

# Health Sciences

---

Volume 4 | Issue 1

Article 9

---

## Medical professors' perception of E-learning during Covid19 Period

Mounia Bendari

*Faculty of Medicine, Mohammed VI University of Health and Sciences, Casablanca, Morocco., mbendari@um6ss.ma*

Hanane Delsa

*Research Entity, Mohammed VI Center for Research & Innovation, Rabat, Morocco.*

Fadila Guessous

*Faculty of Medicine, Mohammed VI University of Health and Sciences, Casablanca, Morocco*

Said Benchekroun

*Research Entity, Mohammed VI Center for Research & Innovation, Rabat, Morocco.*

Follow this and additional works at: <https://publishing.universitypress.ma/health-sciences>



Part of the [Education Commons](#), and the [Medicine and Health Sciences Commons](#)

---

### Recommended Citation

Bendari, Mounia; Delsa, Hanane; Guessous, Fadila; and Benchekroun, Said (2023) "Medical professors' perception of E-learning during Covid19 Period," *Health Sciences*: Vol. 4: Iss. 1, Article 9.

DOI: 10.56264/2658-865X.1088

Available at: <https://publishing.universitypress.ma/health-sciences/vol4/iss1/9>

This Research Article is brought to you for free and open access by Health Sciences. It has been accepted for inclusion in Health Sciences by an authorized editor of Health Sciences.

## RESEARCH ARTICLE

# Medical Professors' Perception of E-learning During Covid 19 Period

Mounia Bendari <sup>a,b,\*</sup>, Hanane Delsa <sup>a,b</sup>, Fadila Guessous <sup>a,b</sup>, Said Benchekroun <sup>a,b</sup>

<sup>a</sup> Faculty of Medicine, Mohammed VI University of Health and Sciences, Casablanca, Morocco

<sup>b</sup> Research Entity, Mohammed VI Center for Research & Innovation, Rabat, Morocco

### Abstract

Over the past few years, our lives have been deeply impacted by technological innovations. Educational programs have also integrated a technological method for learning. This new entity has been called electronic learning (E-learning).

At Mohammed VI University of Health and Sciences, students benefitted from the E-learning for quite a few years now, but the pandemic of Sars-CoV2 was an opportunity for our university to apply increased optimization in the use of the technological methods that we have to make it possible for staff to quickly and efficiently implement tools for adaptation to the circumstances of Sars-Cov 2. These adaptations also assured the continuity of educational programs and formation for all of our students, the primary component of which was the adoption of emergency remote teaching.

The main aim of this review is to identify, evaluate and synthesize the best available evidence for the effectiveness of these internet-based E-learning programs on medicine students. The goal of this study is to aid us in improving the quality of our pedagogical approach globally and especially the E-learning program, not only for the duration of the pandemic period, but long into the future.

To assess the current situation of the E-learning program offered at Mohammed VI University of Health and Sciences, a cross-sectional survey was conducted involving professors. In this review we will report only the medical professors' point of view about their own experiences with E-learning, the principal difficulties that they found and their individual learning needs.

This work permits us to identify the main constraints of teachers in E-learning as well as the difficulties in using computer tools during their lessons. However Most have benefited from the experience and the training provided as well as the support of the technical team but still prefer face-to-face learning. Paradoxically, they recommended E-learning. Therefore, teachers can engage more in the online learning process but need more computer training and support.

**Keywords:** University, Medical, Professor, Clinical tutor, E-learning, Platform

## 1. Introduction

The term E-learning was first used in the mid-1990s as the internet was starting to gain traction [1]. E-learning can be broadly defined as any type of educational tool provided in an electronic form. Many other synonyms, such as computer-assisted learning, E-learning can be used, but all reflect the transfer of knowledge via an electronic device [2]. E-learning can be used in different ways

and takes many forms; for example, it may be delivered in asynchronous or synchronous formats (e.g. interactive online conferences via electronic platforms).

Many professors prefer the traditional face-to-face method because person to person interactivity is essential for the exchange of knowledge and is critically important in the acquisition of skills. In recent years, however, features such as Web 1.0 (discussion forum and e-mail) and, more recently

Received 28 January 2023; revised 23 June 2023; accepted 23 June 2023.  
Available online 3 August 2023



\* Corresponding author. UM6SS – Anfa City, Bld Mohammed Taïeb Naciri, Commune Hay Hassani 82 403 Casablanca, Morocco.  
Tel.: +2120664041975.

<https://doi.org/10.56264/2658-865X.1088>

2658-865X/© 2023 M. Bendari et al. Published by University Press of Morocco. This is an open access article under the CC BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>).

Web 2.0 (wikis and blogs), have occupied a greater place in educational programs and allowed for a transfer of knowledge that is both synchronous and asynchronous [3].

E-learning has proven to be effective and has presented several well-known and recognized advantages, which may be related to the increased accessibility to education, efficiency and cost-effectiveness, as well flexibility of the learning process for the learner, with at least the possibility of interactivity [4].

Even better, technology is constantly advancing and, in the future, education systems will have to face several challenges related to digitization. The crisis of Sars-COV2 pandemic was an opportunity and new learning and training concepts were born. These circumstances help to and develop new digital teaching supported by artificial intelligence (AI) as Education 4.0 process and provide optimized teaching environments [5,6].

Artificial intelligence offers a lot of computing technologies like natural language processing, artificial neural networks, machine learning, deep learning and other technologies [7], these advantages improve the personalization of the learning, assist in dynamic assessments, and increase meaningful interactions in learning experiences, etc [8,9].

Medical studies have certain peculiarities, with apprenticeship that combined theoretical and practical aspects. Mohammed VI University of Health and Sciences has in its possession a platform which it has made available for E-learning called LMS (Learning Management System) called “CANVAS”. This platform is an open-source Learning Management System (LMS), published by Instructure Inc., in Salt Lake City (United States).

Its “standard” version targets higher education institutions that provide courses to students as well as distance education offered through videoconferences and capsules.

Before the era of the pandemic, the platform was underused or used on limited way. With the global crisis of Covid 19, face-to-face teaching became impossible, therefore the technical teams and teachers are committed to developing this platform and optimizing its use as much as possible to continue the educational activity.

## 2. Material and methods

This is a descriptive analytical prevalence study conducted within the Faculty of Medicine of Mohammed VI University of Health and Sciences during 2021.

### 2.1. Participants, survey instrument and statistical analysis

Volunteer medical tutors: Professor in Higher Education, Associate Professor, fundamental science teachers working in Mohammed VI University of Health and Sciences Morocco.

The survey instrument was developed by the principal investigator and a working group. After defining the objectives, bibliographic research was carried out to fix the concepts and the items to explore, based on the critical reading of published articles.

The questions and items were adapted to our target population and focused on knowledge, and communication.

Before developing the final version of the questionnaire, it was pre-tested by professors who were not part of our sample to assess its clarity, as well as the feasibility and time required to complete it. Some inappropriate or vague questions were removed or reworded.

In fact, the initial questionnaire was validated through a peer review approach online, according to the pre-test method [10].

Peer reviewers ( $n = 4$ ) were both professors and faculty staff members responsible for E-learning. Their comments were considered and the questionnaire was adapted accordingly. The locally responsible ethical committee of the university was informed about this survey and gave its written consent.

The questionnaire included 29 items used for the major multiple-choice questions; which were grouped into 4 categories. The 29 items focused on domains, which were deemed to be minimal but crucial competences. These included: General skills for E-learning, access to the platform and principal difficulties in E-Learning. The form was prepared in French, in the form of a Google questionnaire ([Appendix](#)).

This item-based questionnaire was constructed on the bases of a literature search and according to the methods of empirical social research [11].

All surveys were coded and entered into the SPSS 16.0 software. Qualitative variables were expressed as mean and standard deviation or median and quartile. The factors associated with satisfaction of the teaching method were studied in univariate and multivariate analyses using the binary logistic regression model (enter method). The significance level has been set at  $p < 0.05$ .

### 3. Results

Eighty teachers took part in the questionnaire. Among the participants, 63 (78.8%) were between the ages of 30 and 40, and only 5 (6%) were aged more than 60. The participating professors were divided into 47 women (58.8%) and 33 men (41.3%). 50% of the participating professors were in a medical specialty, and 21% in a surgical specialty, with the remaining professors involved in basic sciences. Regarding the experience of participants, our survey showed that 52.5% of professors had between 3 and 6 years of experience. Of these, 27.5% of them had less than 3 years of experience, and 3.8% had between 6 and 10 years of experience and 16% had more than 10 years of experience (Table 1).

#### 3.1. Before Sar-COV2 pandemic

First, we were interested by teaching approach used before Sars-Cov 2 pandemic. The response for the question related to the teaching method showed that professors were accustomed to practicing both face-to-face teaching associated with E-learning on 37.5% of cases. 27.5% of them used only face-to-face teaching, and 8.8% answered that they used a combination of face-to-face lessons and simulation, and 22.5% of participants respond that they use the 3 approaches; face-to-face teaching with E-learning and simulation.

##### 3.1.1. Platform use

Concerning the justification for not using the LMS platform, various reasons were reported, mainly related to the preference of face-to-face courses indicated by 35% of the responses, and the lack of training in E-learning (22% of responses). The

Table 1. Demographic data of participants.

| Categories                  | N 80 (%)  |
|-----------------------------|-----------|
| <b>Gender:</b>              |           |
| Male                        | 33 (41.3) |
| Female                      | 47 (58.8) |
| <b>Age (years):</b>         |           |
| 30–40                       | 63 (78.8) |
| 41–50                       | 8 (10)    |
| 51–60 more than 60 years    | 4 (5)     |
| <b>Years of experience:</b> |           |
| 3–6 years                   | 5 (6.3)   |
| 6–10 years                  | 42 (52.5) |
| Less than 3 years           | 3 (3.8)   |
| More than 10 years          | 22 (27.5) |
| <b>Department:</b>          |           |
| Medicine                    | 13 (16.3) |
| Surgery                     | 39 (48.8) |
| Basic sciences              | 17 (21.3) |
| Dentistry                   | 22 (27.5) |
|                             | 1 (1.3)   |

professors' expected proficiency in computer science was set at an accepted level of good to excellent in more than 60% of the participants (Table 2).

##### 3.1.2. Training

Furthermore, 83% of participants claimed to have benefited from targeted LMS platform training that consisted of video, webinar, tutorials, documentation, direct intervention of a computer expert. 92% responded that the training was beneficial to them.

##### 3.1.3. Difficulties

On the basis of the participants' responses, several difficulties were reported during our survey. The main constraint, according to 31% of responses, was related to a lack of interactivity with students. Secondly, the inaccessibility to conferences was linked to problems with internet connection or of viewing images (Table 3).

At least these difficulties required the assistance of the IT department, but the level of difficulty estimated by the speakers was considered average by 56.3% of the participants, and estimated low by 42.5%. Only 1.3% considered the level of difficulty as high. Fig. 1 summarizes difficulties encountered while the LMS platform was in use.

#### 3.2. During sars -Cov 2 pandemic

During the Sars -Cov 2 pandemic, teachers had to adapt to the new, imposed reality and continued teaching exclusively via E-learning. In addition, the university developed an emergency remote teaching.

##### 3.2.1. Platform

Questions relating to the experience of the platform's medical tutors were included in the questionnaire. 53% of the teachers replied that they preferred face-to-face compared to E-learning. 35% of participants think that the 2 methods are comparable, while only 11.3% have a preference for E-learning (Table 4).

More telling were the participants' responses to a direct question concerning their estimation of the effectiveness of the university's E-learning program. 15% declared their experience to be very satisfactory and 47.5% found it to be good. 31.3% indicated that the program was in need of improvements and the remaining participants reported that their experience was median or mediocre.

Regarding the platform LMS itself, after its use by the participants its level was judged excellent or good but requiring improvement by respectively 37.5% and 55%, the rest found the level of the

Table 2. The reasons for the no use of platform (several answers possible).

|   | Frequency N | Percent % |
|---|-------------|-----------|
| • I don't practice it   | 43          | 53,8      |
| • Insufficient mastery of the computer tool   | 1           | 1,3       |
| • Insufficient mastery of the computer tool,<br>Lack of access to the platform  | 1           | 1,3       |
| • Insufficient mastery of the computer tool,<br>Preference for face-to-face courses   | 2           | 2,5       |
| • Lack of training  | 8           | 10,0      |
| • Lack of training, insufficient mastery of the<br>computer tool  | 1           | 1,3       |
| • Lack of training, insufficient mastery of computer tools,<br>Preference for face-to-face courses  | 1           | 1,3       |
| • Lack of training, insufficient mastery of the computer tool,<br>Preference for face-to-face courses, Platform considered difficult                                    | 2           | 2,5       |
| • Lack of training, insufficient mastery of the computer tool,<br>Preference for face-to-face courses, Platform considered<br>difficult, Lack of access to the platform | 2           | 2,5       |
| • Lack of training, Preference for face-to-face classes   | 4           | 5,0       |
| • Platform considered difficult   | 2           | 2,5       |
| • Preference for face-to-face classes   | 13          | 16,3      |
| • Preference for face-to-face courses, Platform considered difficult  | 4           | 5,0       |
| • Total   | 80          |           |

Table 3. Difficulties while teaching through the LMS.

|       | Frequency N | Percent % |
|-------|-------------|-----------|
| Not   | 41          | 51,2      |
| Yes   | 39          | 48,8      |
| Total | 80          | 100,0     |

platform median. 84% of the participants used the platform for the evaluation of the students with continuous checks primarily carried out based on multiple-choice questions. Table 5 summarizes the principal types of evaluation methods proposed through the platform.

### 3.2.2. Difficulties

The use of the LMS platform for continuous checks was considered suitable and easy for 61.3% of the participants, suitable but difficult for 28.7% of the teachers and not suitable for 10% of the teachers. Finally, 98.8% of the participants, after having used the platform, recommended the use of this platform.

## 4. Discussion

The current study reported advantages, limitations and recommendations to improve online learning during lockdown of institutions due to Sars-COV2 pandemic, and highlights the efforts done by both professors and faculty staff member to implanted and strengthen E-learning to overcome the pandemic.

E-learning can be defined as “the use of electronic media for a variety of learning purposes that range from add-on functions in conventional classrooms to full substitution for the face-to-face meetings by online encounters” [12].

Medical studies, it must be understood, are set apart from other branches so the E-learning in medical education takes on a particular dimension, because of the diversity of interventions. Teaching in this field requires tools and contents that differ from other disciplines making E-learning objectives and required skills necessarily diverse and informed

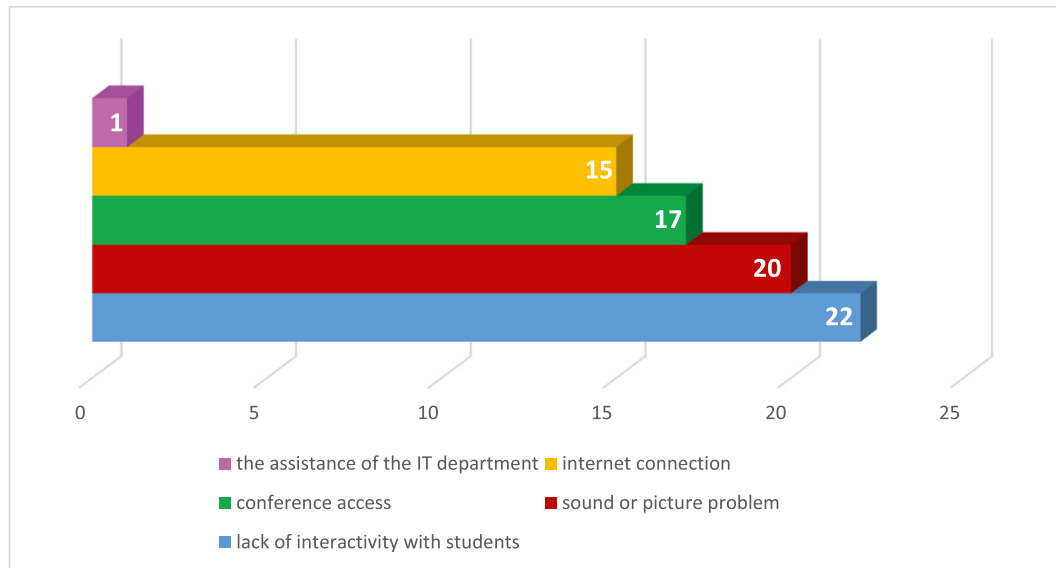


Fig. 1. Difficulties during the E-learning.

Table 4. E-learning compared to the face-to-face method.

|                                     | Frequency N | Percent % |
|-------------------------------------|-------------|-----------|
| Comparable                          | 28          | 35,0      |
| E-learning better than face-to-face | 9           | 11,3      |
| Face-to-face better than E-learning | 43          | 53,8      |
| Total                               | 80          | 100,0     |

Table 5. Types of evaluation methods proposed through the platform.

|   | Frequency | Percent |
|---|-----------|---------|
| Editorial question  | 10        | 12,5    |
| Multiple choice questions (MCQ)   | 35        | 43,8    |
| Multiple Choice Questions (MCQ), Short Open Response Question (QROC)                  | 25        | 31,3    |
| Multiple choice questions (MCQ), Short open-ended question (QROC), Editorial question | 8         | 10,0    |
| Multiple choice questions (MCQ), Editorial question                                   | 2         | 2,5     |
| Total   | 80        | 100,0   |

by specific learning theories. E-learning innovations have proven their ability to aid healthcare professionals in developing their knowledge, skills and attitudes by staying engaged in learning in a potentially timely and profitable way and in a sustainable manner [13].

Medical faculties are also different from those found in other disciplines. They are responsible for the training and development of future physicians who have to be able to exam patients in order to

treat them and follow up with them. The study, therefore, includes a great deal of practical training, in addition to a plethora of shared knowledge as basic requirements. In fact, the benefits of E-learning have been well documented in terms of increased accessibility to education, efficacy, cost effectiveness, learner flexibility and interactivity [4].

Admittedly, some methodological and philosophical shortcomings in the existing fundamentals of E-learning research are a fact. These include the use of comparative design. The comparison between online learning and traditional teaching methods appears to be illogical because the groups used for comparison are heterogeneous, lack uniformity and present multiple confounding factors that cannot be corrected [14,15].

In the past years, medical education has undergone a genuine revolution, shifting from the traditional, instructor-centred teaching to a learner-centred model that puts learners in control of their own learning [16]. These data are confirmed by our result, our teachers combined many educational methods for facilitating learning and generating student engagement, we found that only 27.5% of them used only face-to-face teaching.

Medical education now benefits from E-learning. In fact, its implementation in medical education has proven to be effective through its ability to catalyse the shift to the application of adult learning theory. Indeed, in this learning model, educators are no longer intended as disseminators of information. Instead, their role is closer to that of a learning facilitator and a skills evaluator [16].



It has been widely demonstrated that the use of E-learning in medical education, which seems to be taking on greater importance in educational planning and is becoming more and more promising for the future, can accelerate the use of adult learning theory and change the role of teachers as content providers to facilitate learning, skills training and assessment [17].

Our study was interested in the overall perception of medical teachers towards E-learning during lockdown due to Sars-Cov 2 pandemic. Several parameters were thus evaluated. At Mohammed VI University of Health and Sciences, we have a platform dedicated to E-learning. This pedagogical support can lead to more effective education and may also improve the ability of professors to respond to their students' educational challenges. This platform is called: LMS, or Learning Management System. It is a digital IT platform which allows for the sharing of lessons with students but also distance education through the use of videoconferences and capsules. The aim of the implementation of this platform was to improve the quality and credibility of E-learning research and to enhance the quality of digital medical education.

This platform was not used massively before confinement, the reason was related to the preference of face-to-face courses indicated by 35% of the responses, and the lack of training in E-learning (22% of responses). Through our questionnaire we have deduced that the staff of our university has been able to adapt to distancing learning quickly, despite a lack of training and time at the start of the pandemic. Thanks to the platform, which is both easy and accessible; only 1.3% considered the level of difficulty required the assistance of the IT department as high. Participants have confirmed that E-learning is a method that has many advantages. However, according to the collective opinion of the participating teachers, it cannot replace the traditional face-to-face method.

On the other hand, medical training is called upon to evolve with forward moving changes and modifications, especially to respond to this current pandemic Sars-Cov 2 situation. As a result of the challenge, we found a fast and efficient solution to dispense a high quality of learning [18,19]. But we must keep in mind that education method will always be a subject of innovations in many forms, with the objective of improving the process of teaching and learning and training, among these innovations, we can quote technological innovation, in particular artificial intelligence [9].

One detail, our study uncovered was the immense effort on the part of Mohammed VI University of

Health and Sciences exerted to put in place the necessary measures to prepare professors for this type of teaching by supporting them in pilot projects in record time in order to face the pandemic. 83% of participants answered that they benefited from the LMS platform training and confirmed that the training was helpful for them. Students and professors alike have high expectations, as well as priorities and preferences, which have been in a state of perpetual motion depending on the pandemic situation. In fact, according to professors' response, the training before using the platform is benefit, 92% responded that the training was helpful to them. These results concord with those reported by Yilmaz in 2017, who demonstrate that the preparation for online learning of users was linked to their satisfaction and their motivation [20].

To keep pace with these changes, it was necessary to create a collaboration between our IT team and our educational designers and developers. According to the participants' responses, the LMS platform is easy to use, with most of difficulties found to be simple and easily resolved with the IT department's involvement. In fact, on the basis of the participants' responses, several difficulties were reported during our survey. The main constraint, according to 31% of responses, was related to a lack of interactivity with students. Secondly, the inaccessibility to conferences was linked to problems with internet connection or of viewing images which impact directly interactivity with students. Those difficulties were also reported by other institutions, which evaluated limit of E-learning during Covid 19 pandemic era, and the principal limitations given by students and teachers is lack of immediate feedback, teachers also had some difficulties to assess students' understanding during online lecturing. They mentioned that during online study, participants misbehaved and tried to access online resources during assessments [21].

Other data collected through this survey indicates the ease provided by videoconferences, which required less adaptation effort and increased interactivity with the students, as reported by the participants. Video clips were also added to this, which offered the opportunity to create richer content well suited to the situation.

Our research found that participants believed that overall course assessments should combine the components of both face-to-face and E-learning. The participants' opinions about this course presentation tool were diverse. Most believed that the course should adopt the face-to face method, but they recommended the E-learning platform for others. We can conclude from this that while

professors may appreciate E-learning, they still prefer the tried and tested face-to-face model, mainly due to the lack of preparation on the part of these teachers. In other words, no training plan, last minute training, and/or no support in computer skills.

One of the strengths of this study is the participation of professors with different clinical disciplines, including nephrology, cardiology, ophthalmology, paediatrics, obstetrics and gynecology, and psychology. All were committed to the plan put in place by the university. Most benefitted from the experience but still prefer face-to-face learning, yet, paradoxically, ultimately recommended the E-learning. As a result, we may conclude that professors can become more engaged in the E-learning process but are in need of more training and support in computer skills. This found concords with many recent publications which suggest that blended learning can be an excellent method for training, but further research to assess whether it improves learning outcomes is required [22].

Finally, the current study encourages the use of E-learning in medical institutes thanks to its various advantages. E-learning modalities favors student-centered learning and they are easily manageable during this lockdown situation, and improves continuous faculty development. Authors propose some recommendations for the success of application of E-learning.

1. Faculty needs training and student orientation in using online learning tools.
2. To facilitate the transition to distance learning medical teacher should be able to handle computer tool, to acquire autonomy of use.
3. Mix many approaches like synchronous teaching and asynchronous one, and diversify educational activities to encourage students and motivate them.
4. Regularly update our digital education platform based on user feedback to be ready to fully transition to distance learning if necessary.

## 5. Conclusion

Faculty members prefer face-to-face teaching but express their desire to attend E-learning courses that focus on individualization, blended learning, and mobile learning. Our approach is oriented toward a combination of these two orientations. Technological and educational learning components are not mutually exclusive; on the contrary, in a way, they intersect, with technology operating in the service of pedagogy.

Electronic learning appears to offer both professors and learners many advantages. It responds to learner needs, is flexible, and allows for individual learning. It also enhances reflective thinking and autonomy in learning.

This review provided a synthesis of the data related to our professors' experiences with E-learning. These data will aid us in deciding which tools to use to improve our learning quality and identify the state of knowledge in this field. The review can support educators in the development of meaningful learning programmes and the design of new curricula for healthcare students. Finally, it has been proved that traditional teaching and training methods reach their limit; the crisis has made it possible to boost E-learning in our university, this work proposes guidance for future research in this field.

## Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

## Acknowledgments

The researchers would like to express their gratitude to the professors participating in the study.

We thank Constance E. Guindon for the English revision.

## Conflict of Interest

All authors declare no competing interests.

## Author contribution

Mounia Bendari: first author. Played an important role in redaction and literature search.

Hanane Delsa co-author participated in literature searching, and participated in writing.

Fadila Guessouss have carried out a revision of the text,

Said Benchekroun: have played a substantial role in designing the article.

## References

- [1] Garrison DR. E-learning in the 21st century: a framework for research and practice. second ed. New York: Routledge; 2011.
- [2] Clark RC, Mayer RE. E-learning and the science of instruction: proven guidelines for consumers and designers of multimedia learning, 4th ed. John Wiley; March 2016. ISBN: 978-1-119-15866-0, 528 pages.
- [3] Sinclair Peter. BN(Renal), MPhil1 the effectiveness of internet-based E-learning on clinician behavior and patient outcomes: a systematic review protocol. JBI Database of Systematic Reviews & Implementation Reports 2015;13(1): 52–64.



- [4] Ehlers U-D, Pawlowski JM, editors. Handbook on quality and standardisation in E-learning. Berlin: Springer; 2006.
- [5] Porter M,E, Heppelmann J,E. How Smart, Connected Products Are Transforming Competition. Harvard Business review, November 2014;94:1–23.
- [6] Haderer B, Ciolacu M. Education 4.0: Artificial Intelligence Assisted Task-and Time Planning System. Procedia Comput Sci 2022;200:1328–37.
- [7] Whitby Artificial Intelligence. A beginner's guide. Oxford, U.K.: Oneworld; 2008.
- [8] Chen X, Xie H, Zou D, Hwang GJ. Application and theory gaps during the rise of artificial intelligence in education. Comput Educ: Artif Intell 2020;1. Article 100002.
- [9] Ezzaim A, Kharroubi F, Dahbi A, Aqqal A, Haidine A. Artificial intelligence in education-State of the art. International Journal of Computer Engineering and Data Science (IJCEDS) 2022;2(2).
- [10] Collins D. Pretesting survey instruments: an overview of cognitive methods. Qual Life Res 2003;12:229–38.
- [11] Schnell R, Hill PB, Esser E. Methoden der empirischen Sozialforschung, ninth ed. Munich: Oldenbourg Wissenschaftsverlag; 2011.
- [12] Guri-Rosenblit S. 'Distance education' and 'E-learning': not the same thing. High Educ 2005;49:467–93.
- [13] Greenhalgh T. Computer assisted learning in undergraduate medical education. BMJ 2001;322:40.
- [14] Cook DA. The Research We Still Are Not Doing: An Agenda for the Study of Computer-Based Learning. Acad Med 2005; 80(6):541–8.
- [15] Friedman CP. The research we should be doing. Acad Med 1994;69(6):455–7.
- [16] Ruiz JG, Mintzer MJ, Leipzig RM. The impact of E-learning in medical education. Acad Med 2006;81:207–12.
- [17] Trukhacheva N, Pupyrev N. Blended-learning strategy in the Altay State medical university. Stud Health Technol Inf 2012; 174:72–5.
- [18] Abrusch J, Marienhagen J, Böckers A, Gerhardt-Szép S. Quality management of eLearning for medical education: current situation and outlook. GMS Z Med Ausbild 2015; 32(2):1–6.
- [19] Houri D, Watanabe T, Hayashi K, Kurozawa Y. Evaluation of an elearning distance education system in the graduate school of medical sciences of tottori university. Yonago Acta Med 2012;55(4):69–73.
- [20] Yilmaz R. Exploring the role of E-learning readiness on student satisfaction and motivation in flipped classroom. Comput Hum Behav 2017;70:251–60. <https://doi.org/10.1016/j.chb.2016.12.085>.
- [21] Mukhtar K, Javed K, Arooj M, Sethi A. Advantages, Limitations and Recommendations for online learning during COVID-19 pandemic era. Pakistan J Med Sci 2020;36(COVID19-S4): S27–31. <https://doi.org/10.12669/pjms.36.COVID19-S4.2785>.
- [22] Ortega-Morán J-F, Pagador B, Maestre-Antequera J, Arco A, Monteiro F, Sánchez-Margallo FM. Validation of the online theoretical module of a minimally invasive surgery blended learning course for nurses: A quantitative research study. Nurse Educ Today. Published online 2020:104406. <https://doi.org/10.1016/j.nedt.2020.104406>.