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E-learning readiness among faculty members of medical sciences universities and provide strategies to improve it

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Abstract

Background: The competence of faculty in conducting e-learning is one of the preconditions for e-learning implementation in a university. This study aimed at investigating the readiness of the faculty members of Ardabil University of Medical Sciences (ARUMS) to have e-learning.

Methods: To fulfil this purpose, a triangulation method has been used. In the quantitative section, based on the Technological Pedagogical Content Knowledge (TPACK) model, the faculty competence in conducting e-learning has been measured in four areas: pedagogical knowledge, technological knowledge, content knowledge, and finally the skill of combining pedagogical knowledge, technological knowledge, and content knowledge. Subsequently, with the qualitative data of the semi-structured interview, the findings of the research have been explained. Finally, the strategies for improving the readiness of ARUMS faculty have been identified in e-learning.

Results: One-sample *t* test with a significant level ($P \leq 0.5$) showed that the faculty e-learning of ARUMS had the highest mean of pedagogical knowledge, content knowledge and content-pedagogical knowledge respectively. In other words, the faculty had a high level of pedagogical, content and content-pedagogical knowledge, but they need to improve their technological, technological-content, technological-pedagogical and ultimately, technological-pedagogical-content knowledge.

Conclusion: That is why, in order to have effective e-learning at ARUMS, the faculty has to improve their technological, technological-content, technological-pedagogical and technological-pedagogical-content knowledge. In this regard, several solutions have been proposed in this paper.

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Introduction

In contemporary age, the traditional objectives and implementation methods of educational institutions are constantly challenged and changing just like other organizations. The fundamental changes that took shape by the emergence of information and communication technology over the recent decades have greatly affected the various aspects of higher education. The advancement of information and communication technology has not only improved the quality of education and learning, but it also made its way to research topics, environments and methods at universities. Today, students and faculty prefer fast and easy access to new scientific and educational resources. They would like to remotely interact with each other and to use technology for better teaching and communication. They generally use information and communication technology in order to facilitate the teaching and learning process. This tendency can be completed with e-learning.

E-learning is one of the most widely used terms, which has entered the field of education together with IT. A numerous of educational systems, especially universities, make this type of education a part of their long-term plans and they make huge investment in this teaching

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and learning method.[1] The eLearning term was coined by Cross in 1998[2] and refers to a variety of methods and solutions that use internet and intranet technologies for teaching and learning. Clark and Mayer[3] also defines e-learning as "instruction delivered on a digital device (such as a desktop computer, laptop computer, tablet, or smart phone) that is intended to support learning".

Over recent years, many universities in the world have started e-learning based on the audience's needs and the need to develop new instructional methods. Iranian universities and higher education institutes also have emphasized the development of e-learning in their policies and programs, in order not to lag behind. For example, the Ministry of Health and Medical Education (MoHME)[4] has recently declared a Reform and Innovation in Medical Education Plan. One of aspects of this Plan is virtualization of medical science universities as well as the establishment of a virtual medical university. Many Faculty in medical science universities are not familiar with e-learning, and it is imperative that before establishing any e-learning, their capabilities and weaknesses be identified and their e-learning skills are improved through the necessary training.

Numerous instructional need assessment has shown that Faculty Members in different stages of starting and continuing their academic work, require other interdisciplinary skills in addition to their ability in their field of expertise.[5-8] This means continuation of education, research and management in various fields of medical sciences. In their college studies, they did not have the opportunity to study and work in those areas. Obviously, it is not possible to achieve these capabilities all at once, and they need to be planned and developed one by one in each step of the process of recruiting and upgrading. In general, in our modern world, people should continually be under training and learning so that they can effectively play their professional role. Faculty Members' instructional needs should be adequately fulfilled since they are the main pillars of the university education.

Irani and Telg[9] have stated that the major reasons for the high dropout rate in eLearning are inexperienced instructors. Naidu[10] showed one of the reasons for the low participation of professors in e-learning is the lack of expertise in e-learning technologies. According to Sarlak and Abolhasani Hastiani,[11] this is a challenge to the universities and institutes which have recently established distance education.

Assessing the professional competence of faculty members in conducting e-learning is one the most critical aspect for successfully e-learning implementation. It also measures the readiness of an organization to achieve the benefits of e-learning.[12] A brief literature review shows that many scholars have assessed the readiness of institutions, universities, and organizations to implement the e-learning system.[13,14] However, only few studies investigate the readiness of faculty members of universities of medical sciences to conduct e-learning based on the competency model in electronic environments. Therefore, in this research, the competence of the faculty members of Ardabil University of Medical Sciences (ARUMS) have been investigated. The study investigates conducting e-learning and the necessary prerequisites, issues, conditions and solutions needed to promote these courses.

Context of e-learning in ARUMS

Research and Development Center (EDC) in ARUMS has established an e-learning development center in line with the goals of MoHME as well as implementing the package of development of virtual education in medical sciences. The package was as part of Iran's National Reform and Innovation in Medical Education Plan. The center deployed NAVID's Learning Management System (LMS). NAVID project was a major milestone for virtual university of medical sciences (VUMS) as a responsible body to create national LMS, the project initiated in 2016 when the Reform and Innovation in Medical Education Plan by MoHME was announced. Design, development, and implementation of key features of NAVID was the 2nd phase of the project. During the 2017 fall semester, NAVID was evaluated by faculty, staff, and students through pilot courses in Alborz University of Medical Sciences as a partner University with VUMS. Since 2018 spring semester NAVID (version Beta) has been used by 64 other Medical Universities all around the country. In NAVID, instructors can share materials (text or multimedia), enable student collaboration and discussion, manage assignments and quizzes, and assign grades. NAVID is an ongoing project and new features like gamification, mobile app etc will be added according to the project timetable.

Also in order to implement eLearning, there has developed guidelines for the development of eLearning in medical science education and standards for the virtual education process. The center uses Camtasia and Storyline software to authoring e-content. The studio and equipment to e-content authoring also provided. The center serves with six staff to faculty with interests in conducting eLearning. The university has held some workshops with the goal of raising awareness and developing a new approach to e-learning for faculty members and for students separately. There have also been several courses titled "e-Content authoring in eLearning" and "Talent Students Empowerment with eLearning" and several e-assessment. ARUMS has deployed the NAVID system to pave the way for e-learning for medical universities. The LMS enables faculty members to conduct their own eLearning course. However, despite all the efforts, the participation of the faculty in conducting the e-learning is still low.

Therefore, the major purpose of this study was to measure the readiness of faculty members of ARUMS to implement e-learning. The study attempted to answer the following questions:

- Are ARUMS faculty members ready to have e-learning?
- How ready are ARUMS faculty members in terms of Pedagogical knowledge for implementing e-learning?
- How ready are ARUMS faculty members in terms of technological knowledge for implementing e-learning?
- How ready are ARUMS faculty members in terms of Content Knowledge for implementing e-learning?
- To what extent are the faculty members of ARUMS ready to combine pedagogical, technological and content knowledge to prepare for e-learning?

Materials and Methods

This is an applied research in terms of objectives and a mixed-method research in terms of method. The research also uses triangulation. The purpose of triangulation is to achieve different but complementary data about a research subject. Thus, the data were collected quantitatively and quantitatively. Finally, the results were analyzed according to the data from the two research methods.

A: Quantitative section

The research is a descriptive survey. In a descriptive research, the population can be studied and evaluated through a survey. The research used a questionnaire as an instrument.

In order to assess the readiness of faculty members of ARUMS in conducting e-learning, the translated version of the Archambault & Crippen's questionnaire[15] was used. The instrument employed the use of TPACK (Technological Pedagogical Content Knowledge) as a guiding framework for competence that faculty members in conducting e-learning should know and be able to do. The questionnaire evaluates the competence in terms of four areas of pedagogical knowledge, technological knowledge, content knowledge and competence to integrate pedagogical knowledge, technological knowledge and content knowledge. It included 24 items that are graded in the form of a 5-point Likert-type scale (1 = Poor, 5 = Excellent).

The questionnaire was modified on faculty context. Items of the questionnaire were modified by the authors and then reviewed by four knowledgeable instructional technology and medical education experts who have extensive experience with e-learning. After all, several changes were made to the instrument based on feedback from the experts. The questionnaire validity was evaluated by experts. The reliability of questionnaire determined 0.86 by using the Cronbach's alpha formula. Table 1 shows the reliability of each component of the questionnaire. Since Cronbach's alpha was above 0.70, it can be stated that the instrument was properly reliable.

Descriptive statistics (frequency, mean and standard deviation) and inferential statistics (one sample T test and Friedman test) were used for analyzing the research data.

B: Qualitative section

The semi-structured interview method was used in qualitative phase. In other words, through semi-structured written or oral questions, each faculty member of ARUMS was interviewed about their instructional needs and ways to improve the readiness of e-learning. It included 4 open-ended question. Respondents were asked, "what pedagogical solutions do you propose to teachers to improve e-learning competence at ARUMS?" and "what technological solutions do you propose to teachers to improve their e-learning competence at ARUMS?" and "what content solutions (specialized knowledge) do you propose to teachers to improve e-learning at ARUMS?" and eventually "to integrate e-learning in teaching, what solutions do you propose to teachers?". But the questions weren't limited, and the interviewer asked the appropriate questions. The results of this interview coupled with the results of the quantitative phase (survey) were used to explain and provide solutions. The purposive sampling was used in the qualitative stage and went on until the saturation point. In other words, we kept on having the semi-structured interviews until the researchers determined that the continuation of the interview would not add anything new to the list.

The qualitative content analysis method was used to analyze the data obtained from the interviews. The research applied a deductive approach to qualitative data analysis. The deductive approach involves beginning with a theory, developing categories from that theory, and then collecting and analyzing data to test or developing those categories. In this research, in order to make full sense of the data, a start list of a pre-categories was generated in line with TPACK framework. Initially, responses were scripted. Then, the responses were then categorized into pedagogical knowledge, technological knowledge, content knowledge, and pedagogical and technological content integration knowledge with using MAXQDA qualitative analysis software.

Statistical population and sampling method

The statistical population was the faculty members of ARUMS. Given the probability of excluding some of the samples in response to the questionnaires, the whole

Table 1. The reliability of components of TPACK questionnaire

Component	Cronbach's alpha	Question
Pedagogical knowledge (PK)	0.72	3-2-1
Technological knowledge (TK)	0.93	6-5-4
Content Knowledge (CK)	0.81	9-8-7
Technological-content knowledge (TCK)	0.83	10-11-12
Pedagogical-content knowledge (PCK)	0.85	13-14-15-16
Technological-Pedagogical Knowledge (TPK)	0.93	17-18-19-20
Technological-pedagogical-content knowledge (TPCK)	0.92	21-22-23-24

population was selected as a sample. Thus, with the census sampling method, the sample size was 180 of the faculty members according to a report from the Education Deputy of ARUMS. The inclusion criteria for the samples in this research were having a mean age of 30 to 60 years, a master's degree or higher, work experience of at least one year.

Results

According to the descriptive data, it can be stated that 70 people from the total population of the study participated in this research. 65.7% were male and 34.3% were female. Most participants were in the age group of 40-50 years (50%) and 30-40 years (31.4%). Furthermore, 80% of the participants were from the Medicine Faculty; 8.6% were from the Paramedical Faculty; 2.9% were from the faculty of Pharmacology; 4.3% were from the Faculty of Health, and 1.4 percent did not write down their faculty. The majority of participants were respectively from the internal medicine (15.7%), genecology (14.3%), health information management (8.6%) and pediatrics (7.1%) while the remaining groups had a relatively lower share of participation. Regarding the employment types of the participants, 49.3% were the full–time Tenure Contracts; 26.1% were the full–time Probationary Contracts; 5.8% had Term Contracts, and 15.9% were committed to providing service. In terms of academic rank, 52.9% were assistant professors; 24.3% were associate professors; 18.6% were instructors and 4.3% were full professors. In the following, we describe the results of the research descriptive statistics.

According to the results of Table 2, it can be seen that the pedagogical knowledge (M = 4.33, SD = 0.547), content knowledge (M = 4.15, SD = 0.672) and pedagogical-content knowledge (M = 4.13, SD = 0.626) have the highest means. In other words, the faculty members have a high level of pedagogical, content and pedagogical knowledge, but there is room for improvement in technological knowledge (M= 3.21, SD = 0.978), technological-content knowledge (M= 3.80, SD = 1.443), technological-pedagogical knowledge (M = 3.02, SD = .98), and Technological-pedagogical-content knowledge (M= 3.27, SD = 0.972).

In this study, a one-sample *t* test conducted to compare the mean components obtained in the sample to the hypothetical test value of 3. In the other words, according to the TPACK questionaries' scale, the null hypothesis was equal to 3. The *t* test determines whether the difference we find in our sample is larger than we would expect to see by chance. The findings of Table 3 show that the one-sample *t* test is significant with the limit of 3 in pedagogical knowledge, content knowledge, technological-content knowledge, pedagogical content knowledge, with 95% level of confidence. In other words, the faculty members of the university have a sufficient level of such knowledge, and they need to work on their technological knowledge, technological pedagogical knowledge and technological pedagogical content knowledge. The results of Friedman test (Table 4) were calculated to prioritize the instructional needs in implementing e-learning.

The results of Table 4 show that the Friedman test result is significant ($P \leq 0.05$, chi-square =164.63) with a degree of freedom of 6 and 95% confidence. In other words, there is a significant difference between the components of the readiness of faculty members for holding e-learning.

Table 2. Descriptive statistics of the research variables (N = 70)

Component	Mean	Std. Deviation	Std. Error Mean	Min.	Max.
Pedagogical knowledge (PK)	4.333	0.547	0.065	2.67	5
Technological knowledge (TK)	3.213	0.978	0.117	1	5
Content Knowledge (CK)	4.151	0.673	0.080	1.67	5
Technological-content knowledge (TCK)	3.799	1.443	0.173	1.67	5
Pedagogical-content knowledge (PCK)	4.131	0.626	0.075	2	5
Technological-Pedagogical Knowledge (TPK)	3.017	0.980	0.117	1	5
Technological-pedagogical-content knowledge (TPCK)	3.270	0.972	0.116	1	5

Table 3. One-sample *t* test results (test value = 3)

Component	*t*	*df*	Sig. (2-tailed)	Mean Difference	95% CI of the Difference	
					Lower	Upper
Pedagogical knowledge (PK)	20.383	69	0.0001	1.333	1.203	1.464
Technological knowledge (TK)	1.821	69	0.073	0.213	0.020-	0.446
Content Knowledge (CK)	14.334	69	0.0001	1.151	0.991	1.311
Technological-content knowledge (TCK)	4.635	69	0.0001	0.799	0.456	1.144
Pedagogical-content knowledge (PCK)	14.99	69	0.0001	1.121	0.972	1.27
Technological-Pedagogical Knowledge (TPK)	0.145	69	0.885	0.017	0.217-	0.251
Technological-pedagogical-content knowledge (TPCK)	2.326	69	0.023	0.27	0.039	0.502

Table 4. Friedman test to prioritize faculty members' knowledge needs (N = 70)

Component	Mean Rank	Priority
Technological Pedagogical knowledge	2.45	1
Technological knowledge	2.73	2
Technological pedagogical content knowledge	2.91	3
Technological content knowledge	4.17	4
Pedagogical content knowledge	4.95	5
Content Knowledge	5.26	6
Pedagogical Knowledge	5.52	7

There was a statistically significant difference between faculty members' knowledge component, $\chi^{2(2)} = 164.63$, $P = 0.05$. Therefore, based on the results of this table, priority of the needs of the faculty members respectively goes to the areas of technological pedagogical knowledge, technological knowledge, technological pedagogical content knowledge, technological content knowledge, pedagogical content knowledge, content knowledge and pedagogical knowledge. The ranks table shows the mean rank for each of the competence. Table 4 has ranked the mean from low to high. The low mean rank reflects the less knowledge in that competence, and the high mean rank indicates more knowledge in that competence than others. E-learning managers need to pay attention to these priorities in order to empower faculty members for e-learning.

In order to investigate the expressed instructional needs of faculty members in conducting e-learning, qualitative data gathered with semi-structured interview techniques and a questionnaire. In these questions, the main emphasis was on the problems, challenges, and suggested solutions rather than direct questions about the courses that they needed. Table 5 lists these needs by categorizing them according to the TPACK model.

According to Table 5, the instructional needs expressed by faculty members are categorized in each dimension of knowledge. Based on the findings of the research and the content analysis approach to address the instructional needs expressed for each aspect of the knowledge, some suggestions are made in Table 6. The table takes into account the requirements and limitations expressed by

Table 5. List of expressed instructional needs of the faculty members in conducting e-learning

Category	Sub-category	Expressed Instructional Needs
PK	E-Content Authoring	Ability to authoring e-content, knowledge of the production of e-content, animation or digital simulation
	Technology in education	Knowledge of technology uses in teaching and learning, Using new software for teaching - learning processes, the ability of students to use the eLearning in teaching-learning, Mastery to e-teaching and e-assessment methods, use of variety of applications that support pedagogical principles.
TK	ICDL	ICDL and Digital Citizen competence, knowledge of the Internet and networks, knowledge of applications software, how to use new software, Skills in using electronic boards and webcams, ability and skills in relation to technology issues,
	eLearning software & hardware	Skills in using LMS and software, the knowledge of using online and offline teaching Hardware and software, skill in preparing and use podcasts, skill to create and manage discussion groups on social networks
TPCK	Instructional design	Learn how to implement e-learning, skill and knowledge to creating e-learning course, using new e-learning solutions, using a variety of media in e-learning, engaging students in e-content, online teaching strategy, conducting a blended learning, knowledge to developing and conducting e-learning for theoretical and Basic course, informing about best practice in eLearning, VR or augmented reality technologies in clinical settings
TCK	Clinical learning materials	Skill and knowledge to designing, developing and using of anatomy simulations, familiarity with tools and technologies of teaching basic or clinical sciences, the use of clinical practitioners' experiences in using tools and e-learning technologies
	Basic learning materials	Teaching specialized software for each discipline such as microbes and parasites and fungi, knowledge to access to the open educational resource database in Basic sciences disciplines
PCK	Clinical teaching methods	Strategy to engaging student through e-learning in clinical education, teaching methods of core concepts in each discipline using technology, Co-Teaching Strategies in Clinical Science Course, PBL and TBL in eLearning, best practice of eLearning in Clinical Science Courses
	Basic sciences teaching methods	Strategy to motivating student through e-learning in Basic sciences, The methods for creating interdisciplinary courses in e-learning, providing specialized training methods for each department, team teaching strategy, using the views of prominent professors in reforming and promoting instructional programs, applying examples tailored to each discipline, best practice of eLearning in basic Science Courses, discussions and meetings with the groups in each discipline, consulting with the faculty members that already established eLearning
CK	Core competence	Research competence, Medical Knowledge, Patient Care, Professionalism, Interpersonal and Communication Skills, Systems-Based Practice
PK	Teaching methods In eLearning	E-teaching methods, student learning style in eLearning, teaching in cyberspace, conducting online courses, encouraging the students to study
	Assessment & evaluation in eLearning	Classroom assessment in eLearning, performance and alternative assessment in eLearning, testing the knowledge of learners about e-learning
	Ethics In e-learning	Prevent cheating and plagiarism in eLearning, privacy and security in eLearning, ethics in eLearning

Note: Pedagogical knowledge (PK), Technological knowledge (TK), Content Knowledge (CK), Technological-content knowledge (TCK), Pedagogical-content knowledge (PCK), Technological-Pedagogical Knowledge (TPK), Technological-pedagogical-content knowledge (TPCK)

Table 6. Suggested Faculty Development Courses for Each Dimension

Dimension	Courses
PTK	Principles of Effective E-Content Authoring, Educational Technology in Medical Education
TK	E-Content Authoring Tools, E-Learning Software Evaluation, E-Learning Management Systems, Making Infographic in E-Learning.
CPTK	Instructional Design of Clinical Courses, Instructional Design of Basic Science Courses, Effective Teaching Design in E-Learning, Digital Presence in E-Learning, Blended Learning Design, Flipped Classroom Design
CTK	Open Educational Resources in Clinical Course, Open Educational Resources in Basic Course, Clinical Learning Materials Design, Development and Evaluation, Basic Learning Materials Design, Development and Evaluation
CPK	Methods of Teaching Clinical Courses in ELearning, E-Teaching Method of Basic Sciences, Clinical and Performance E-Assessment Methods, Mentoring and Coaching ELearning Integration in Clinical Course, Mentoring and Coaching ELearning Integration in Basic Sciences Course, Anatomy Teaching Method
CK	Quantitative and Qualitative Research Course, Medical Knowledge Course, Patient Care Course, Professionalism Course, Interpersonal and Communication Skills Course, Systems-Based Practice Course
PK	Learner Assessment Course, Ethics And Intellectual Property In E-Learning, Performance and Alternative Assessment in ELearning, E-Teaching, Conducting Online Courses

Note: Pedagogical knowledge (PK), Technological knowledge (TK), Content Knowledge (CK), Technological-content knowledge (TCK), Pedagogical-content knowledge (PCK), Technological-Pedagogical Knowledge (TPK), Technological-pedagogical-content knowledge (TPCK)

the interviewees.

Table 6 presents the proposed training courses. It should be noted that these courses are based on the needs expressed by the faculty members and need to be considered along with the stated requirements and constraints.

Discussion

With the emergent of the information and communications technology, and its impact on all aspects of life, the world has entered a new society called the Information Society. Educational system as the most important pillar of the society moves it towards the information society. Educational system and human capital have the most important role in this process. People are the most valuable resource of an organization. They use their knowledge and ability to improve and benefit the organization. This research finding revealed that the readiness of faculty members of ARUMS to conduct e-learning, and it also proposed strategies for promoting the readiness. According to the study, one-sample *t* test with a significant level ($P \leq 0.5$) showed that the faculty members of ARUMS had the highest mean of pedagogical knowledge, content knowledge and pedagogical content knowledge respectively. In other words, the faculty members of the university had a high level of pedagogical, content and content-pedagogical knowledge, but they need to improve their technological, technological-content, technological-pedagogical and ultimately, technological-pedagogical-content knowledge.

This research is in line with previous studies. For example Hetty Rohayani et al[13] reviewed research related to the measurement of the level of readiness for e-learning in higher education institutions. Each researcher had a different point in determining the factors to measure the readiness of eLearning in higher education. The factors that most widely used by researchers to measure the readiness of e-learning was policy, knowledge, skill, experience, attitudes, motivation, habits, technology, financial, human resource, infrastructure, content, culture, organizational barrier and psychological. The study found that skills and attitudes are the most significant factors influences E-learning readiness. They concluded that each institution has different levels of readiness. Therefore, each institution should be more careful in determining what the factors that will be critical to focus on measure their eLearning readiness, in order to obtain accurate information, which describes the actual condition of their institution. Eslaminejad et al[16] assessed the instructors' readiness for implementing e-learning in continuing medical education in Iran. The results revealed that the mean of readiness on e-learning for faculty members was 3.25 ± 0.58 in technical and 3.37 ± 0.49 in pedagogical domains on a 5-point Likert scale (1–5). The study showed that the medical faculty members had a positive attitude related to e-learning and there was a significant difference between instructors' computer competency with technical and pedagogical readiness on e-learning. Thus, it can be considered as an important aspect in readiness for e-learning.

Abdollahi et al[17] studied the feasibility of distance learning through the Internet at technical colleges in Tehran. They found that at present, the technical schools in Tehran are not able to use the Internet as a complement to the traditional system to train individuals.

Jariangprasert[18] examined the understanding and readiness of students and professors of the Faculty of Business Administration at the Chiang Mai University regarding the use of e-learning in education. The findings have shown that e-learning is generally very useful, but the target population is not ready to use e-learning and needs a lot more support. Liaw and Huang[19] believe that in order to implement and develop an e-learning environment, it is necessary to first determine the readiness of learners in terms motivation, attitude, beliefs and trust.

Sadik[20] stated that three components of attitude, experience and competence play a huge role on individual readiness for the development and implementation

of e-learning education. In his research, Vate-U-Lan[21] found that universities tended toward distance education. Investigating the readiness for e-learning in Health Sciences Higher Education Institute, Lopes[12] provided a model for assessing e-learning readiness and reported the results of its use at that Institute.

The results of the Darab and Montazer's study[22] showed that the mean of the components studied (software, hardware and support, coordination and monitoring) at Tarbiat Modarres University is 8.2 out of 10, which reveals a lack of readiness and serious weakness in the field of e-learning. Maleki Mardasht et al[23] examined the level of readiness of Urmia University students to participate in the e-learning system. The findings of this study showed that students of Urmia University have a moderate level of readiness for e-learning and there is a significant difference between the level of undergraduate and postgraduate students' readiness to participate in e-learning. In a future study, it is recommended that assess the impact of technological, technological-content, technological-pedagogical and ultimately, technological-pedagogical-content knowledge training or assistant on faculty members' ability to implement e-learning.

Conclusion

This research found that the faculty members of ARUMS have a lower level of pedagogical technological, technological and content, Technological pedagogical and content knowledge. They are in need for the officials' attention to empowerment of these. Furthermore, according to Table 5, it seems that the main issue for many faculty is the technological knowledge that has been repeatedly emphasized in the interviews and data from the questionnaires. In other words, the issue of technological educational content was not so much a concern for many professors. This can be interpreted in several ways: the professors may not need such knowledge or, in other words, they have the necessary capabilities. The second interpretation is that there are not enough technological infrastructures to let this happen. Since many professors do not have e-learning training experience, the second assumption is closer to reality. In other words, pedagogical knowledge, technological knowledge, and content knowledge are prerequisites for the combined knowledge. Therefore, the combined knowledge cannot be attained unless the basic knowledge are mastered. In the interviews, there was an emphasis on holding specialized courses for the professors. It goes without saying that these training courses should be practical, continuous and phase by phase. There should also be constant mentoring and support. The qualitative study had another important point that was not considered in the components of knowledge, and it was a matter of motivation and incentives. The creation of evaluation systems for teachers' performance in e-learning, the allocation of educational or research privileges to electronic education activities among other suggestions were emphasized by the interviewees. Finally, according to the research findings, the following guidelines are presented to empower faculty members to provide e-learning. These include: Using experienced e-learning professors in each discipline or department to provide their successful experiences or best practice, establishing codes and incentive privileges for those who provide eLearning, the provision and support of the necessary infrastructure for technology, the deployment of professors to advanced specialized courses for higher education and universities, the use of experience and knowledge of expert professors and the use of international experience. According this research findings, most of the workshops held at the university level are not practical and have mere theories for the greater part. It is recommended that workshops should be done practically to achieve better efficiency. One of the most important limitations of this study was the low participation rate of faculty members. It was difficult to access the faculty because of their busy time and different times of attendance at the college. For the sake of increasing the response rate was taken the entire statistical population as the sample. Also, according to a protocol, the sample members were contacted several times and in several ways. As well as one of the codes of ethics in the study was the voluntary response of the participants to the questions. Due to the ethics code, we did not enforce the members to answer the questions. Indeed, some of them did not want to participate in the research.

Ethical approval

The present study was a part of a research project approved by ARUMS, entitled "Investigating E-Learning Readiness in Faculty Members of Medical Sciences Universities and Strategies to Improve it". Verbal informed consent was obtained from all subjects before the study. Also ethical approval for the study was obtained from ARUMS Research Ethics Committee. The ethical approval number was IR.ARUMS.REC.1396.277.

Competing interests

The authors declare that there is no conflict of interest.

Authors' contributions

The concept and framework were designed by ER; The questionaries' and data was collected SH. Data analyzed by ER. The manuscript was prepared by ER and edited by SH AND JH. The technical editing was done by JH.

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