



# Identifying and Prioritizing the Educational Needs Professors of Medical Sciences in the Field of E-Learning with the Analytic Hierarchy Process Approach

Saiedeh Abbasi <sup>1</sup>, Sara Bagheri <sup>1</sup>, Zohrehsadat Mirmoghtadaie <sup>2</sup>, Zohreh Khoshgoftar <sup>1,\*</sup>

<sup>1</sup> Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup> Department of Electronic Learning, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

\*Corresponding Author: Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: [bkhoshgoftar7@gmail.com](mailto:bkhoshgoftar7@gmail.com)

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## Abstract

**Background:** Professors in universities and educational institutions hold a crucial role in crafting educational approaches utilizing cutting-edge technologies. They need to possess significant expertise in e-learning and tackle the obstacles associated with delivering education and utilizing Information and communication technologies within higher education. To effectively navigate these challenges and adaptations, professors need to equip themselves with new educational techniques through training and readiness to adeptly incorporate emerging technologies into their teaching practices, thus enhancing the educational journey for students. By identifying, understanding, and ranking professors' requirements and preferences, effective and diverse educational initiatives can be tailored to meet their needs.

**Objectives:** This research aimed to recognize the educational needs of medical science professors in the field of e-learning from the experts' point of view and prioritize these needs utilizing the analytic hierarchy process (AHP).

**Methods:** This practical study was conducted in 2022 using a process-oriented approach and AHP. The main stages included the creation of a hierarchical structure, comparative judgment, and determining priorities. In the first step, 13 criteria were identified, which were derived from scientific articles and previous research. In the second step, the pairwise comparison matrix was used for comparative judgment, and the weight of each criterion was calculated. The third step involved determining priorities based on the weight of each criterion and the inconsistency ratio. The participants of this study included professors of basic and clinical sciences from different faculties.

**Results:** The results of this study demonstrated that from the point of view of experts and participants, among the 13 criteria, the skills of virtual teaching (with weights of 0.146 and 0.148), electronic content production (with weights of 0.093 and 0.092), and holding online training courses (with the weights of 0.092 and 0.100) formed the three main needs of medical science professors in the field of e-learning and had the highest degree of importance and necessity compared to other criteria.

**Conclusions:** Identifying the educational needs of medical science professors for organizing and designing necessary programs to enhance knowledge, skills, and empowerment will lead to improving the quality of e-learning, and eventually, reducing professors' concerns in this area.

**Keywords:** Medical Faculty, Empowerment, Distance Education, Analytic Hierarchy Process, Medical Education

## 1. Background

In the modern era, e-learning refers to the utilization of information and communication technology in the learning process. This educational approach, rooted in computer and information technology, provides the

possibility of creating new methods in the education process (1). E-learning stands as a transformative model that has revolutionized university education. Since the 1960s, e-learning has undergone significant advancements and diversification across different fields, such as business, commerce, and education. Presently,

the term "e-learning" refers to the provision of flexible Internet-based education within higher education and business sectors (2). This mode of education is linked with enhancing productivity, reducing costs, and increasing access to educational materials. E-learning encompasses an array of concepts and processes, comprising computer-based learning, web-based learning, virtual classrooms, and digital collaboration (3). Since the digital environment provides the ability to actively interact and have diverse educational resources, e-learning has significant importance in the digital age. Different e-learning methods have been chosen for adoption in universities and organizations, such as combining in-person teaching with technology, flipped classrooms, blended learning, and synchronous and asynchronous learning (4). E-learning is aimed at achieving universities' strategic educational and research objectives and supporting professional growth within organizations. The flexible and adaptable nature of e-learning systems allows the enhancement of educational courses. Over time, e-learning has played a significant role in the evolution of the educational system by overcoming the limitations of traditional learning, providing equal educational opportunities independent of place and time, offering personalized learning opportunities, and granting access to a wide range of educational resources (5). E-learning has had a significant impact on medical education owing to its diverse advantages. Medical education, as a part of higher education, is responsible for transferring knowledge, attitudes, and skills necessary for students to master job qualifications (6). Higher education institutions and colleges are trying to employ e-learning to optimize the learning process. These efforts are aimed at effectively and correctly implementing the learning process and improving the quality and effectiveness of training in medical education. The emergence of virtual schools, virtual universities, e-learning, and online certificates is indicative of the fact that e-learning is recognized as a determining educational tool in universities (7). E-learning makes better use of new knowledge and improves teaching in universities of medical sciences (8). The significant impact of e-learning technology on medical sciences has been documented, highlighting the examination of these effects in depth. To elaborate, research institutes and universities, such as Stanford University and the University of Tennessee, have provided promising results about blended learning mechanisms in the medical field. Research shows that blended learning, which involves combining traditional methods with electronic methods, has numerous advantages over traditional educational methods (6). In Iran, the

Ministry of Health, Treatment, and Medical Education has also announced the package for the development of e-learning to medical universities nationwide in the transformation and innovation in medical science education. This package aims to enhance e-learning in medical sciences, and universities have endeavored to achieve this goal through training human resources, regulating laws, encouraging and motivating, producing electronic content, and providing the necessary infrastructure (9). Moreover, with the spread of COVID-19, many universities have turned to using online and distance education. This experience demonstrates the importance and necessity of using e-learning experiences in crises and unexpected situations, such as virus outbreaks (10). Global transformations and critical issues can play a key role in the development and progress of e-learning in medical sciences. Although the use of e-learning in medical universities is variable, it appears to be more common in basic medical science courses than in clinical education (11).

Considering the advancement of technology and international transformations, paying attention to electronic learning and educational innovations in the field of medicine is one of the basic priorities of educational programs in universities and educational institutions. Since the quality of education is one of the fundamental factors in improving healthcare services, professors hold the responsibility of teaching and training students correctly and efficiently (12). The role of professors in every university and institution is critical in offering educational solutions using new technologies. Therefore, they should possess remarkable abilities in the field of e-learning (13). In today's communication-driven and technologically advanced world, professors in universities are encountering significant challenges in effectively using information technologies and e-learning (14). The fast-paced evolution of technology necessitates that professors not only become proficient in modern communication tools but also continuously update their skills (15, 16). They face hurdles in preparation and training, requiring them to adapt to these changes. A key indicator of quality in e-learning is professors' ability to effectively use the necessary technologies (17). Therefore, they need adequate training and innovative teaching methods to leverage new technologies and enhance the educational experience for their students. Addressing these needs involves offering a range of educational programs, such as workshops, seminars, online conferences, short courses, and self-study options. Educational workshops are particularly popular for professional development among professors at universities worldwide (18).

However, the implementation of educational courses is subject to educational planning based on the needs of the learners so that it leads to active and successful learning (19). Identifying the opinions, needs, and preferences of professors is a necessity for designing educational courses and determining educational topics and priorities. Besides that, in educating adults, recognizing their needs makes the implementation of educational courses more effective (20). Therefore, conducting needs assessments plays a crucial role in the design of educational programs to address the real needs of individuals and special groups and meet the goals of the desired situation (21). This process involves the collection and analysis of information based on the real needs of people and target groups to design and implement the training programs necessary to achieve the intended goals and situation (22). The more this needs assessment is done in a principled, correct, factual, and accurate manner, the better and more desirable the decision-making and educational planning process will be (10). One of the important methods in assessing needs and prioritizing educational needs is the analytical hierarchy process (AHP). Analytic hierarchy process is a multi-criteria decision-making method that can be employed in solving complex problems at different levels in a simpler way (23). In this method, different needs and goals are evaluated and prioritized using quantitative and qualitative criteria. Once the needs and preferences of professors have been identified and prioritized using the AHP technique, tailored educational programs can be created to effectively cater to their needs. Therefore, the present study aimed to identify the educational needs of medical science professors in the field of e-learning from the experts' point of view and then prioritize them using the AHP.

## 2. Objectives

(1) To identify the educational needs of medical science professors in the field of e-learning, as perceived by experts.

(2) To prioritize the identified educational needs of medical science professors in e-learning using the AHP methodology.

## 3. Methods

### 3.1. Study Design

This applied study was based on a quantitative research design with a process-oriented approach using the AHP. The study aimed to make decisions about the

educational needs of medical science professors in the field of e-learning. The study was conducted in three basic stages: Creation of a hierarchical structure, comparative judgment, and determination of priorities.

First stage: Creation of a hierarchical structure: A total of 13 criteria were identified to evaluate the goal of identifying and prioritizing the educational needs of medical science professors in e-learning (Appendix 1 in Supplementary File). Symbols A to M represent each criterion, including familiarity with netiquette rules, familiarity with material and intellectual property, skill in working with learning management systems, skill in working with educational software, skill in using electronic resources, virtual teaching skill, skill in managing the virtual learning environment, familiarity with electronic student assessment methods, skill in providing virtual feedback, skill in conducting online training courses, familiarity with interacting in an electronic environment, skill in producing electronic content, and familiarity with monitoring student progress. These criteria were derived from scientific articles and previous research. In general, the criteria and sub-criteria are obtained from the analysis of previous studies, and the hierarchical structure or hierarchical tree is compiled with the criteria at the higher levels and the sub-criteria at the lower levels. However, since no sub-criteria were included in this study, only one level was used to compare, weigh, and prioritize the criteria.

Second stage: Comparative judgment: In this stage, to compare and determine the importance of the criteria, a second section of the questionnaire was prepared and distributed in line with the AHP format for pairwise comparison of the criteria based on the opinions of the study participants. The comparison of these 13 criteria was done by emphasizing their importance and necessity, using a  $13 \times 13$  pairwise comparison matrix. The questions in the second part of the questionnaire were compared between the first and second groups (Appendix 1 in Supplementary File provides the pairwise comparison of criteria A and B). The 9-point scale of Saaty was used, with 1 indicating equal importance and 9 indicating the highest importance or preference. If the second group was preferred over the first, the inverse of the scale (1 to 9) was used. A binary comparison was then made between each of the criteria (24, 25).

After entering the pairwise comparison matrices of the criteria into the Expert Choice software, the weight of each criterion was calculated using this software. The weight of each factor indicates its importance and value compared to other factors. This careful and precise

selection of weights by the participants significantly contributed to determining the desired goal (26). After obtaining the pairwise comparison matrix, the inconsistency ratio was calculated, serving as an index to identify potential contradictions in the pairwise comparison matrix. According to Saaty (24), who developed the AHP method, an inconsistency ratio below 0.1 indicates that the consistency of the comparison matrix is acceptable. On the other hand, a value greater than 0.1 signifies contradictions in the evaluation and judgments of experts. For example, in a consistent pairwise comparison, if A is better than B and B is better than C, then A must also be better than C (27).

Third stage: Determination of priorities: In this stage, several operations were performed in the Expert Choice software to determine priorities. First, the normalized matrix was calculated based on the pairwise comparison matrix, enabling the collective measurement of the indicators and their ranking. After calculating the normalized matrix, the priority vector was obtained by averaging the weight of each criterion. The priority vector was then multiplied by the comparison matrix to yield the matrix of all priorities. Once the matrix of priorities was determined, the criteria were ordered and ranked based on their importance, weight, and inconsistency.

### 3.2. Participants and Sampling

The target population consisted of professors from various faculties affiliated with Shahid Beheshti University of Medical Sciences who had experience with virtual education from 2020 to 2022. Participants were selected using a purposive sampling method. Faculties included in the study were the Faculty of Medicine, Faculty of Health and Safety, Faculty of Nursing, Faculty of Paramedicine, Faculty of Pharmacy, Faculty of Dentistry, Faculty of Traditional Medicine, Faculty of Nutrition, Faculty of Rehabilitation, Faculty of New Technologies, and Faculty of Medical Education and Learning Technologies. Professors were selected from these faculties based on their scientific ranks (professor, associate professor, assistant professor, and instructor), as well as heads of Education Development Centers, educational deputies, heads of academic departments, and professors with at least two years of teaching experience in the Navid electronic learning systems or other virtual platforms.

This group of individuals was included in the study since they had the most insight into the educational needs of professors within the e-learning field. The AHP method can be applied both to an individual and to a group of individuals (26). As this method relies on

experts' opinions, and the number of participants should range between 5 and 20 (28, 29), 18 representatives from the statistical population (faculty members) were selected. Exclusion criteria were not being a faculty member at Shahid Beheshti University of Medical Sciences and lacking experience in virtual training between 2020 and 2022.

### 3.3. Tools

The first section of the current questionnaire consisted of professors' demographic information, such as gender, position, educational background, age, and work experience. The second section was dedicated to comparing the 13 identified criteria regarding the educational needs of professors in e-learning. The content validity of the questionnaire was confirmed by experts, and its reliability was calculated by Cronbach's alpha coefficient of 0.96 using SPSS software. A pilot test was conducted on a sample of seven professors who completed the questionnaire. The accuracy and reliability of the AHP were evaluated using the inconsistency ratio. An inconsistency ratio of less than 0.1 is a measure indicating accurate answers from participants. If the inconsistency ratio is higher, it signals inaccuracies in responses, requiring re-evaluation. In AHP, it is essential to calculate and report the inconsistency ratio (26, 29). Expert Choice software was used for these calculations. Reliable results are indicated by an inconsistency ratio of less than 0.1; higher values necessitate adjustments to ensure consistency.

### 3.4. Data Collection Methods

The initial data for this study were collected through a questionnaire. After determining the sample size, the questionnaires were electronically distributed via email and social media platforms to 18 participants, ensuring ease of access.

### 3.5. Data Analysis

Using the AHP technique, the educational needs of medical science professors in the field of e-learning were analyzed and ranked based on their importance and necessity. Expert Choice software was used to interpret and calculate AHP results. Descriptive statistics were used to describe the demographic variables.

### 3.6. Ethical Considerations

Ethical considerations were fully observed throughout the research process. The research received ethical approval from the relevant institutional review

board (ethical code: [IR.SBMU.SME.REC.1400.068](#)). The study respected cultural values, participants' rights, honesty, diversity of beliefs, and confidentiality of information. Informed consent was obtained from all participants, and they were informed of their right to withdraw from the study at any stage.

#### 4. Results

In this study, females accounted for 11 (61%) of the respondents. Considering academic rank, 1 (6%) of the participants were lecturers, 8 (44%) were assistant professors, 5 (28%) were associate professors, and 4 (22%) were professors. Regarding educational degrees, 2 (11%) of the samples had a master's degree, 1 (6%) had a doctoral degree, and 15 (83%) had a PhD degree. The number of 10 (53%) respondents were in the age group of 36 to 45 years, and 7 (39%) had work experience of 11 to 15 years. In this study, the educational needs of medical science professors in the field of e-learning were prioritized based on importance and necessity. For this purpose, the participants compared the identified criteria using a questionnaire. After entering the pairwise comparison table of the importance of the criteria in the Expert Choice software, the software calculated the weight of each criterion based on the relative importance of the target decision-makers. The value of the inconsistency ratio was obtained at 0.01, which was less than 0.1, indicating the lack of contradiction in the evaluation and judgments of the participants; therefore, the comparisons made were confirmed.

[Table 1](#) presents the weight of each criterion based on their importance and order of prioritization. Moreover, [Figure 1](#) displays the prioritization of criteria based on importance. The obtained results showed that from the point of view of experts and participants, virtual teaching skill was the most important educational need of professors in the field of e-learning with the highest weight of 0.146. This need was considered the most important priority for empowering professors in this field, which should be taken into consideration by the planners. In the following, with a significant difference, the skill of producing electronic content (weighed at 0.093) and the skill of conducting online training courses (weighed at 0.092) took the second and third places in prioritizing the educational needs of professors in the field of e-learning in terms of importance.

According to the opinions of the experts, familiarity with electronic student assessment methods (weighed at 0.088), the skill of working with learning management systems (weighed at 0.082), and the skill

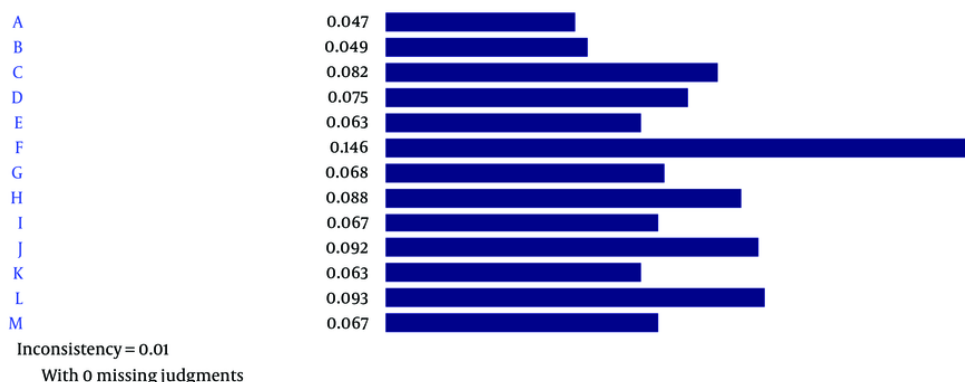
of working with educational software (weighed at 0.075), respectively, were ranked as the fourth to sixth educational needs of the professors. Furthermore, the skill of managing the virtual learning environment (weighed at 0.068), familiarity with how to monitor student progress (weighed at 0.067), the skill of providing virtual feedback (weighed at 0.067), the skill of using electronic resources (weighed at 0.063), and familiarity with how to interact in an electronic environment (weighed at 0.062) were categorized as the subsequent priorities. According to the participants, familiarity with material and intellectual property (weighed at 0.049) and familiarity with netiquette rules (weighed at 0.047) were the least important.

Upon entering the pairwise comparison table of the criteria's necessity in the Expert Choice software, the weight of each criterion was calculated using this software. The value of the inconsistency ratio was obtained at 0.02, which was less than 0.1, indicating the lack of inconsistency in the evaluation and judgments of the participants, and therefore approving the comparisons made. In [Table 2](#), the weight of each criterion is reported based on their necessity and order of prioritization. Moreover, [Figure 2](#) illustrates the prioritization of criteria based on necessity. The participants ranked virtual teaching skills as the top priority among the educational needs of professors in e-learning (highest weight = 0.148). The participants considered this index the most necessary one that should be taken into account in designing teacher empowerment courses. With a relatively significant difference with the first priority, the skill of conducting online courses (weighed at 0.100) and the skill of producing electronic content (weighed at 0.092) took the second and third places. Based on the findings of the present research, the skill of working with learning management systems (weighed at 0.086) formed the fourth position in terms of necessity.

The following three priorities belonged to the skill of managing the virtual learning environment (weighed at 0.079), familiarity with electronic student assessment methods (weighed at 0.078), and the skill of working with educational software (weighed at 0.076). Additionally, the results of this research indicated that, according to the participants, the skill of providing virtual feedback (weighed at 0.067), familiarity with how to monitor student progress (weighed at 0.065), the skill of using electronic resources (weighed at 0.062), and familiarity with how to interact in an electronic environment (weighed at 0.057) formed the 8th to 11th positions in terms of necessity. According to the participants, the two indicators of familiarity with

**Table 1.** Weighting of Each Criterion Relative to the Goal Based on Importance and Prioritization

Criterion	Symbol	Rank	Weight
Virtual teaching skill	F	1	0.146
Skill of producing electronic content	L	2	0.093
Skill of conducting online training courses	J	3	0.092
Familiarity with electronic student assessment methods	H	4	0.088
Skill of working with learning management systems	C	5	0.082
Skill of working with educational software	D	6	0.075
Skill of managing the virtual learning environment	G	7	0.068
Familiarity with how to monitor student progress	M	8	0.067
Skill of providing virtual feedback	I	9	0.067
Skill of using electronic resources	E	10	0.063
Familiarity with how to interact in an electronic environment	K	11	0.062
Familiarity with material and intellectual property	B	12	0.049
Familiarity with netiquette rules	A	13	0.047



**Figure 1.** Prioritization of criteria based on importance

netiquette rules (weighed at 0.050) and familiarity with material and intellectual property (weighed at 0.039) were ranked as the lowest priorities and had the least necessity.

**5. Discussion**

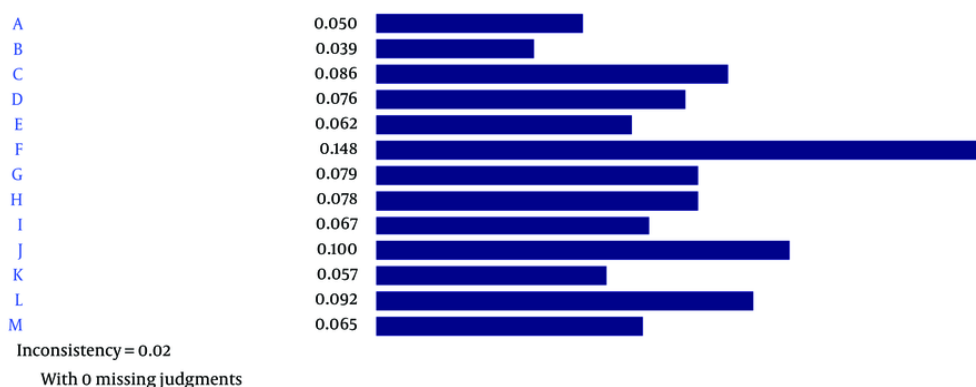
The results of this study outlined the priority of professors' educational needs in the field of e-learning. Based on the experiences and perceptions of the participants, the educational needs of professors in e-learning, in terms of importance, included the skill of virtual teaching, the skill of electronic content production, the skill of holding online courses, familiarity with methods of electronic student assessment, the skill of working with learning

management systems, the skill of working with educational software, the skill of managing the virtual learning environment, familiarity with how to monitor student progress, the skill of providing virtual feedback, the skill of using electronic resources, familiarity with how to interact in the electronic environment, familiarity with material and intellectual property, and familiarity with netiquette rules.

In terms of necessity, the educational needs of professors were prioritized as follows: The skill of virtual teaching, the skill of holding online courses, the skill of electronic content production, the skill of working with learning management systems, the skill of managing the virtual learning environment, familiarity with electronic student assessment methods, the skill of

**Table 2.** Weighting of Each Criterion Relative to the Goal Based on Necessity and Prioritization

Criterion	Symbol	Rank	Weight
Virtual teaching skill	F	1	0.148
Skill of conducting online training courses	J	2	0.100
Skill of producing electronic content	L	3	0.092
Skill of working with learning management systems	C	4	0.086
Skill of managing the virtual learning environment	G	5	0.079
Familiarity with electronic student assessment methods	H	6	0.078
Skill of working with educational software	D	7	0.076
Skill of providing virtual feedback	I	8	0.067
Familiarity with how to monitor student progress	M	9	0.065
Skill of using electronic resources	E	10	0.062
Familiarity with how to interact in an electronic environment	K	11	0.057
Familiarity with netiquette rules	A	12	0.050
Familiarity with material and intellectual property	B	13	0.039



**Figure 2.** Prioritization of criteria based on necessity

working with educational software, the skill of providing virtual feedback, familiarity with how to monitor student progress, the skill of using electronic resources, familiarity with how to interact in the electronic environment, familiarity with the rules of netiquette, and familiarity with material and intellectual property. These results are consistent with a study conducted to investigate the needs of teachers for online education in South Carolina. In the mentioned research, the basic educational needs were training in instructional design, preparation of instructional content, the use of technology tools, methods of establishing interaction, and evaluation techniques in online courses (30). In both studies, emphasis was placed on training and empowering professors to effectively use e-learning tools and technologies.

Examining the results of the present study highlighted the critical importance of addressing the educational needs of professors in the field of e-learning. Considering the importance of virtual teaching skills and holding online training courses, professors would be able to provide a better educational experience and increase the learning rate of students. The skills of producing electronic content and working with learning management systems play a crucial role in improving the quality of electronic learning. Besides that, familiarity with electronic student assessment methods and the skill of virtual learning environment management provide the possibility of monitoring student progress and giving appropriate feedback in electronic training courses.

The findings of the current study revealed that the priority and importance of needs might vary among professors. Narenji et al. conducted a study to identify the educational needs of professors regarding e-learning. While the results of the mentioned research demonstrated that professional and ethical commitments were a high-priority need for professors, those of the present study indicated that this factor was deemed the lowest priority from the experts' point of view. This discrepancy in the results can be attributed to factors such as environmental conditions, specific needs of institutions, and differences in organizational culture. This finding could be considered an interesting topic for further research (31). Based on the results of a study conducted by Rahmani et al. to rank factors affecting the development of e-learning in higher education, it is recommended to prioritize not only the content quality, structure management, education process, software infrastructure, and hardware infrastructure but also consider the characteristics of both the students and instructors as the utmost priority (32). Mocaripour et al. observed in their research that the existence of meaningful interaction between the level of skill, knowledge, and attitude of students and professors was vital. Therefore, to effectively implement e-learning, it is essential to have the appropriate infrastructure, meet necessary standards, and conduct educational workshops (33).

In the present study, various factors of educational needs in the field of e-learning have been identified based on their importance and necessity. This needs analysis can be used in the formulation and design of empowerment courses leading to the improvement of professors' skills and knowledge and the advancement of education. In general, the skills of developing virtual teaching, holding online training courses, and producing electronic content are recognized as the first three priorities in terms of importance and necessity. This means that professors must be able to convey educational concepts virtually and hold online training courses. This skill entails developing topics, designing activities and exercises, managing time, properly organizing content, and communicating with students. Professors must also be able to produce diverse and engaging electronic content, such as PowerPoint presentations, audio files, and other educational resources tailored to the needs of students.

In this regard, some studies have been dedicated to determining the key factors contributing to the success of e-learning initiatives in developing nations. The identified factors comprised boosting the level of technological awareness and attitude towards e-

learning, increasing fundamental knowledge and skills in basic technology, enhancing the quality and effectiveness of learning content, the need for computer training, motivating the adoption of e-learning, educational environment analysis, and ensuring the user-friendliness of e-learning platforms (34-38).

The present study faced several limitations. First, this study mainly focused on developing countries; therefore, the results and conclusions cannot be generalized to other countries. Second, this study intended to consider only the educational needs of professors and did not encompass other effective factors in the e-learning process, such as cultural and social factors. Third, this study was prepared utilizing the existing results and findings within a constrained timeframe. Therefore, there is a possibility of emerging new trends and developments in the area of e-learning and the educational needs of professors, which should be compared with the current situation in future research. One of the notable strengths of this study is its use of the AHP within a quantitative, process-oriented framework to effectively identify and prioritize the educational needs of medical science professors in e-learning. It is suggested that these findings be employed by the Education Development Centers of Medical Education to design the necessary programs aimed at improving the knowledge, skills, and empowerment of professors. It is also recommended that these needs be met by holding educational workshops and webinars along with preparing videos and various educational content. Professors are also required to acquire essential competencies in terms of technical knowledge, working with the system, content creation, and communicative, interactive, and electronic skills. These measures would ease their concerns regarding virtual education.

The results of this study can be deemed as an effective step in the promotion of electronic education and learning in the university, which can improve the teaching-learning process across the universities in Iran. Future research should assess the lasting effectiveness of these developed skills and their influence on teaching methods and student achievements. Comparative studies across various medical science fields could uncover particular challenges, allowing for more targeted support. Furthermore, investigating the incorporation of new technologies in e-learning could identify additional skills needed by faculty. Lastly, qualitative approaches, such as interviews or focus groups, could improve comprehension of faculty experiences and obstacles in implementing e-learning practices.



### 5.1. Conclusions

In general, the present study highlights the importance of addressing the diverse educational needs of professors for advancing e-learning in university settings. These needs encompass technical skills, instructional strategies, learning environment management, and effective communication with students. By recognizing and effectively satisfying these needs, the enhancement of learning quality can be ensured.

### 5.2. Highlights

**Targeted Training Programs:** Develop tailored professional development courses focusing on virtual teaching skills, electronic content production, and online training facilitation, addressing professors' specific needs.

**Enhanced E-Learning Strategies:** Implement evidence-based e-learning strategies that leverage the identified educational needs to improve the effectiveness and engagement of medical education.

**Continuous Needs Assessment:** Establish a framework for ongoing assessment of professors' educational needs, ensuring adaptability to emerging technologies and educational trends in medical sciences.

### 5.3. Lay Description

In our research, we explored the educational needs of medical science professors regarding e-learning. We found that the most important skills they need include teaching effectively in a virtual setting, creating engaging online content, and conducting online courses. By focusing on these areas, professors can enhance their teaching and provide a better learning experience for students. Our study highlights the need for tailored training programs to help professors develop these skills, ultimately improving the quality of online education in medical sciences. This approach can help professors feel more confident and effective in using technology to teach.

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### Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal website and open PDF/HTML].

### Footnotes

**Authors' Contribution:** Study concept and design: Z. Kh.; acquisition of data: S. A.; analysis and interpretation of data: S. B., Z. Kh., and Z. M.; drafting of the manuscript: S. B., S. A.; critical revision of the manuscript for important intellectual content: Z. Kh., Z. M.; statistical analysis: Z. Kh., Z. M.; administrative, technical, and material support: Z. Kh., Z. M.; study supervision: Z. Kh.

**Conflict of Interests Statement:** Sara Bagheri is a reviewer of this journal. The team of authors did not use artificial intelligence to write this article.

**Data Availability:** The dataset presented in the study is available on request from the corresponding author during submission or after its publication. The data are not publicly available due to concerns regarding participant confidentiality and privacy.

**Ethical Approval:** This study is approved under the ethical approval code of (IR.SBMU.SME.REC.1400.068).

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**Informed Consent:** Informed consent was obtained from all participant.

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