Original Article

The frequency and acceptance of educational technology as a learning tool among faculty members

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Abstract

Background & Objective: Educational technologies improve instruction and make learning easier. They have several advantages, such as encouraging active learning, raising motivation, and improving the standard of instruction. This study aimed to determine how frequently and how well faculty members at Hamadan University of Medical Sciences used educational technology as a teaching tool. Additionally, it aimed to identify the difficulties related to online learning and collect their opinions on educational technology.

Materials & Methods: A cross-sectional study, was conducted between early February and early May 2023. The target population consisted of all Hamadan University of Medical Sciences faculty members, of which 139 or so were chosen by stratified random sampling from each particular school. The research instrument was a questionnaire divided into sections covering: 1) socio-demographics and occupation, 2) experience with new educational technologies, 3) a list of these technologies, and 4) questions derived from the validated Technology Acceptance Model (TAM). We utilized a multiple linear regression model to analyze the relationship between demographic variables and outcomes. We also used the chi-square test to compare proportional differences at a 95% confidence level.

Results: According to the analysis, 86.33% of faculty members have integrated new educational technologies into their instruction. Wearable technology was used the least for instruction (1.44%), while mobile apps were the most common (53.96%). The majority of new educational technologies (47.48%) were used for theoretical instruction.

Conclusion: Given the advantages of educational technologies, investigating how they are currently being used and creating a systematic plan for their successful implementation can benefit faculty, students, and academic institutions. This method should supplement conventional lectures.

Keywords: educational technology, technology acceptance model, faculty members

Introduction

Many universities and educational institutions had to suddenly switch from traditional classrooms to distance learning during the covid-19 pandemic due to the need for social distancing [1, 2]. Improvements were urgently needed as a result of this change, which required the use of educational technology to continue instruction while following social and physical distancing regulations [3]. Even after the pandemic, many institutions now provide

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online courses in addition to in-person lectures due to recent developments in educational technology [4].

The use of a wide variety of digital resources to improve the teaching process and encourage effective learning is known as educational technology [5]. Educational technology can significantly enhance the learning process by delivering educational materials on platforms that can be accessed globally [6]. Delivering education through these technologies helps transform the teaching process toward a more student-centered approach, encouraging more direct interaction with the instructor and engagement, as well as deep and critical thinking [7].

The Technology Acceptance Model (TAM) explains the factors influencing an individual's decision to adopt or reject a particular technology for task completion [8]. According to TAM, two primary factors affect adoption: perceived usefulness and ease of use. Perceived usefulness is the extent to which an individual believes utilizing a specific technology will enhance job performance [9]. How to involve faculty members who are content with new technologies in the educational sector is a relevant question in the technological age we live in today. Since it highlights the many advantages of educational technologies for learning and teaching skill enhancement, answering this question benefits students and academic institutions. Staff members' acceptance of educational technologies will likely improve if they perceive them as beneficial and advantageous, positively influencing their attitudes and intentions to use them more frequently.

Challenges such as inadequate facilities and equipment, capacity-building deficiencies, the need for extended preparation time, and technical difficulties have hindered the use of educational technologies [6, 10]. This study investigates the prevalence and acceptance of educational technology as a learning tool among faculty members, considering that the advantages of implementing it go beyond pandemic applications for both teaching institutions and students. It also investigates how they view educational technology to pinpoint the difficulties associated with online learning.

Materials & Methods

Design and setting(s)

A cross-sectional study assessed the frequency and acceptance of new educational technologies among faculty members at Hamadan University of Medical Sciences from early February to early May 2023. To align with the study's primary objective, a similar 2015 study by Zalat et al. was referenced to determine the sample size. The sample size was calculated with an error level of 0.05 and a power of 90%. The total sample size comprised 139 faculty members who participated in the study.

Participants and sampling

The study population included faculty members from the Hamadan University of Medical Sciences (departments of Medicine, Dentistry, Pharmacy, Health, Nursing and Midwifery, Rehabilitation, Paramedicine, New Technologies, and Research) who had been recruited to teach before the covid-19 pandemic and had experience teaching online courses. Inclusion criteria were consent to participate in the study and expertise using educational technologies.

Tools/Instruments

The questionnaire comprised four sections. The first section included questions on socio-demographic and occupational information, such as gender, age, duration of teaching experience, type of school, academic rank, and employment status. The second section investigated experiences with new educational technologies and listed various technologies including Mobile Apps, Simulators, Gamification, Artificial Intelligence, Motion Graphics, Virtual/Augmented Reality, Microlearning, Podcasts, Big Data, Internet of Things, Wearable Technologies, and Massive Open Online Courses (MOOCs). Social media was excluded due to its regular use by faculty members. Respondents answered three yes/no questions regarding their experience with each technology, whether they had developed teaching materials, and whether they had attended workshops on these technologies. The third section scored questions using a binary checklist (yes/no).

The fourth section of the survey contained questions based on the validated TAM (8–10) to evaluate the faculty members' perceptions of the educational technologies' usefulness, ease of use, and acceptance on a five-point scale range of "strongly disagree" to "strongly agree." TAM is instrumental in understanding the factors influencing the target group's potential acceptance or rejection of technology [11]. Permission for this section's content was obtained from the corresponding author of the article "The Experiences, challenges, and Acceptance of e-learning as a Tool for Teaching during the covid-19 Pandemic among university medical staff" [6]. The questionnaire's validity was ensured by soliciting feedback from 10 experts on the questions' necessity, redundancy, and clarity, leading

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to necessary modifications. The questionnaire's reliability was confirmed with a Cronbach's alpha value greater than 0.7 [12]. The questionnaire had good reliability, with Cronbach's alpha of 0.78.

Data collection methods

Data collection was conducted via a questionnaire with four sections: [1] socio-demographic and occupational information, [2] experience with new educational technologies, [3] a yes/no checklist of new educational technologies, and [4] the validated Technology Acceptance Model (TAM) assessing perceptions of usefulness, ease of use, and acceptance.The questionnaire was distributed in print to faculty offices and electronically via department heads.

Data analysis

Data were analyzed using descriptive and analytical statistical tests with STATA 17 software. Descriptive statistics (frequency and percentage) described the variables. A p-value of ≤ 0.05 was deemed statistically significant. We utilized a multiple linear regression model to analyze the relationship between demographic variables and outcomes. Additionally, we applied the chi-square test to compare differences in proportions, all at a 95% confidence level.

Results

One hundred thirty-nine employees of Hamadan University of Medical Sciences provided the data. Most participants had 1–10 years of teaching experience (71.22%), were assistant professors (58.99%), and were primarily from the medical department (51.08%). 38.13% of the staff participating in this study were officially employed (**Table 1**).

The second section of the questionnaire found that 120 staff members had used the new educational technologies for teaching (86.33%), and the majority of them had used the technologies for more than 2 years (43.88%). Before the covid-19 pandemic, 91 participants (65.47%) had already been using new educational technologies, although only 21.58% reported having access to fast internet speeds. These technologies were primarily employed for theoretical lessons (47.48%) (**Table 2**). In the third section of the survey, mobile apps were the most frequently used technologies for teaching (53.96%), and wearable technologies were the least used (1.44%). Mobile apps were the preferred choice for creating educational products using new technologies (10.79%), whereas simulators, gamification, and wearable technology were seldom selected (1.44% each). Concerning participation in workshops to learn about new educational technologies, mobile apps again led the way (31.65%), with wearable technology remaining the least engaged (1.44%) (**Table 3**). The fourth section's findings indicate that the perceived usefulness, ease of use, and acceptance of new educational technologies as teaching tools are promising. 43.17% of participants expressed their intention to use these technologies in the future, with a maximum of only 2.88% strongly disagreeing with two subsections (**Table 4**). **Table 5** presents a frequency distribution of demographic variables related to the use of new educational technology, accompanied by p-values indicating the statistical significance of differences among categories. It shows that the majority of respondents are assistant professors (58.47%), with a smaller percentage as associate professors (20.60%) and professors (13.6%). The p-value of 0.787 indicates that these academic ranks' use of technology does not differ significantly. A p-value of 0.688, which also shows no significant correlation between teaching experience and technology use, reflects that all respondents have more than 30 years of teaching experience. In terms of departmental representation, the health department has the most respondents (51.8%), followed by paramedicine (37.0%) and rehabilitation (25.9%).

Table 1. Characteristics of participants

Variables	n (%)
Academic rank of faculty members	
Instructor	11 (7.91)
Assisstant professor	82 (58.99)
Associate professor	28 (20.14)
Professor	18 (12.95)
Teaching experience (years)	
1-10	99 (71.22)
10-20	25 (17.99)
20-30	10 (7.19)
>30	4 (2.88)
Department	
Medical	71 (51.08)
Pharmacology	10 (7.19)
Dental	9 (6.47)
Nursing	11 (7.91)
Health	14 (10.07)
Paramedicine	12 (8.63)
Rehabilitation	7 (5.04)
Employment status	
Official	53 (38.13)
Employment contract	8 (5.76)
Service commitment	31 (22.30)
Contractual employment	43 (30.94)

Note: Percentages are based on the total number of participants who responded to each question. Some participants did not answer certain questions in the questionnaire, and these responses were excluded from the calculations.
Abbreviations: n, number of participants; %, percentage.

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The medical, pharmacology, dental, and nursing departments had no respondents. A significant difference in technology usage by department is indicated by the p-value of 0.045, which suggests that departmental affiliation influences technology adoption. Last but not least, the majority of respondents (40.52%) have a formal job, followed by those with employment contracts (31.90%) and service commitments (21.55%). A p-value of 0.915 suggests no appreciable differences in technology use according to employment status.

Table 2. Experience regarding the new educational technologies

Experience of staff members	n (%)
Having used the new educational technologies for teaching	120 (86.33)
Duration of using the new educational technologies:	
< 1 year	17 (12.23)
1-2 years	43 (30.94)
> 2 years	61 (43.88)
Having used the new educational technologies for teaching before covid-19 pandemic	91 (65.47)
Having access to fast internet speed	30 (21.58)
Having used the new educational technologies in:	
Theoretical lessons	66 (47.48)
Practical lessons	3 (2.18)
Clinical cases	12 (8.63)

Abbreviations: n, number of participants; %, percentage.

Table 3. Prevalence of using the new educational technologies

Varibles / Technologies	Having used the mentioned educational technology for teaching n (%)	Having created an educational product using the mentioned educational technology n (%)	Having participated in a workshop to learn about the mentioned educational technology n (%)
Mobile apps	75 (53.96)	15 (10.79)	44 (31.65)
Simulators	21 (15.11)	2 (1.44)	19 (13.67)
Gamification	14 (10.07)	2 (1.44)	21 (15.11)
Artificial intelligence	18 (12.95)	7 (5.04)	19 (13.67)
Motion graphic	23 (16.55)	9 (6.47)	21 (15.11)
Virtual reality	16 (11.51)	5 (3.60)	16 (11.51)
Augmented reality	3 (2.16)	5 (3.60)	9 (6.47)
Micro-learning	17 (12.23)	7 (5.04)	16 (11.51)
Podcast	58 (41.73)	25 (17.99)	24 (17.27)
Big data	10 (7.19)	5 (3.60)	4 (2.88)
Internet of things	7 (5.04)	5 (3.60)	4 (2.88)
Wearable technology	2 (1.44)	2 (1.44)	2 (1.44)
MOOCs	12 (8.63)	6 (4.32)	11 (7.91)

Abbreviations: n, number of participants; %, percentage; MOOCs, massive open online courses.

With a particular focus on perceived usefulness, perceived ease of use, and acceptance, the analysis in **Table 6** looks at how different factors affect the dimensions of new educational technologies. With coefficients of -0.03 for perceived usefulness and -0.08 for perceived ease of use, both of which produce non-significant p-values (0.787 and 0.521, respectively), the results show that age has little bearing. The effects of academic rank are also insignificant; full professors, associate professors, and assistant professors all have coefficients between -3.35 and -2.90, falling short of significance. Perceived usefulness and teaching experience are more positively correlated (2.04, p = 0.087), suggesting possible relevance. Dental and medical professionals had a more favorable opinion of ease of use (3.87, p = 0.130) than other departments, which consistently produced coefficients near zero with non-significant p-values. Similar limitations apply to the effects of employment status; contractual employment showed some positive coefficients but was not significant across all variables. Overall, there are few strong correlations between the factors under investigation and the aspects of new educational technologies.

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Table 4. Acceptance of the new educational technologies as learning tools

Dimensions	Sub-category	Strongly agree n (%)	Agree n (%)	Neither agree nor disagree n (%)	Disagree n (%)	Strongly disagree n (%)
Perceived usefulness	Accelerated teaching process	52 (37.41)	50 (35.97)	17 (12.23)	14 (10.07)	1 (0.72)
	Improved performance	54 (38.85)	54 (38.85)	14 (10.07)	10 (7.19)	2 (1.44)
	Increased productivity	52 (37.41)	52 (37.41)	18 (12.95)	9 (6.47)	3 (2.16)
	Efficient	51 (36.69)	55 (39.57)	18 (12.95)	9 (6.47)	2 (1.44)
	Simplified teaching process	51 (36.69)	56 (40.29)	18 (12.95)	4 (2.88)	3 (2.16)
	Helpful	51 (36.69)	75 (53.96)	6 (4.32)	1 (0.72)	1 (0.72)
Perceived ease of use	Easily learned	48 (34.53)	50 (35.97)	23 (16.55)	10 (7.19)	3 (2.16)
	Controllable	36 (25.90)	44 (31.65)	35 (25.18)	15 (10.79)	4 (2.88)
	Understandable	34 (24.46)	69 (49.64)	21 (15.11)	9 (6.47)	2 (1.44)
	Flexible	45 (32.37)	58 (41.73)	24 (17.27)	5 (3.60)	2 (1.44)
	Easily used	33 (23.74)	55 (39.57)	24 (17.27)	19 (13.67)	4 (2.88)
	Easily skilled	46 (33.09)	62 (33.09)	22 (15.83)	3 (2.16)	2 (1.44)
Acceptance of the new educational technologies	Will use the new educational technologies in the future	55 (39.57)	60 (43.17)	18 (12.95)	1 (0.72)	1 (0.72)
	Will use the new educational technologies frequently	36 (25.90)	48 (34.53)	41 (29.50)	7 (5.04)	2 (1.44)
	Satisfied with the new educational technologies	41 (29.50)	52 (37.41)	34 (24.46)	4 (2.88)	3 (2.16)
	Recommend the new educational technologies as teaching tools	50 (35.97)	52 (37.41)	26 (18.71)	3 (2.16)	1 (0.72)

Note: Percentages are based on the total number of participants who responded to each question. Missing responses were excluded from the calculations. The items in this section were adapted from the Technology Acceptance Model (TAM) and used with permission.
Abbreviations: n, number of participants; %, percentage.

Table 5. The frequency of using new educational technology according to demographic variables

Variables	n (%)	p-value
Academic rank		
Instructor	9 (7.63)	0.787
Assisstant professor	69 (58.47)	
Associate professor	24 (20.60)	
Professor	16 (13.6)	
Teaching experience (years)		
1-10	0 (0.0)	0.688
10-20	0 (0.0)	
20-30	0 (0.0)	
>30	4 (100.0)	
Department		
Medical	0 (0.0)	0.045
Pharmacology	0 (0.0)	
Dental	0 (0.0)	
Nursing	0 (0.0)	
Health	14 (51.8)	
Paramedicine	10 (37.0)	
Rehabilitation	7 (25.9)	
Employment status		
Official	47 (40.52)	0.915
Employment contract	37 (31.90)	
Service commitment	25 (21.55)	
Contractual employment	7 (6.03)	

Abbreviations: n, number of participants; %, percentage; p-value, probability-value.

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Table 6. The role of some factors on new educational technologies dimensions

Variables	Perceived usefulness			Perceived ease of use			Acceptance		
	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value
Age(per year)	- 0.03	(-0.27, 0.21)	0.787	-0.08	(0.16, 0.52)	0.521	-0.05	(0.16, 0.52)	0.592
Academic rank									
Assisstant professor/ Instructor	- 2.90	(- 8.02, 2.22)	0.265	- 0.05	(6.49, 0.79)	0.983	- 0.11	(- 3.70, 3.47)	0.950
Associate professor/ Instructor	- 2.43	(- 8.29, 3.44)	0.414	0.76	(5.88, 0.76)	0.794	- 0.24	(- 4.35, 3.87)	0.908
Professor / Instructor	- 3.35	(- 10.48, 3.78)	0.354	- 1.08	(3.32, 0.37)	0.758	- 0.82	(- 5.81, 4.17)	0.746
Teaching experience (per year)	2.04	(- 0.30, 4.37)	0.087	1.04	(2.56, 0.42)	0.368	1.26	(- 0.37, 2.90)	0.128
Department									
Pharmacology/Medical	- 1.30	(- 5.71, 3.11)	0.560	- 1.75	(3.16, 0.57)	0.422	- 0.01	(- 2.08, 4.96)	0.997
Dental/Medical	3.87	(- 1.16, 8.90)	0.130	2.03	(3.35, 0.78)	0.415	1.44	(- 2.67, 3.72)	0.420
Nursing/Medical	- 1.36	(- 5.92, 3.20)	0.556	- 1.30	(2.85, 0.49)	0.545	0.53	(- 2.78, 2.83)	0.744
Health/Medical	- 0.84	(- 4.85, 3.17)	0.687	- 0.56	(7.38, 0.63)	0.777	0.03	(0.16, 0.52)	0.983
Paramedicine/Medical	- 3.93	(- 8.40, 0.55)	0.085	- 1.53	(2.16, 0.36)	0.490	- 0.05	(- 0.21, 0.12)	0.592
Rehabilitation/Medical	1.91	(- 4.17, 7.99)	0.535	1.44	(2.40, 0.35)	0.633	-0.11	(- 3.70, 3.47)	0.950
Employment status									
Employment contract/Official	- 0.04	(- 4.14, 4.06)	0.986	- 1.85	(0.16, 0.52)	0.363	- 0.24	(- 5.81, 4.17)	0.908
Service commitment/ official	- 0.61	(- 5.30, 4.08)	0.797	- 2.18	(4.95, 0.98)	0.348	- 0.82	(- 0.37, 2.90)	0.746

Abbreviations: p-value, probability-value; CI, confidence interval.

Discussion

It was thought to be beneficial to look into the acceptance and perceptions of educational technologies because of the many advantages made especially clear during the pandemic and the subsequent need to use these technologies to avoid disrupting education. This study aims to optimize their benefits and improve their application with conventional teaching techniques. According to the findings, 120 faculty members (86.33%) had used new educational technologies for their students' education, among these technologies. During social distancing, the covid-19 pandemic forced people worldwide to rely more on online learning and educational technologies [1, 13]. Amare et al.'s study showed that nearly three-fourths (72.6%) of faculty members hold positive beliefs and highly accept educational technology. Furthermore, the likelihood of accepting and utilizing technologies for learning was 2.3 times higher for faculty members working in teaching settings at research institutions [14].

In this study, mobile apps were the most frequently used educational technologies. The results of Voicu et al.'s study showed that perceived usefulness, habit, perceived skill, and self-efficacy directly influence the Continuance Intention (CU) to use smartphones in higher education. Further, performance expectancy, intrinsic motivation, perceived ease of use, and perceived enjoyment indirectly influence the CU to use [15]. Participants' responses regarding the future use of new educational technologies were positive, with 55% strongly agreeing and 60% agreeing. A good teacher facilitates learners' learning process by applying new educational technologies and has a toolbox of these technologies to use according to the subject and learning situation. According to the results, there is promise in the perceived value, usability, and acceptance of new educational technologies as teaching aids. Incorporating elements of education and virtual reality (VR) technology in training settings, an expanded TAM was created. The relationships between factors relevant to VR technology and learning were supported, and the original TAM factors showed the most vital relationships [16]. Gabriel et al's study demonstrated considerable differences in how digital technologies are incorporated into post-secondary education. At the university (where we conducted our research), there is no policy governing the use of digital tools in the classroom, and each professor approaches their instruction according to their preferences and viewpoints [17]. Promotion, financial rewards, and reducing workload and time are all significant motivators for staff members to embrace and

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use new technology [10]. Training facilitates employee adoption by giving them the information and abilities they need to use new technology effectively and efficiently. Employee adoption of new technology is fueled by managerial support, which includes giving them financial and technical support and the time they need to become familiar with it [18].

According to the study's findings, there are notable differences in technology used by the department, with the Health department having the most respondents, but no discernible differences in usage across academic ranks, teaching experience, or employment status. Furthermore, the perceived utility, usability, and acceptance of new educational technologies are not significantly impacted by age, academic standing, or employment status; however, teaching experience and departmental affiliation are marginally more relevant but still not very significant.

Faculty members can overcome the time and space constraints of traditional teaching methods by utilizing contemporary educational technologies. The speed at which technology is developing in education is astounding. The cross-sectional nature of this study and its focus on faculty members from a single university represent limitations, given the limited facilities and suboptimal internet speeds that impact the adoption of new educational technologies. Furthermore, a significant obstacle that led to a limited study population was the faculty members' unwillingness to answer the questionnaire. Creating an electronic version of the survey was advantageous because it made it easier for university employees to access and respond whenever it was most convenient for them.

Conclusion

The current study results indicated that faculty members had employed new educational technologies for learning (86.33%). Among these technologies, mobile apps were the most frequently used for online teaching, whereas wearable technologies were the least utilized. These findings suggest that the perceived usefulness, ease of use, and acceptance of new educational technologies as teaching tools are promising. Future research should build upon these findings by exploring additional areas and facets of the subject, enlarging the sample size, and, crucially, concentrating on the existing educational technology's role in collaborative learning and engagement. Subsequent studies also employ qualitative methods, such as interviews, group discussions, focus groups, and observations, to better understand the situation and faculty members' attitudes.

Ethical considerations

Approval from the institutional ethical committee was secured (Ethical code: IR.UMSHA.REC.1402.037), and the Declaration of Helsinki conducted the study. Written informed consent was obtained from all participants.

Artificial intelligence utilization for article writing

The authors declare that AI-based tools have not been used in the research and preparation of this manuscript.

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Conflict of interest statement

The authors stated no potential conflicts of interest.

Author contributions

Seidi, H E Momtaz, and F Shavandi contributed to the conception and design of the study. F Shavandi and M Seidi contributed to the development of the questionnaire. F Shavandi, N Moradi, and M Seidi contributed to data collection. Z Cheraghi, M Seidi, and F Shavandi contributed to the analysis and interpretation of the results. F Shavandi and M Seidi contributed to manuscript preparation and writing. All authors approve of the final manuscript.

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Data availability statement

The questionnaire can be obtained by contacting the corresponding author.

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