



# Faculty perceptions and use of e-learning resources for medical education and future predictions

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**Purpose:** This study aims to investigate medical faculties' perceptions and current practice of using e-learning resources, needs and suggestions for more effective use of such resources, and future directions of e-learning in medical education.

**Methods:** This descriptive study was conducted on full-time faculty members who were registered users of the e-learning portal of the consortium of Korean medical schools. Participants were invited to an online survey containing 45 items that addressed their perceptions and use of e-learning resources, and their predictions of future use. Descriptive analysis and reliability analysis were conducted as well as a thematic analysis of qualitative data.

**Results:** Ninety faculty members from 31 medical schools returned the questionnaires. Participants positively perceived e-learning resources and that they predicted their use would become increasingly popular. Still, only half of the respondents were using e-learning resources for teaching and agreed that they were willing to share their e-learning resources. Our study illustrates several barriers inhibit faculty use and sharing of e-learning resources, and a need for a more comprehensive, better-organized resource repository. Participants also pointed out the needs for more resources on multimedia assessment items, clinical videos, and virtual patients.

**Conclusion:** Our study sheds light on medical faculty needs for institutional support and faculty development programs on e-learning, and institutional policies that address faculty concerns regarding ownership, intellectual property rights, and so forth on creating and sharing such resources. Collaborations among medical schools are suggested for creating a better organized around learning outcomes and more comprehensive repository of resources.

**Key Words:** Medical education, Teaching, Educational technology, Medical faculty

## Introduction

E-learning resources have become more popular in medical education with the abrupt transition to online education caused by the coronavirus disease 2019 (COVID-19) pandemic. Consequently, collaborative efforts have been made to offer medical students e-learning resources

for various instructional purposes [1–3]. E-learning resources benefit students by giving them opportunities to learn at any time and place [1] and enabling them to learn of state-of-the-art developments in medicine from world-class experts [4]. Furthermore, research indicates that online learning is more effective in enhancing medical students' knowledge and skills than traditional instructions [5,6].

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There is a growing importance of e-learning resources for today's medical students, who belong to the Generation Z. This generation is known to be "digital natives" who are immersed with digital technologies in how they live and work [7]. The generation Z students are generally more accustomed to digital learning resources using various media and ubiquitous technologies than traditional textbooks [8]. Faculty need to understand the learning needs of this new generation and offer teaching and learning methods that are suited to their learning needs [8]. Still, little is known about faculty perceptions and their current practice of using e-learning resources for their teaching, and we need to understand what motivates and inhibits their adoption of such practices to promote more active use of e-learning resources in their teaching.

Despite the increasing popularity and importance of e-learning resources, there are several challenges for medical teachers in creating and sharing such resources. A recent study on medical faculty found that insufficient quality or inappropriate attribution of e-learning resources were barriers to their sharing of teaching resources even though they perceived e-learning resources promoted student learning [9]. Moreover, creating a repository of e-learning resources for medical students would consume a great deal of faculty time and effort, and medical schools often face with limited resources for providing support for such faculty activities [10,11].

Several studies have shown medical students have positive perceptions of e-learning resources and use them extensively [12–15], but research on faculty perceptions and their use of these resources has been limited. Furthermore, research is warranted on faculty perceptions and experiences of e-learning resources as it is fundamental to their adoption of pedagogical changes suited for the changing environment of medical education [16]. Herein, we investigated medical faculties' perceptions and uses of e-learning resources for medical education and their

future projections. Our study aims to shed light on the current practice of e-learning by medical faculty, which have practical implications for fostering their use of such resources and for navigating the directions of e-learning developments in the future.

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## Methods

### 1. Study sample and settings

This descriptive study was conducted of medical faculty nationwide. The study sample was approximately 2,500 full-time faculty members from 36 medical schools in South Korea. These medical teachers were registered users of the e-learning portal of the consortium of Korean medical schools, e-MedEdu ([www.mededu.or.kr](http://www.mededu.or.kr)) [17]. This e-learning portal offers a repository of over 1,700 online resources in basic and clinical medicines, to which approximately 250 medical teachers have contributed since 2008, with an average annual website hit of over 200,000. The resources available in this portal include clinical cases, images, videos, sounds, online modules, and multimedia assessment items. The study sample was selected to draw the sample representative of medical schools of various types across the nation and spans across various academic backgrounds and teaching experiences.

### 2. The research instrument

We developed a questionnaire to measure participants' perceptions, usages of e-learning resources, and their predictions of future use. This 45-item questionnaire included seven items on participant demographics and backgrounds, and 15 items that addressed their perceptions of e-learning, which were adapted from the "Learning Object Evaluation Scale for Teachers" scale [18]. We translated the original instrument into Korean and val-

idated the translated version in a previous study [19]. The items on participant perceptions of e-learning comprised five sub-scales, namely, (1) usefulness of e-learning, (2) quality of content, (3) student engagement in e-learning, (4) overall satisfaction with e-learning, and (5) self-efficacy on using e-learning resources for teaching. Another five items solicited participant predictions for the future use of e-learning resources. Participants rated their responses using a 5-point Likert scale (1="strongly disagree", 5="strongly agree"). In another items, participants were asked to respond on how they used e-learning resources and the reasons for not using them by choosing one or more answers from a list of response options (Appendix 1). Additionally, an open-ended item was included to elicit respondent perceptions and suggestions regarding e-learning. To ensure the content validity of the research instrument, two researchers (experts in e-learning and medical education) reviewed and offered feedback on items in the instrument.

### 3. Study procedures and ethical considerations

We invited the participants to complete the self-administered questionnaire. Questionnaires were distributed by e-mail in an online format during the spring of 2021. To avoid non-response bias, we encouraged responses by offering financial incentives and sending frequent reminders via e-mail, as suggested by Phillips et al. [20].

Questionnaires were administered after obtaining permission from the Institutional Review Board (IRB) of Dongguk University, Gyeongju, Korea (IRB no., 2021 0004). Informed consent forms were not required by the IRB, and it was waived. Instead, researchers provided all participants with a description of the purpose and methods of the study, stressed participant rights regarding voluntary participation in the study, and assured them of

personal confidentiality in the beginning of the online survey.

## 4. Data analysis

Questionnaire responses were subjected to descriptive analysis, and reliability analysis (Cronbach's  $\alpha$ ) was performed to evaluate the internal consistencies of items. IBM SPSS Statistics for Windows ver. 27.0 (IBM Corp., Armonk, USA) was used for the data analysis. Qualitative data were obtained from responses to the open-ended question regarding faculty needs for e-learning resources for triangulation of data sources. Thematic analysis was performed to identify emerging themes from the qualitative data [21]. Initial thematic analysis was conducted by the first author (K.J.K.) by coding and grouping data sources, and subsequent discussions were held by the research team for extraction and finalization of themes. To establish study trustworthiness, the results of the thematic analysis were audited by a panel of medical educators.

## Results

### 1. Respondent demographics and perceptions of e-learning

Ninety faculty members from 31 medical schools of various types (public and private) and sizes across the nation returned the questionnaires (a response rate of approximately 3.6%). Table 1 summarizes the demographics and backgrounds of the study participants. Academic positions and disciplines varied; 39% were assistant professors, 31% were associate professors, and 29% were professors, and 81% worked in clinical medicine, 9% in basic medical sciences, and 10% in other disciplines, such as medical education and medical humanities. Most

of the participants (61%) had 6 to 20 years of teaching experience, 20% had less than 5 years, and 19% had taught for over 20 years. Participant experience with the e-MedEdu portal also varied, though around two-thirds had used it for 1-10 years.

Table 2 presents participants' responses to items on their perceptions of e-learning and the reliabilities of each sub-scale. Respondents generally agreed with statements that e-learning was useful for student learning and that content quality was adequate and agreed with the statement

Table 1. Respondent Demographics and Backgrounds (n=90)

Characteristic	No. of respondents (%)
Sex	
Female	27 (30.0)
Male	63 (70.0)
Age (yr)	
30s	7 (7.8)
40s	52 (57.8)
50s	29 (32.2)
≥60s	2 (2.2)
Academic position	
Assistant professor	26 (28.9)
Associate professor	28 (31.1)
Professor	35 (38.9)
Others	1 (1.1)
Teaching experience (yr)	
<5	18 (20.0)
6-10	72 (25.8)
11-20	34 (37.8)
>20	27 (9.7)
e-Learning experience (yr)	
<1	1 (20.0)
1-5	31 (54.4)
6-10	29 (32.2)
>10	12 (13.3)

they were satisfied with e-learning, where the median responses were 4. The median responses to student engagement in e-learning and the self-efficacy of e-learning ranged from 3.33 to 3.67. Cronbach's  $\alpha$  values of the instrument were >0.8 for all five subscales, which demonstrated acceptable levels of reliability.

## 2. Respondent usages of e-learning resources

Approximately half of the respondents (n=49) reported they used e-learning resources for teaching. In terms of how the respondents use e-learning resources, some answered that they cited the resources as references in their teaching materials (n=42, 47.2%), some used them as references when they prepared for teaching (n=40, 44.9%), and others used them for their lectures (n=33, 37.1%) or for materials to support pre-class learning activities (n=31, 34.8%). As regards those who were not using e-learning resources, the most frequently selected responses for the reason were "a lack of resources relevant to my lectures" (n=27, 45.0%), "unaware of their availability" (n=15, 25.0%), and "lack of time to use them during class" (n=13, 21.7%).

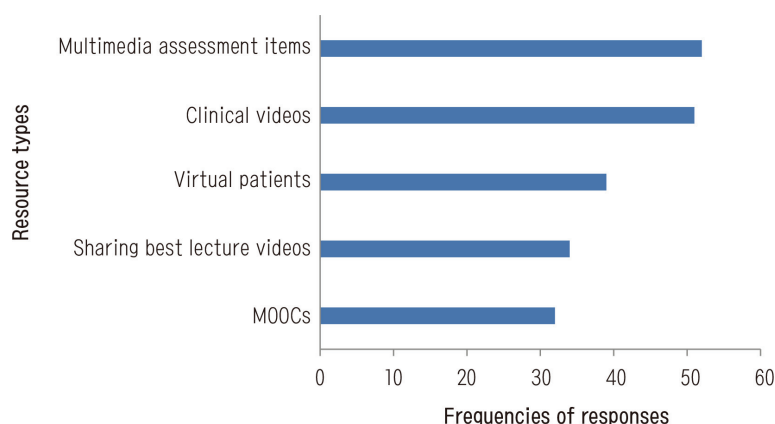
Fig. 1 summarizes participant responses regarding e-learning resources that need to be developed and shared. Over half of the respondents pointed out a need for more resources on multimedia assessment items and clinical videos. Others also chose virtual patients, which was followed by sharing best lecture videos across institutions

Table 2. Respondent Perceptions of e-Learning Resources (n=90)

Sub-scales	Mean $\pm$ SD	Median	Reliability (Cronbach's $\alpha$ )
Usefulness for learning	4.09 $\pm$ 0.54	4.00	0.82
Quality of the content	3.88 $\pm$ 0.60	4.00	0.84
Student engagement	3.45 $\pm$ 0.79	3.33	0.89
Overall satisfaction	3.97 $\pm$ 0.78	4.00	0.88
Self-efficacy of e-learning use	3.62 $\pm$ 0.88	3.67	0.91

The items were scored using a 5-point scale, where 1="strongly disagree," and 5="strongly agree."  
SD: Standard deviation.

Fig. 1. Faculty Needs on More e-Learning Resources



MOOCs: Massive Open Online Courses.

Table 3. Participants' Future Predictions of Their Use of e-Learning Resources (n=90)

Items	Mean ± SD	Frequency (%)		
		Disagree	Neutral	Agree
e-Learning will be used more in medical education in the future.	4.45±0.60	0	5 (5.9)	80 (94.2)
e-Learning resources will be used less when the COVID-19 pandemic ends.	2.17±1.04	68 (79.1)	9 (10.5)	9 (10.5)
I will use e-learning resources more frequently in my teaching.	4.03±0.82	4 (4.7)	15 (17.6)	66 (77.7)
I receive adequate support for developing e-learning resources.	3.02±1.04	23 (26.5)	40 (46.5)	24 (27.9)
I am willing to share my teaching resources in the e-learning portal.	3.52±0.91	7 (8.1)	36 (41.9)	43 (50.0)

The items were scored using a 5-point scale, where 1="strongly disagree," 5="strongly agree."  
SD: Standard deviation, COVID-19: Coronavirus disease 2019.

and open resources such as Massive Open Online Courses (MOOCs).

### 3. Respondent predictions of future e-learning use

Table 3 presents a summary of participants' future predictions for the use of e-learning resources. A vast majority of participants predicted more active use of e-learning resources in medical education. Still, less than 30% of the participants felt they were receiving enough institutional support to develop e-learning resources, and only half of them agreed that they were willing to share their resources.

### 4. Faculty needs and suggestions for e-learning resources

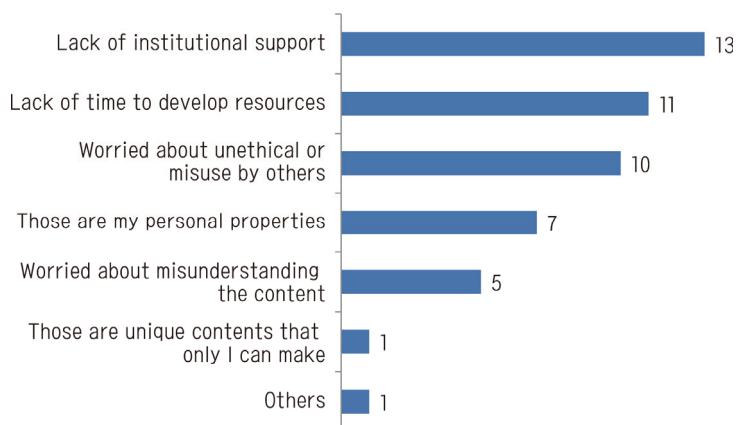
Fig. 2 shows reasons why faculty members are unwilling

to share their e-learning resources. Thirteen respondents (14.4%) cited lack of institutional support for creating resources, and 11 (12.2%) responded time pressures restricted the development of such resources. Others (25.6%) mentioned concerns regarding ownership, intellectual property rights, and unethical or inappropriate use by others. Based on the qualitative data collected, the following themes emerged regarding faculty needs and suggestions for effective use of e-learning resources.

#### 1) Usefulness of e-learning resources

Participants pointed out the benefits of e-learning and how they were using it during teaching. One participant commented that "I got to know the e-learning resources recently and found it useful to provide student with learning activities before class." Another participant stated that "audio clips were useful for me to develop multimedia items for student assessments."

Fig. 2. Reasons Why Faculty Members Are Unwilling to Share Their e-Learning Resources



**2) Needs for more comprehensive and better-organized resources**

Several participants called for a more comprehensive repository of learning resources and better organization of its contents. To expand the e-learning resources repository, some suggested “the contents need to be mapped with national standards for learning outcomes in basic medical education.” In particular, several participants stressed a need to create and share “multimedia assessment items to implement computer-based testing,” and videos on clinical procedures and patient encounters.

**3) Needs for faculty development programs**

Several participants commented on the need to better promote the e-learning portal to increase awareness among faculty members and students and provide information on how to use it for teaching and learning. In particular, some called for a faculty development program aimed at constructing multimedia assessment items.

and future directions of e-learning in medical education. We found the overall perceptions of medical faculty members of e-learning resources were more positive than those encountered in our previous study, in which we used the same research instrument [19]. Furthermore, most of our respondents predicted that the use of e-learning resources will become more popular in the future. Our findings seem to reflect the widespread adoption of online teaching and learning in medical education in response to the COVID-19 pandemic. Still, we found only half of the respondents were using e-learning resources for their teaching and many of them were reluctant to share the resources they created. These findings show similar faculty perceptions of their use and sharing of e-learning resources found in a previous Australian study [9].

Our study shows there are several barriers to medical faculties’ use and sharing of e-learning resources. First, some respondents were of the opinion they were not receiving adequate institutional support, which was also the most frequently selected reason for faculty reluctance to share e-learning resources. These findings warrant institutional support and highlight the needs for collaborative efforts by medical schools to overcome resource constraints, which can be especially challenging in low- and middle-income countries [22]. Second, some re-

**Discussion**

This study investigated medical faculties’ perceptions and current practice of using e-learning resources, needs and suggestions for more effective use of such resources,

spondents expressed concerns about issues regarding attributions such as ownership, intellectual properties, and unethical or inappropriate use by others. This finding calls for institutional policies to support medical faculties to resolve such issues. Third, our findings indicate that a more comprehensive repository of e-learning resources is needed. This finding is consistent with that of a rapid review of the status of medical education during the COVID-19 pandemic by Bastos et al. [23], which highlighted that lack of resources presents a barrier to online learning.

Our findings have implications for future directions in terms of content areas that we should focus on creating and sharing resources. Our respondents highlighted the need for more multimedia assessment items in the resource repository. This finding is consistent with a recent trend of an increasing popularity of assessment items among e-learning resources in medical education [24]. Furthermore, this finding appears to reflect the recent changes in the national licensing examinations in South Korea that has incorporated multimedia assessment items with the adoption of computer-based testing. Clinical videos were the second most popular response to questions concerning resources that need to be expanded more in the repository. These videos are known to be effective clinical education tools [12,25] and have been the most popular contents in e-MedEdu [26]. This finding reflects faculty perceptions concerning the effectiveness of clinical videos for student learning and the importance of using online resources for supporting student learning of clinical skills during the pandemic.

We also found respondents showed interest in the use of virtual patients, which have been known to provide an effective means of improving student learning outcomes [27]. This finding concurs with the assertion that virtual patients are expected to play an important role in meeting the challenges posed by the rapidly changing nature and

complexity of medical education [28]. Furthermore, our findings reaffirm the need for faculty development programs to support the creation and sharing of e-learning resources, which is consistent with a recent review on the impact of COVID-19 on medical education that highlighted the need for faculty development programs in support of their transition to online teaching [29].

Limitations of this study need to be acknowledged. First, the low response rate of our participants limits the generalizability of our findings. As mentioned above, we made several efforts to improve the response rate by sending several reminders, but the response rate was low compared to our sample size despite offering incentives. Nevertheless, we drew the cohort from a nationwide sample to achieve representativeness. As a result, our respondents represented 31 of 40 medical schools in South Korea and exhibited a diverse range of demographics (e.g., gender, ages, and academic positions), disciplines, and e-learning experiences. Second, the study was conducted in the Korean context, and thus, some of our findings may not be generalizable to other countries as the challenges and needs on e-learning resources may differ across countries. An international study is recommended to investigate generalizability of our findings across different contexts.

In conclusion, in this study, we investigated medical faculties' perceptions and use of e-learning resources to identify practical implications for fostering their use of such resources. We found medical faculty members positively perceived e-learning resources and that they predicted their use would become increasingly popular. Nonetheless, our study shows several barriers inhibit faculty use and sharing of e-learning resources, namely, lack of institutional support and faculty development programs, concerns about issues in creating and sharing resources such as ownership and intellectual property rights, and need for a more comprehensive, better-

organized resource repository.

Despite the growing importance and popularity of e-learning resources, research was scant on faculty perceptions and use of such resources. We found positive faculty perceptions of using e-learning resources, but there were some issues that inhibit their use of such resources. Our findings highlight the need to remedy such barriers so that faculty adapt their teaching that are suited for the needs of today's medical students.

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Appendix 1. Multiple-Choice Items in the Questionnaire on Faculty Perceptions and Use of e-Learning Resources

28. What e-learning resources do you mainly use for teaching? (multiple answers allowed)
- (a) Clinical cases
  - (b) Clinical videos (clinical procedures or patient encounters)
  - (c) Other videos
  - (d) Images
  - (e) Others \_\_\_\_\_
29. How do you use e-learning resources for your teaching? (multiple answers allowed)
- (a) As references to prepare for teaching
  - (b) For materials to support pre-class learning activities
  - (c) Use them as teaching materials during the class
  - (d) Present them to students as references in the teaching materials
  - (e) For materials to support post-class learning activities
  - (f) Others \_\_\_\_\_
30. If you don't e-learning resources for your teaching, what is the reason(s)? (multiple answers allowed)
- (a) Not aware of the e-learning portal
  - (b) Do not feel the need for more e-learning resources other than existing ones
  - (c) A lack of resources relevant to my lectures
  - (d) The quality is not good
  - (e) Lack of time to use them during the class
  - (f) Not convenient to use them
  - (g) Others \_\_\_\_\_