technological means during lockdown, the absence of technical difficulties, the feeling of improvement in learning, and the presence of support and when the interactivity considered important. It was inversely associated with the in-person follow-up of previous courses (Table 4).

3.4.2. In Multivariate Analysis. In multivariate analysis, previous use of the educational platform (OR = 66.3), improved assimilation during distance learning (OR = 22.6), and being supported by teachers (OR = 7) seemed to be the most powerful factors in the model compared to the other studied factors (Table 5).

3.5. Students' Preferences and Recommendations for Virtual Leaning after the Pandemic. A total of 41.4% of students responded that they prefer the hybrid form (26.1 were for the face-to-face form and 29% for online only) and 68.7% of the students recommended continuing DL after the pandemic. By analyzing the verbatim according to an analysis grid, the results were as follows.

3.5.1. Distance Learning: A New Education That Has Won over Medical Students. The medical students rated their experience positively during the health crisis as most of them perceived an improvement in their learning. In particular, they highlighted ease of access to courses and the advantages in terms of saving money and energy. Also, they saw their psychosocial health improved: reduction of stress and fatigue and increase in free time. The DL also made it possible to follow quality lessons in a more comfortable way (less arduousness, less stressors) by being more concentrated.

"Before lockdown, I had a problem with the time to attend class so a little fatigue after the clinical training, so less concentration. But with distance education, we attend our course with a relaxed head at home and much more concentrated."

In addition, interactions were greatly favored, especially for students who had difficulty asking questions in lecture halls. We can therefore say that self-study has represented a source of autonomy appreciated by students in view of the many advantages it provides them.

"There is much more interactivity, the teachers are more available than in lecture halls, and for those who have difficulty speaking in lecture halls they were lucky enough to be able to participate in writing during the discussion. There is the possibility of reviewing the recorded session, and having an online course saves us time compared to the commute to the faculty."

Table 1: Participants' sociodemographic characteristics.

Variables		Participants ($N = 111$)	
		Number (n)	Percentage (%)
Gender	Male	35	31.5
	Female	76	68.5
Age (in years)	≤22	94	84.7
	[22–25]	17	15.3
Year of the medial study	1st	24	21.6
	2d	26	23.4
	3d	12	10.8
	4th	26	23.4
	5th	23	20.7
Cycle of the medical study	First	50	45.0
	Second	61	55.0
Nationality	Moroccan	105	94.6
	Foreigner	06	05.4
Residency during the COVID-19 lockdown	Marrakesh	76	68.5
	Outside Marrakesh	35	31.5

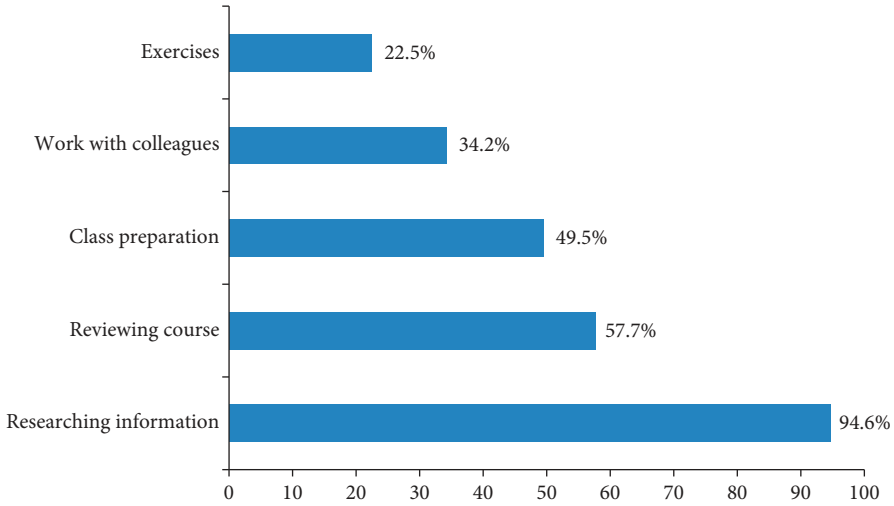

Figure 1: Description of the students' use of the virtual technologies during their medical studies.

3.5.2. Distance Learning: A Challenge for Other Students. A minority of the students surveyed did not appreciate distance learning. According to them, socioeconomic and environmental inequalities represent a brake on DL since not all students have the material means or adequate living conditions that are required for e-learning sessions to go well.

"This type of education is not good for all students, especially for those students who are poor and who cannot always have Internet connection in addition to housing in geographic areas where there is little network. . ..."

Also, the lack of interaction between teachers and students was highlighted with difficulties in assimilating self-study courses. In addition, there were numerous logistical and informatics technical problems (unavailability of the platform, impossibility of connection, sound problem, etc.).

"There are classes that do no't even work and it's not interactive."

3.5.3. Students' Suggestions and Recommendations. According to participants, this could be a form of teaching that would strengthen the face-to-face part and would be particularly useful in the event of another health emergency, for example. For a student, it would be nice to "just use distance learning as a supplement and have revision sessions with teachers after they have completed lessons in the amphitheater."

On the other hand, the current lack of training for students and teachers in connection with distance teaching and learning represents a brake on the final implementation of learning at the FMPM for the moment. Moreover, it was pointed out that DL is a favorable method but the socio-economic disparities between the students would be a source of unequal chances of success.

One student believes that "you need training for students and teachers to use these platforms well. We must help students who do not have the means to follow the courses."

Table 2: The students 'perceptions of the distance learning during the lockdown and their utilization of the educational platform.

Variables		All participants n (%)	Study cycle		p
			1st cycle	2d cycle	
Utilization of the education platform before lockdown	Never-sometimes	93 (83.7)	46 (49.5)	47 (50.5)	0.029
	Often-always	18 (16.3)	04 (22.2)	14 (77.8)	
Utilization of the ICT** for medical education	Never-sometimes	38 (34.2)	18 (47.4)	20 (52.6)	0.438
	Often-always	73 (65.8)	32 (43.8)	41 (56.2)	
Attending face-to-face class before the pandemic	Never	16 (14.4)	04 (25.0)	12 (75.0)	0.001*
	Sometimes	22 (19.8)	04 (18.2)	18 (81.8)	
	Often	42 (37.8)	21 (50.0)	21 (50.0)	
	Always	31 (27.9)	21 (67.7)	10 (32.3)	
First experience with e-learning	Yes	88 (79.3)	39 (44.3)	49 (55.7)	0.472
	No	23 (20.7)	11 (47.8)	12 (52.2)	
DL satisfaction during the pandemic	Not satisfied	12 (10.8)	10 (83.3)	02 (16.7)	<0.0001
	Not very satisfied	18 (16.2)	13 (72.2)	05 (27.8)	
	Satisfied	58 (52.3)	17 (29.3)	41 (70.7)	
	Very satisfied	23 (20.7)	10 (43.5)	13 (56.5)	
Quantity of online courses followed	Less than the half	35 (31.5)	21 (60.0)	14 (40.0)	0.026
	More than the half	76 (68.5)	29 (38.2)	47 (61.8)	
Comprehensibility of the courses regarding the expectations	Not to not very comprehensible	21 (18.9)	18 (81.8)	04 (18.2)	<0.0001
	Comprehensible to very comprehensible	89 (80.1)	32 (36.0)	57 (64.0)	
Degree of improvement through the DL***	Absent	20 (18)	13 (65.0)	07 (35.0)	0.022*
	Low	17 (15.3)	11 (64.7)	06 (35.3)	
	Average	49 (44.1)	19 (38.8)	30 (61.2)	
	Important	25 (22.5)	07 (28.0)	18 (72.0)	
	None–little use	23 (20.7)	30 (47.6)	33 (52.4)	0.333
Utility of the forum set by the school (FMPM)	Useful to very useful	88 (79.3)	20 (41.7)	28 (58.3)	<0.0001
	Not satisfied	38 (34.2)	26 (68.4)	12 (31.6)	
Support from teachers/institution	Somehow satisfied Satisfied-very satisfied	73 (65.8)	24 (32.9)	49 (67.1)	—
Encountering difficulties	Yes	92 (82.9)	15 (45.5)	18 (54.5)	0.559
	No	19 (17.1)	35 (44.9)	43 (55.1)	
Recommendation of DL after the pandemic	Yes	76 (68.5)	30 (39.5)	46 (60.5)	0.211*
	No	13 (11.7)	07 (53.8)	06 (46.2)	
	I do not know	22 (19.8)	13 (59.1)	09 (40.9)	
Courses' interactivity degree (scale from 1 to 10)		6.5 ± 2.5	5.7 ± 2.5	7.2 ± 2.4	<0.0001
Number of hours per week for DL (On10) mean ± standard deviation (SD)		10.8 ± 8.9	11.4 ± 10.4	10.4 ± 7.6	0.389
Self-perception of learning level (scale from 1 to 10)		6.3 ± 2.2	5.6 ± 2.3	6.8 ± 1.9	0.001
Probability in % of following DL in the future ($N = 84$)		71.8 ± 31	63.1 ± 34.1	78.0 ± 27.3	0.040

*Fisher exact test, **ICT: Information and Communication Technology, ***DL: Distance Learning.

Finally, improvements should be considered if we want to strengthen the quality of DL (planning and running of courses, reduction of technical problems of access to teaching).

4. Discussion

4.1. Distance Learning at the Marrakesh Medical School. With the increasing use of technology in education, online learning has become a common teaching method. Compared to offline learning, online learning has advantages to enhance undergraduates' knowledge and skills; therefore, it can be considered as a potential method in undergraduate medical education [10]. During the COVID-19 pandemic, this has become an obligation for medical schools around the world and it is time for newbie institutions to align with this new requirement in terms of online education. All the more so as it has many advantages and has helped to preserve the physical and mental health of the students and ensure satisfaction according to previous literature [11–13], although the distance and virtual learning must have the characteristics of accessibility, contextualization, flexibility, interaction, and collaborative work and will need to continue to improve during and after this pandemic [14]. Also, it is imperative to take into consideration the difficulties and challenges of a transition to online education in medical studies. It requires a balance between learning, development of skills, and some clinical and practical skills. Furhter, it is important not to change the habits of the students and teachers who do not master the use of software and teaching platforms [15]. Students with financial difficulties and special needs may not have equal opportunities to access

Table 3: The difficulties encountered by the students during the distance learning in the time of the lockdown.

Types of difficulties encountered	Effective sample size (n)	Percentage (%)
Difficulties related the learning environment change	51	55.4
Work organization	51	55.4
Work overload	44	47.8
Courses expectations nondiscussed	43	46.7
Decrease of the interaction and collaborative work (student/student and student/teacher. Group work ...)	40	43.5
Communication difficulties with the teachers	28	30.4
Learning difficulties and difficulties to achieve courses' goals	28	30.4
Difficulties in using digital media	21	22.8
Communication difficulties with the administration	18	19.6

technology. It is therefore necessary to take into account the nature of a health emergency and its possible impact on inequalities in access to education and to adapt solutions to both students and educators [16, 17]. In this sense, FMPM is questioning how to provide a quick solution in accordance with the instructions of the National Ministries of Education and Health and thinking about the smooth transition by adapting to the needs of students and teachers. Training sessions and tutorials on accessing and using the platform were disseminated through the faculty website. Teachers were invited to add sound to their lessons and to foster discussion with students during synchronous interactive online lessons. Also technical support was offered at the request of users [18].

Like several authors from different parts of the world [3, 12, 19–22], we were interested in exploring student's perspectives on online medical education as an alternative to traditional education. The majority of students felt they had a good knowledge of ICT and two-thirds reported use in medical studies mainly for information retrieval and course review. However, the educational platform was underutilized before the lockdown since most of the students attended the lectures. During this closure period, 79% of the students appreciated the DL (54.0% in 1st cycle vs. 89.0% in 2nd cycle, $p < 0.001$) and 80.2% thought that the online courses were understandable. The difficulties were related to the organization of work, to the change in the learning environment. The hybrid form was recommended by students even after the pandemic. The benefits of digital pedagogy were felt by our participants, like in previous studies, namely, the flexibility and the ability to learn at their own pace and reduce travel costs [23].

4.2. Students' Perspectives and Associated Factors. Across the world, students 'perspectives on distance learning have been disparate between pros and cons. The positive perspective is fostered by a previous e-learning experience. In Nepal, for example, 76.5% had never attended online courses and therefore the same proportion (77.8%) preferred traditional classroom instruction in the future. Medical students did not find online classes as effective as the traditional classroom teaching; it could be made more interactive and productive by introducing interactive and brainstorming sessions complementing the conventional face-to-face education [20]. The same observation was made according to a study in Jordan with 488 medical and dental students (1 to 3 year) [24]. Gender, level of study, and study material were not associated with this preference according to the authors [24]. The low involvement in these countries can be linked to the quality of training in interactive pedagogy and digital technologies of teachers. It justifies the subsequent recommendation that the training of trainers is a real lever for the development of DL.

Unlike in Israel, the online experience for the students was positive. A high level of overall satisfaction and a low rate of technical problems during electronic learning were significantly correlated with the desire to continue online learning [12]. Our students favored the hybrid form of teaching, and the perspective was different between the two cycles of study. Indeed, satisfaction with distance education was higher among undergraduate students despite being used to traditional lecture-based education. The 1st- and 2nd-year students probably encountered more difficulties in assimilating the theoretical contents which are essentially fundamental sciences during these two years of medical studies. Satisfaction was higher in case of previous use of virtual techniques for medical studies, availability of technological means during the lockdown, absence of technical difficulties, having a feeling of improvement in the learning process, and having a support system to facilitate the interactivity. It was inversely associated with the in-person follow-up of previous courses. These results were confirmed by the verbatim of the students in response to the open-ended questions. The difficulties observed in distance higher education in Morocco during the lockdown period are shared and can be summed up in the lack of familiarization with ICT in education and the lack of technological means and increased workload [8]. Some teachers have also encountered problems with new technologies, such as scheduling videoconferences or using interactive methods through web services [13]. This could result from the need for training both students and teachers in this essential educational innovation.

4.3. Recommendations. Online education lacks specific quantitative standards to measure the quality of the teaching process. This affects the learning effectiveness of medical students and needs to be addressed further [15]. In the

Table 4: Factors associated with the distance learning satisfaction among the students.

	Satisfaction		p
	Not very satisfied or not satisfied n (%)	Satisfied to very satisfied n (%)	
Gender			
Woman	16 (21.1)	60 (78.9)	0.037
Man	14 (40.0)	21 (60.0)	
Study cycle			
1st cycle	23 (46.0)	27 (54.0)	<0.0001
2nd cycle	07 (11.5)	54 (88.5)	
Utilization of the ICT for medical education before			
Yes	13 (17.8)	60 (82.2)	0.002
No	17 (44.7)	21 (55.3)	
Attending face-to-face class before			
Yes	25 (34.2)	48 (65.8)	0.018
No	05 (13.2)	33 (86.8)	
Use of the platform before			
Yes	01 (05.6)	17 (94.4)	0.039*
No	29 (31.2)	64 (68.8)	
Having a computer or a laptop to attend the class			
Yes	16 (17.6)	75 (82.4)	<0.0001
No	14 (70.0)	06 (30.0)	
Good quality Internet access			
Yes	12 (14.6)	70 (85.4)	<0.0001
No	18 (62.1)	11 (37.9)	
First e-learning experience			
Yes	23 (26.1)	65 (73.9)	0.679
No	07 (30.4)	16 (69.6)	
Lectures' comprehension and assimilation			
Yes	08 (09.0)	81 (91.0)	<0.0001
No	22 (100.0)	00 (00.0)	
Courses' interactivity (means ± SD)			
	3.0 ± 3.9	8.1 ± 7.4	<0.0001
Education improvement			
Yes	03 (04.1)	71 (95.9)	<0.0001
No	27 (73.0)	10 (27.0)	
Encountering difficulties			
Yes	30 (32.6)	62 (67.4)	0.004
No	00 (00.0)	19 (100.0)	
Technical difficulties			
Yes	14 (42.4)	19 (57.6)	0.018
No	16 (20.5)	62 (79.5)	
Support and technical assistance			
Yes	14 (17.1)	68 (82.9)	0.0001
No	16 (55.2)	13 (44.8)	
Learning support by the faculty/teachers			
Yes	04 (05.5)	69 (94.5)	<0.0001
No	26 (68.4)	12 (31.6)	

SD: Standard Deviation. *Fisher's exact test. **T-test.

Table 5: Factors associated to the satisfaction of distance learning in the multivariate model analysis by binary logistic regression.

Factors	Odds ratio	IC 95%		p
		Lower	Upper	
Use of the platform before lockdown	66.3	1.9	$2.2*10^3$	0.019
Improvement in learning during the lockdown	22.6	4.1	123.7	<0.0001
Learning support by the teachers	7.0	1.3	38	0.023
Distance learning courses interactivity	1.8	1.1	2.8	0.007
Constant in the equation (multivariate model) ($B = -5.346$)	0.005	—	—	<0.0001

Hosmer et Lemeshow: Khi square = 6.7. $p = 0.566$.

literature, students' experiences are context dependent. In Germany, for example, medical students recommended digital adoption for education after the pandemic [21]. On the other hand, in other countries, the opinion was in favor of in-person education as in Nepal. Our recommendations join those of other authors such as in Saudi Arabia or Jordan on the hybrid form. The authors suggest that medical students moderately accepted e-learning during the COVID-19 Pandemic closure time. More training of the students and tutors, better designing of e-courses, more interaction, motivation, and blended learning are recommended [19]. Technical and infrastructural resources were reported as a major challenge for implementing distance learning, hence understanding technological, financial, institutional, educators, and student barriers is essential for the successful implementation of distance learning in medical education [3].

At the Marrakesh Medical School (FMPM), it is necessary to institutionalize online education which must be complementary and not a substitute for the usual classes. Having a more holistic approach to the students' training must be adopted in postpandemic period taking into account the mental impact of COVID-19 on students as well as improving the security and technology of virtual platforms [14, 25]. We recommend the following.

(i) Institutionalize online education.
(ii) Encourage mentorship at the FMPM.
(iii) Continue training faculty and students.
(iv) Promote hybrid online and face-to-face teaching.
(v) Improve the educational platform for more flexibility and technical operationalization.
(vi) Encourage interactivity through case discussion modules, chat, and discussion forums.
(vii) Take into consideration the new learning/teaching methods during the assessment of learning acquisition.
(viii) Manage the student work time for better adaptation and profitability.

4.4. Limits and Advantages. The investigation took place during the closure time as part of the response in Morocco against the epidemic which coincided with the end of the 2nd semester of the 2019–2020 academic year (July, 2020). This period was particularly stressful for the students which may impact their response regarding the assessment and perception of distance learning. Despite several reminders, we were only able to get 111 responses (1700 students enrolled so an estimated response rate of 6%). This could induce a nonresponse bias (students who refuse to participate or who did not have access to the platform to answer the questionnaire). But the number of participants could also testify to the low access to the platform during this period for connection problem or lack of technology.

This survey is part of an action research project whose results with students will be supplemented by a second survey at the end of the 1st semester of the 2020–2021 academic years, and by interviews with the faculty and the technical team in order to set up actions to support and improve the educational system and promote digital pedagogy at FMPM in the medium and long term.

5. Conclusion

Despite the emergency to start distance learning imposed by the COVID-19 health crisis, it appears that students were generally satisfied (52.3% satisfied and 20.7% very satisfied) and had a positive experience. This satisfaction was felt more among students of the 2nd cycle of initial medical studies (88.5% versus 54%, $p < 0.0001$) and was influenced by factors such as the interactivity of teaching and the improvement of learning.

These results and the students' recommendations encourage a reflection on the institutionalization of distance education by taking advantage from the experience during the COVID-19 epidemic to succeed in the transition to digital pedagogy in hybrid form by further promoting learning and interaction with our students in undergraduate training after the pandemic.

Data Availability

All relevant data are included in the manuscript. The corresponding author can be reached for raw data.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

Thanks are due to all participating students. This research did not receive specific funding.

References

[1] Hantem A.. Les conditions de l'enseignement à distance pendant le confinement dû au COVID-19: Cas de l'enseignement supérieur au Maroc. [Internet]. 2020 [cited 2020 Dec 29]. Available from: https://hal.archives-ouvertes.fr/hal-02883214.
[2] S. El Firdoussi, M. Lachgar, H. Kabaili, A. Rochdi, D. Goujdami, and L. El Firdoussi, "Assessing distance learning in higher education during the COVID-19 pandemic," *Education Research International*, vol. 13, 2020.
[3] M. Al-Balas, H. I. Al-Balas, H. M. Jaber et al., "Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives," *BMC Medical Education*, vol. 20, no. 1, 341 pages, 2020.
[4] J. G. Ruiz, M. J. Mintzer, and R. M. Leipzig, "The impact of E-learning in medical education," *Academic Medicine*, vol. 81, no. 3, pp. 207–212, 2006.
[5] N. Mehta, C. Sayed, R. Sharma, and V. Do, "Medical education advances and innovations: a silver lining during the COVID-19 pandemic," *Canadian Medical Education Journal*, vol. 11, 2020.

[6] N. G. Patil and Y. C. H. Yan, "SARS and its effect on medical education in Hong Kong," *Medical Education*, vol. 37, no. 12, 2003.

[7] L. P. Howell, J. P. Joad, E. Callahan, G. Servis, and A. C. Bonham, "Generational forecasting in academic medicine: a unique method of planning for success in the next two decades," *Academic Medicine*, vol. 84, no. 8, pp. 985–993, 2009.

[8] J. Eckleberry-Hunt and J. Tucciarone, "The challenges and opportunities of teaching "generation Y"" *Journal of Graduate Medical Education*, vol. 3, no. 4, 2011.

[9] D. O'Doherty, M. Dromey, J. Lougheed, A. Hannigan, J. Last, and D. McGrath, "Barriers and solutions to online learning in medical education - an integrative review," *BMC Medical Education*, vol. 18, no. 1, p. 130, 2018.

[10] L. Pei and H. Wu, "Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis," *Medical Education Online*, vol. 24, no. 1, Article ID 1666538, 2019.

[11] A. K. Bolatov, T. Z. Seisembekov, A. Z. Askarova, R. K. Baikanova, D. S. Smailova, and E. Fabbro, "Online-learning due to COVID-19 improved mental health among medical students," *Medical Science Educator*, vol. 31, pp. 1–10, 2020.

[12] Y. Sandhaus, T. Kushnir, and S. Ashkenazi, "Electronic distance learning of pre-clinical studies during the COVID-19 pandemic: a preliminary study of medical student responses and potential future impact," *Israel Medical Association Journal*, vol. 8, no. 22, pp. 423–427, 2020.

[13] L. A. Chinelatto, T. R. d. Costa, V. M. B. Medeiros et al., "What you gain and what you lose in COVID-19: perception of medical students on their education," *Clinics*, vol. 75, Article ID e2133, 2020.

[14] R.-J. Wilcha, "Effectiveness of virtual medical teaching during the COVID-19 Crisis: systematic review," *JMIR Medical Education*, vol. 6, 2020.

[15] S.-Q. Wang and F.-Y. Xu, "Letter to the editor regarding "the evolving impact of covid-19 on medical student orthopedic education: perspectives from medical students in different phases of the curriculum," *Geriatric Orthopaedic Surgery & Rehabilitation*, vol. 11, 2021.

[16] S. A. Ahmed, N. N. Hegazy, H. W. Abdel Malak et al., "Model for utilizing distance learning post COVID-19 using (PACT) ™ a cross sectional qualitative study," *BMC Medical Education*, vol. 20, 2020.

[17] D. Sharma and S. Bhaskar, "Addressing the covid-19 burden on medical education and training: the role of telemedicine and tele-education during and beyond the pandemic," *Front Public Health*, vol. 8, 2020.

[18] PLATEFORME DE FORMATION–Faculté de Médecine et de Pharmacie de Marrakech [Internet]. [cited 2021 Jan 5]. Available from: http://www.fmpm.uca.ma/?page_id=374.

[19] N. K. Ibrahim, R. Al Raddadi, M. AlDarmasi et al., "Medical students' acceptance and perceptions of e-learning during the Covid-19 closure time in King Abdulaziz University," *Journal of Infection and Public Health*, vol. 14, no. 1.

[20] S. Nepal, A. Atreya, R. G. Menezes, and R. R. Joshi, "Students' perspective on online medical education amidst the COVID-19 pandemic in Nepal," *Journal of Nepal Health Research Council*, vol. 18, no. 3, pp. 551–555, 2020.

[21] T. Loda, T. Löffler, R. Erschens, S. Zipfel, and A. Herrmann-Werner, "Medical education in times of COVID-19: German students' expectations - a cross-sectional study," *PloS One*, vol. 15, no. 11, Article ID e0241660, 2020.

[22] L. Puljak, M. Čivljak, A. Haramina et al., "Attitudes and concerns of undergraduate university health sciences students in Croatia regarding complete switch to e-learning during COVID-19 pandemic: a survey," *BMC Medical Education*, vol. 20, no. 1, p. 416, 2020.

[23] S. Dost, A. Hossain, M. Shehab, A. Abdelwahed, and L. Al-Nusair, "Perceptions of medical students towards online teaching during the covid-19 pandemic: a national cross-sectional survey of 2721 UK medical students," *BMJ Open*, vol. 10, no. 11, 2020.

[24] N. Al-Azzam, L. Elsalem, and F. Gombedza, "A cross-sectional study to determine factors affecting dental and medical students' preference for virtual learning during the COVID-19 outbreak," *Heliyon*, vol. 6, no. 12, Article ID e05704, 2020.

[25] S. Rainbow and T. Dorji, "Impact of COVID-19 on medical students in the United Kingdom," *Germs*, vol. 10, no. 4, pp. 240–243, 2020.