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Modeling the e-learning development based on instructional leadership: a mixed study

Background: Considering the importance of leadership in the e-learning of students in higher education, this study aimed to model the development of e-learning based on educational leadership.

Method: The study was conducted in 2024 on members of the nursing education, educational technology, and educational planning faculties of Mashhad University of Medical Sciences. The study used an exploratory mixed-method approach with semi-structured interviews of 15 purposively selected participants. Data analysis in the qualitative section was carried out using triple-coding via the MaxQDA 2020 software, while the quantitative section was analyzed through the structural equation modeling approach and measurement of item loadings using the PLS software. Data was collected using a researcher-made questionnaire from 335 randomly selected members of the statistical population.

Results: The qualitative part included five dimensions of e-learning development based on educational leadership. These dimensions included leadership and management of education in universities, organizational factors, technological infrastructure in universities, human factors, and curriculum structure. Based on the results of the quantitative analysis, the highest priority was given to the component of support from senior managers while the lowest priority was for the reward system component. The model was validated by confirmatory factor analysis, with all dimensions of the model being valid.

Conclusion: Educational leadership plays a critical role in e-learning development, which can be enhanced through collaboration and mentorship.

Keywords: e-learning development, Educational leadership, Electronic learning

مُدجة تطوير التعلم الإلكتروني على أساس القيادة التعليمية: دراسة مختلطة

الخلفية: بالنظر إلى أهمية القيادة في التعلم الإلكتروني لطلبة التعليم العالي، هدفت هذه الدراسة إلى وضع نموذج لتطوير التعلم الإلكتروني على أساس القيادة التربوية.

الطريقة: أجريت الدراسة في عام ٢٠٢٤ على أعضاء كليات تعليم التمريض وتكنولوجيا التعليم والتخطيط التربوي بجامعة مشهد للعلوم الطبية. استخدمت الدراسة منهجًا استكشافيًا مختلطًا مع مقابلات شبه منظمة مع ١٥ مشاركًا تم اختيارهم بشكل مقصود. تم إجراء تحليل البيانات في القسم النوعي باستخدام الترميز الثلاثي عبر برنامج MaxQDA 2020، بينما تم تحليل القسم الكمي من خلال منهج مُدجة المعادلة الهيكلية وقياس تحميلات العناصر باستخدام برنامج PLS. تم جمع البيانات باستخدام استبيان أعده الباحث من ٣٣٥ عضوًا تم اختيارهم عشوائيًا من السكان الإحصائيين.

النتائج: الجزء النوعي تضمن خمسة أبعاد لتطوير التعلم الإلكتروني على أساس القيادة التربوية. وشملت هذه الأبعاد قيادة وإدارة التعليم في الجامعات، والعوامل التنظيمية، والبنية التحتية التكنولوجية في الجامعات، والعوامل البشرية، وهيكلة المناهج الدراسية. وبناء على نتائج التحليل الكمي، أعطيت الأولوية العليا لعنصر الدعم من كبار المديرين بينما كانت الأولوية الدنيا لعنصر نظام المكافآت. تم التحقق من صحة النموذج من خلال التحليل العاملي التوكيدي، مع كون جميع أبعاد النموذج صالحة.

الاستنتاج: تلعب القيادة التربوية دورًا حاسمًا في تطوير التعلم الإلكتروني، والذي يمكن تعزيزه من خلال التعاون والإرشاد.

الكلمات المفتاحية: تطوير التعلم الإلكتروني، القيادة التربوية، التعلم الإلكتروني

مدلسازی توسعه یادگیری الکترونیکی مبتنی بر رهبری آموزشی: مطالعه‌ای آمیخته

زمینه و هدف: با توجه به اهمیت رهبری در یادگیری الکترونیکی دانشجویان در آموزش عالی، این تحقیق با هدف مدلسازی توسعه یادگیری الکترونیکی مبتنی بر رهبری آموزشی انجام شد.

روش: این مطالعه که از نظر هدف کاربردی و از نظر روش‌شناسی آمیخته اکتشافی (کیفی-کمی) بود، بر روی اعضای هیأت علمی آموزش پرستاری، تکنولوژی آموزشی و برنامه‌ریزی آموزشی دانشگاه علوم پزشکی مشهد در سال ١٤٠٣ انجام شد. گردآوری داده‌ها طی مصاحبه‌های نیمه ساختاریافته با ١٥ نفر که با روش نمونه‌گیری هدفمند انتخاب شده بودند، صورت گرفت. تجزیه و تحلیل داده‌ها در بخش کیفی بر اساس فرآیند تحلیل کیفی طی کدگذاری سه گانه باز، محوری و انتخابی از طریق نرم افزار مکس کیودا ٢٠٢٠ و در بخش کمی از طریق رویکرد معادلات ساختاری و اندازه‌گیری بار عاملی گویه‌ها بوسیله نرم افزار پی ال اس انجام شد. گردآوری داده‌ها طی پرسشنامه محقق ساخته از بین ٣٣٥ نفر از اعضای جامعه آماری که با روش نمونه‌گیری تصادفی انتخاب شده بودند، صورت گرفت.

یافته‌ها: بخش کیفی، پنج بعد توسعه یادگیری الکترونیکی مبتنی بر رهبری آموزشی شامل رهبری و مدیریت آموزشی در دانشگاه، عوامل سازمانی، زیرساخت‌های فناوریانه دانشگاه، عوامل انسانی، ساختار برنامه‌های درسی بود. بر اساس نتایج تحلیل کمی، بالاترین اولویت مربوط به مؤلفه حمایت مدیران ارشد و کم‌ترین اولویت مربوط به مؤلفه سیستم پاداش دهی بود. بر اساس اعتباریابی مدل، تمامی ابعاد مدل دارای اعتبار بودند و مدل از برازش مناسب برخوردار بود.

نتیجه‌گیری: رهبری آموزشی نقش مهمی در توسعه آموزش الکترونیکی دارد که می‌تواند از طریق همکاری و راهنمایی افزایش یابد.

واژه‌های کلیدی: توسعه یادگیری، رهبری آموزشی، یادگیری الکترونیکی

انسفرکشنل لیڈر شپ کی بنیاد پر ای لرننگ ڈیولپمنٹ کی ماڈلنگ: ایک مخلوط مطالعہ

پس منظر: اعلیٰ تعلیم میں طلباء کی ای لرننگ میں قیادت کی اہمیت کو مدنظر رکھتے ہوئے، اس مطالعہ کا مقصد تعلیمی قیادت پر مبنی ای لرننگ کی ترقی کو ماڈل بنانا تھا۔

طریقہ: یہ مطالعہ ٢٠٢٤ میں مشہد یونیورسٹی آف میڈیکل سائنسز کی نرسنگ ایجوکیشن، ایجوکیشنل ٹیکنالوجی، اور ایجوکیشنل پلاننگ فیکلٹیز کے ممبران پر کیا گیا تھا۔ مطالعہ میں ١٥ مقصدی طور پر منتخب شرکاء کے نیم ساختہ انٹرویوز کے ساتھ ایک تحقیقی مخلوط طریقہ کار کا استعمال کیا گیا۔ کوالٹیٹیو سیکشن میں ڈیٹا کا تجزیہ MaxQDA 2020 سافٹ ویئر کے ذریعے ٹریبل کوڈنگ کا استعمال کرتے ہوئے کیا گیا، جبکہ مقداری سیکشن کا تجزیہ ساختی مساوات ماڈلنگ کے نقطہ نظر اور PLS سافٹ ویئر کا استعمال کرتے ہوئے آئٹم لوڈنگ کی پیمائش کے ذریعے کیا گیا۔ اعداد و شمار کی آبادی کے ٣٣٥ تصادفی طور پر منتخب کردہ اراکین سے محقق کے بنائے گئے سوالنامے کا استعمال کرتے ہوئے ڈیٹا اکٹھا کیا گیا۔

نتائج: قابلیت والے حصے میں تعلیمی قیادت کی بنیاد پر ای لرننگ کی ترقی کی پانچ جہتیں شامل تھیں۔ ان جہتوں میں یونیورسٹیوں میں تعلیم کی قیادت اور انتظام، تنظیمی عوامل، یونیورسٹیوں میں تکنیکی بنیادی ڈھانچہ، انسانی عوامل، اور نصاب کا ڈھانچہ شامل تھا۔ مقداری تجزیہ کے نتائج کی بنیاد پر، سب سے زیادہ ترجیح سینئر مینیجرز کے تعاون کے جزو کو دی گئی جبکہ سب سے کم ترجیح انعامی نظام کے جزو کو دی گئی۔ ماڈل کی توثیق کرنے والے عنصر کے تجزیہ کے ذریعے کی گئی تھی، جس میں ماڈل کی تمام جہتیں درست تھیں۔

نتیجہ: تعلیمی قیادت ای لرننگ کی ترقی میں ایک اہم کردار ادا کرتی ہے، جسے تعاون اور رہنمائی کے ذریعے بڑھایا جا سکتا ہے۔

کلیدی الفاظ: ای لرننگ ڈیولپمنٹ، ایجوکیشنل لیڈر شپ، الیکٹرانک لرننگ

INTRODUCTION

Today, with great transformations and remarkable capacities in the field of human knowledge, the world has created tools that have led to changes in the nature of work and life, and extensive developments in the fields of education, social and human economics (1). Education and technology have now merged together and e-learning has emerged as a powerful tool for education and learning, which has expanded with today's various intelligent technologies and has had an impact on learning and teaching methods (2), resulting in changes in approaches to education and learning, and subsequently in teaching and learning methods (3). Educational organizations play an important role in the growth and expansion of e-learning. These organizations need leaders to take steps towards using and accepting e-learning and creating visions for the future, and guiding members towards achieving those visions. Effective leadership can create different and improving learning in educational organizations (4). During the COVID-19 pandemic, strategic planning in higher education has focused more on preparedness for online education and assessment. Learners in higher education systems engage in online webinars, instructional videos, live learning experiences and resources for professors, parents, and students (5). In this regard, educational sessions have been organized for students and faculty members of universities to prepare them for guidance in this new virtual learning method. These challenges require a critical look at leadership in times of crisis. This perspective has been approved by Gure and Drisdell (6), who argued that leadership in determining the direction and acceptance of strategic risks requires courage. Rouch and colleagues (7) argued that skillful educational leadership during the COVID-19 pandemic is essential for the implementation of effective policies in line with the university's mission and vision, providing professional development and education for learners in new virtual learning methods. In the study by Laton-Meissner and Pretorius (8), they not only emphasized the important role that leaders must play in organizational and subordinate responsibilities, but also highlighted the complexities of leadership roles. They also stated that the essential leadership qualities during the COVID-19 crisis were empathy, vulnerability, self-awareness, and agility, aimed at reducing the emotional disturbance experienced by employees and students, which is caused by the direct impact of the pandemic. A principled approach makes it clear that most of the components of e-learning mentioned in various research can effectively appear under strong educational leadership. Therefore, a clear understanding of educational leadership in e-learning environments is essential. Thus, identifying and extracting components that help educational leaders effectively guide e-learning environments are important.

METHODS

The study was conducted in 2024 on members of the nursing education, educational technology, and educational planning faculties of Mashhad University of Medical Sciences. The research is applied in terms of its objective and

descriptive-survey in its method. Data collection was conducted using a mixed method (qualitative-quantitative). It is worth mentioning that the mixed method is one of the types of scientific research used to provide a model for representing the phenomenon under study. This method can be used in scientific research that aims to design models and modeling. The tool for collecting qualitative data was interviews with experts, and quantitative data were collected using library studies and a researcher-made questionnaire. The qualitative sample consisted of 15 faculty members from Mashhad University of Medical Sciences (Nursing Education, Educational Technology, Educational Planning) selected using purposive sampling. The quantitative population was 2,594 individuals, including all faculty members and all university managers (basic, intermediate, and senior levels), from which 335 individuals were chosen using simple random sampling and Cochran's formula. The reliability of the qualitative section was calculated using the Holsti method (an agreement of 2% observed). The agreement between two coders in this method was 0.83, which is greater than 0.6; therefore, the qualitative analysis has sufficient validity. The validity of the qualitative section was assessed through expert judgment, showing a face and content validity of 86%, which is satisfactory. In the quantitative section, content validity was used, and reliability was evaluated via structural equation modeling (Table 1). In interpreting the indicators presented, the model was evaluated based on five indices (Table 2).

R²: This is the most important criterion for evaluating endogenous variables, with acceptable values being 0.19, 0.33, and 0.67. Considering the 15 endogenous variables in the fit table, it can be concluded that variables such as senior management support, acceptance of e-leadership responsibility, curriculum implementation, welcoming new technologies into the university, development of educational procedures, expansion of e-learning culture in the university, and curriculum implementation are significant. Meanwhile, the remaining variables have strong relationships with the exogenous variable. Due to issues with the R² index, the adjusted Rajastad index is used, which is a comparison indicator with other models and does not have a defined standardized value.

Q²: A positive and large Q² indicates high capability. Based on the mentioned table, it should be noted that senior management support, acceptance of e-leadership responsibility, networking, development of educational procedures, creating a calm educational environment, analytical and strategic thinking, and transparency in the university have a strong explanatory power.

SRMR: The value of this index is evaluated to be less than 0.1. According to this statement, the model has a good fit for this index.

GOF: This index is the square root of the product of the average communalities and the average R². Values of 0.36, 0.25, and 0.01 are described as strong, moderate, and weak for the GOF index, respectively. Based on this, the model's fit can be evaluated as high in this index.

The analysis of the collected data was conducted using MAXQDA software for the qualitative part and Smart PLS

software for the quantitative part through the structural equation modeling approach.

RESULTS

Qualitative

After reviewing the literature and conducting interviews with experts, data from the qualitative interviews were collected.

The concepts and verbal propositions obtained were then classified through two stages of coding: open coding and axial coding. In the open coding stage, 82 concepts were extracted, and in the axial coding stage, these concepts were categorized into dimensions. These dimensions included:

1. Leadership and management in university education (expansion of the e-learning culture in the university,

Table 1. Validity and reliability of variables			
Variables	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Support from senior management	0.81	0.706	0.501
Expansion of the culture of electronic education in the university	0.903	0.842	0.518
Acceptance of the introduction of new technologies in the university	0.911	0.804	0.658
Acceptance of responsibility for electronic leadership	0.781	0.759	0.439
Networking	0.721	0.724	0.415
Development of educational procedures	0.892	0.845	0.463
Creating a calm environment in the educational setting	0.706	0.867	0.451
Analytical and strategic thinking	0.791	0.818	0.471
Transparency in the university	0.808	0.797	0.403
Utilization of information technology	0.667	0.766	0.426
Provision of technological hardware infrastructure	0.738	0.592	0.469
Reward system	0.853	0.707	0.475
Efficient human resources	0.502	0.775	0.458
Curriculum design	0.667	0.817	0.430
Implementation of the curriculum	0.708	0.906	0.471

Table 2. Model fit indices			
Variables	Q2	R Adjusted	R ²
Support from senior management	0.796	0.894	0.898
Acceptance of responsibility for electronic leadership	0.774	0.913	0.917
Networking	0.792	0.212	0.24
Development of educational procedures	0.852	0.112	0.853
Creating a calm environment in the educational setting	0.672	0.321	0.427
Analytical and strategic thinking	0.672	0.398	0.542
Transparency in the university	0.642	0.543	0.532
Expansion of the culture of electronic education in the university	0.508	0.618	0.728
Implementation of the curriculum	0.496	0.894	0.898
Acceptance of the introduction of new technologies in the university	0.514	0.913	0.927
Provision of university hardware infrastructure	0.574	0.913	0.917
Efficient University Human Resources	0.622	0.212	0.214
Curriculum design	0.452	0.112	0.423
Utilization of information technology	0.542	0.321	0.427
Reward system	0.512	0.398	0.502
GOF		0.352	
SRMR		0.03	

acceptance of e-leadership responsibility, support from senior managers, and welcoming new technologies into the university),

2. Organizational factors (transparency in the university, development of educational procedures, networking, creating a calm educational environment, and analytical and strategic thinking),

3. Technological infrastructure of the university (utilization of information technology and provision of technological hardware infrastructure),

4. Human factors (efficient academic human resources, mental reward system, and e-learning expertise),

5. Curriculum structure (curriculum implementation and design) (Table 3, Figure 1).

Quantitative

Factor loadings of the items were used to measure the reliability of the metrics. The PLS software considered an acceptable factor loading of 0.7 for the items. According to Holland (9), the minimum acceptable factor loading for each metric is 0.7, and metrics with factor loadings below this threshold should be eliminated. In this study, all components had appropriate factor loadings. The components measured included: support from senior managers, expansion of the e-learning culture in the university, welcoming new technologies into the university, acceptance of e-leadership responsibility, networking, development of educational procedures, creating a calm educational environment, analytical and strategic thinking, transparency in the university, usage of information technology, provision of technological hardware infrastructure, reward system, efficient academic human

resources, curriculum design, and curriculum implementation. The highest factor loading was for the item "acceptance of e-leadership responsibility" at 0.766, and the lowest was for the item "reward system" at 0.401 (Table 4).

DISCUSSION

Based on the three-stage coding process—open, axial, and selective—in this qualitative study, it was revealed that the model for developing e-learning based on educational leadership in the Mashhad University of Medical Sciences comprises five dimensions.

This dimension included components such as support from senior managers, expansion of the e-learning culture in the university, welcoming new technologies into the university, and acceptance of e-leadership responsibilities. Educational leadership is considered one of the important factors in acquiring innovation in universities, in the context of increasing global pressures and structural changes in higher education systems. This type of leadership creates learning opportunities for the development of students and faculty in educational activities. Leadership is a significant influence on university innovation, as educational leaders play a critical role in generating ideas, setting goals, and fostering a culture of innovation within the university.

Effective educational leaders are better able to manage university affairs, and because e-learning in academic settings requires capable leaders to foster a fair and flexible educational environment, it can be said that educational leadership contributes to enhancing and improving students' e-learning through positive attitudes of university managers toward e-learning, foresight for identifying potential

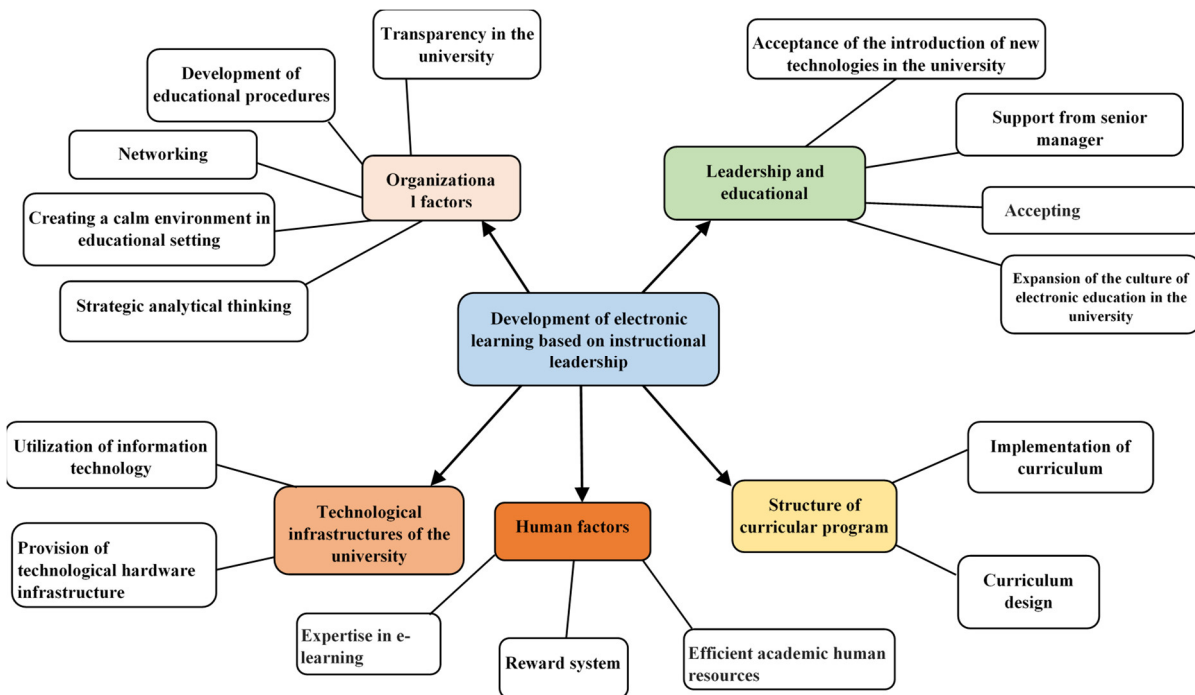


Figure 1. Dimensions and components of e-learning development based on educational leadership at Mashhad University of Medical Sciences (Max Kyoda)

Table 3. Results Related to Coding_1

Dimension	Component	Concept	Dimension	Component	Concept	
Educational leadership and management at the university	Support from senior managers	Positive attitude of university managers towards students' e-learning	Organizational Factors	Networking	Encouraging online communities	
		Foresight to identify potential outcomes			Promoting social interactions among students	
		Involving university staff in decision-making regarding university e-learning platforms			Developing teamwork and joint decision-making	
	Expanding the culture of e-learning in the university	Encouraging students to use technology		Creating online learning communities in the university		
		Cultural groundwork in the university for the development of e-learning platforms		Creating a supportive and inclusive learning environment		
		Improving access for students and university staff to IT infrastructure and continuous support for this access		the provision and procurement of learning resources		
	Introduction of New Technologies to the University	Financial support for acquiring new technological and educational infrastructure.		Informing educational methods by university leaders.		
		Organizing training courses to introduce new educational technologies to professors, students, and staff.		Creating feedback mechanisms to improve student learning.		
		Establishing communication with staff		defining a vision for student academic success		
	Acceptance of Electronic Leadership Responsibility	Understanding and accepting new technologies to meet the needs of staff and students and fostering relationships between them.		Leading under pressure,		
		avoiding controlling others		emphasizing optimism		
		Moving away from top-down leadership style and adopting a more distributed approach in leadership.		Caring for learners		
Technological Infrastructure of the University	Utilizing information technology	collective leadership	Analytical thinking and strategic	Creating a calm environment in the educational setting.	inspiring managers, staff, and professors for learning	
		Adaptability to specific conditions of electronic education, especially post-COVID era.			decision-making based on data	
		Equal access for students to up-to-date educational technologies at the university.			Risk planning.	
	Utilizing information technology	Electronic learning systems tailored to student needs.	Creating long-term strategies.			
		Updating university electronic learning websites.	Organizational trust between university managers and staff.			
		Information security of the university's electronic learning system.	A responsive, flexible organizational culture committed to service delivery, mutual respect, and focused on value, creativity, and innovation.			
	Provision of technological hardware infrastructure	Access to high-speed university internet.	Open and free dialogue.			
		Utilizing electronic tools tailored to the needs and desires of students.	Identifying e-learning needs of students.			
		Setting up computer networks in the university.	Designing electronic learning content.			
	Provision of technological hardware infrastructure	Fully equipping classrooms with computers.	Curriculum Structure	Designing curriculum.		
		Equipping the university with educational technologies.				

Table 3. Continued.

Dimension	Component	Concept	Dimension	Component	Concept		
Human Factors	Electronic Education Expertise	Developing technical knowledge of university staff	Curriculum Structure	Designing curriculum.	Designing practical electronic education programs		
		Supervisory systems in the university.			Designing shared learning communities for students with an electronic education approach.		
		Evaluating the technological knowledge of university staff.			Designing electronic education courses tailored to medical universities.		
	Reward System	Recognizing exemplary students.		Curriculum Implementation	Curriculum Implementation	Utilizing new software in electronic education.	
		Recognizing scientific contributions of students and professors				Online medical courses for medical university students.	
		Encouraging students to engage in scientific activities in the virtual environment by managers.				Active participation of professors during electronic education.	
	Efficient University Human Resources	Recruiting specialized faculty in electronic education.			Efficient University Human Resources	Curriculum Implementation	Considering individual and specific competencies of students by professors.
		Providing necessary human resources for developing the electronic learning environment for students.					Implementing new teaching methods.
		Training specialized human resources in electronic education.					Student-centered and flexible education.
		Developing students' capabilities and media literacy.					Development of student associations
		Selecting electronic education professors and instructors based on meritocracy by student associations .					Using feedback in electronic education.

Table 4. Factor loading of variables

Variables	Factor loadings
Support from senior management	0.789
Expansion of the culture of electronic education in the university	0.537
Acceptance of the introduction of new technologies in the university	0.497
Acceptance of responsibility for electronic leadership	0.766
Networking	0.688
Development of educational procedures	0.677
Creating a calm environment in the educational setting	0.656
Analytical and strategic thinking	0.653
Transparency in the university	0.645
Utilization of information technology	0.402
Provision of technological hardware infrastructure	0.491
Reward system	0.401
Efficient University Human Resources	0.485
Curriculum design	0.435
Implementation of the curriculum	0.525

problems, participation of university staff in decisions related to e-learning platforms, encouragement of students to utilize technology, developing a culture within the university to promote e-learning, improving access for students and staff to IT infrastructures, ongoing support for this access, financial backing for acquiring new technological and educational resources, training courses to introduce new educational technologies to faculty, students, and staff, connecting with staff, understanding and embracing new technologies to meet staff and student needs, fostering relationships, abandoning top-down control, shifting away from authoritarian leadership styles, adopting a more distributed leadership approach, collective leadership, and adaptability to specific online education conditions, especially after the COVID-19 pandemic.

The findings of this study aligned with works by Heydari and Ain Gholami (10); Alizadeh et al. (11); Farazkish and Montazer (12); Rahmani et al. (13); Yukoosh (14); Tenoto (14); Fanoos and He (15); Viradandi Volour et al. (16); Antonopoulos et al. (17); Alotebi et al. (18); Hayashi and Fisher Adams (19). Leadership is context-sensitive and situational in nature; thus, explaining leadership becomes complicated with a prescriptive definition. However, the current literature on leadership in higher education provides significant insights. As it pertains to higher education, there is a growing interest in defining the meaning of leadership.

Juntarasook (21) proposed four general leadership tools in higher education: leadership as position, leadership as performance, leadership as an action, and leadership as a professional role model. Leadership as a position refers to fulfilling a formal role in a leadership position. Leadership as performance refers to demonstrating competence and success in professional fields. Leadership as action involves interactions or activities that include colleagues, students, and team members who are often positioned as followers.

Relevant to higher education, especially distributed leadership, collective leadership, transformative leadership, and socially responsible leadership, are suggested in the literature as more democratic models of leadership.

Another dimension of developing e-learning based on educational leadership relates to organizational factors, including networking, development of educational procedures, creating a calm educational environment, analytical and strategic thinking, and transparency in the university. This dimension is influenced by transformative leadership styles in the university. Educational leaders create a context based on transformational and interactive leadership styles to foster an environment that can develop electronic educational activities and ultimately enrich and enhance students' e-learning experiences.

Educational leaders promote online communities, encourage social interactions among students, enhance teamwork and shared decision-making, establish online learning communities within the university, create a supportive and inclusive learning environment, provide learning resources, and inform teaching methods by leaders at the university. They also create feedback mechanisms for improving student learning, define a vision for students' academic success, create a calm educational environment through guided pressures, emphasize optimism, care for learners, inspire managers, staff, and faculty to learn, utilize analytical and strategic thinking, and foster transparency in the university through building organizational trust among managers and academic staff, nurturing a responsive organizational culture committed to service, mutual respect, and centered on value and creativity.

In this regard, the results of the present study aligned with studies by Farazkish and Montazer (12); Rahmani et al. (13); Arabsarikh Mishabi et al. (22); Jafarpoor (23); Yukoosh (5); Tenoto (14); Fanoos and He (15); Viradandi Volour et al. (16); and Antonopoulos et al. (17).

The technological infrastructure of the university, which includes components such as the utilization of information technology and provision of technological hardware infrastructure, represents another dimension of developing e-learning based on educational leadership. This encompasses equal access for students to up-to-date educational technologies at the university, electronic learning systems adapted to students' needs, updates to the university's e-learning websites, information security for the university's e-learning systems, access to high-speed internet, and the use of electronic tools tailored to the needs and desires of students. Additionally, setting up computer networks within the university, fully equipping classrooms with computers, and enhancing the university's educational

technologies are essential aspects. Technological infrastructure is considered one of the most significant educational leverage points in the context of university e-learning. In this regard, the findings of the present study are in line with studies by Lashkari et al. (24); Rahmani et al. (13); Arabsarikh Mishabi et al. (24); Ismaili et al. (25); Jafarpoor (23); and Garcia (26).

This dimension includes components such as e-learning expertise, a reward system, and efficient academic human resources. University leaders, through implementing educational management, contribute to developing e-learning by enhancing the technical knowledge of university staff, establishing monitoring systems, evaluating the technological knowledge of staff, recognizing exemplary students, acknowledging the scientific contributions of students and faculty, encouraging students to engage in scientific activities online, recruiting faculty specialists in e-learning, providing the necessary human resources for developing e-learning platforms, training specialized e-learning personnel, enhancing the media literacy and competencies of students, and selecting e-learning instructors and trainers based on merit. The findings of the present study are in line with studies by Fahlman (27); Hayashi and Fisher Adams (19); Alotebi et al. (18); Hansluk (28); Fanoos and He (15); Yukoosh (14); Ismaili et al. (25); Rahmani et al. (13); and Lashkari et al. (24).

CONCLUSION

The curriculum structure, which includes components such as curriculum design and implementation, plays a crucial role in e-learning development. Designing the curriculum structure involves identifying the e-learning needs of students, creating content for e-learning, formulating practical e-learning programs, designing student learning communities with an e-learning approach, and developing e-learning courses tailored to the University of Medical Sciences. This also includes utilizing new software in e-learning, offering online medical courses for students, and ensuring active participation of instructors during e-learning sessions, taking into account the individual competencies of students, implementing modern teaching methods, student-centered and flexible training, developing student associations, and utilizing feedback in e-learning. The findings of the present study are aligned with studies like those of Lashkari et al. (24).

LIMITATIONS

The data collection primarily relied on qualitative interviews, which posed challenges in conducting open-ended interviews with experts and specialists. The findings from the qualitative section are based on data obtained from 15 faculty members at Mashhad University of Medical Sciences, which may limit the theoretical generalizability of the results.

Ethical Considerations: Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. This study was approved by the ethics committee of

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- Jafari H, Abbasi F. Comparison of electronic learning in the strategy of self-regulation skills and educational motivation in normal and electronic schools in the field of experimental sciences. *Education technology*. 2020 Dec 21;15(1):51-60. Persian.
- Al-Fraihat D, Joy M, Sinclair J. A comprehensive model for evaluating e-learning systems success. *Distance Learn*. 2018 Jul 1;15(3):57-73.
- Razzaghi M, Hedayati Khoshmehr A, Qasimzadeh Alishahi A, Shahbazi R. Examining the role of students' attitude, system quality and knowledge management in e-learning usage behavior with the mediation of e-learning acceptance. *Science and techniques of information management*. 2023 Apr 21;9(1):17-44. Persian.
- Hoy WK, Miskel CG. *Educational administration: Theory, research, and practice*. McGraw Hill: 2008 Feb.
- Yokuş G. Developing a guiding model of educational leadership in higher education during the COVID-19 pandemic: A grounded theory study. *Participatory Educational Research*. 2022 Jan 1;9(1):362-87.
- Gurr D, Drysdale L. Leadership for challenging times. *International Studies in Educational Administration*. 2020;48(1):24-30.
- Roache D, Rowe-Holder D, Muschette R. Transitioning to online distance learning in the COVID-19 era: A call for skilled leadership in higher education institutions (HEIs). *International Studies in Educational Administration*. 2020 Jan;48(1):103-10.
- Lawton-Misra N, Pretorius T. Leading with heart: Academic leadership during the COVID-19 crisis. *S Afr J Psychol*. 2021 Jun;51(2):205-14.
- Hulland J. Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strateg Manag J*. 1999 Feb;20(2):195-204.
- Heydari Z, Ainqolaei F. Leadership in virtual learning environments. *New developments in educational management*. 2021 Jun 22;4(1):53-64. Persian.
- Alizadeh N, Pilehvari N, Alborzi M. Analyzing the improvement criteria of e-learning services based on cloud computing using Dimtel technique. *Future studies of management*. 2019 Nov 22;30(118):159-73. Persian.
- Farazkish M, Montazer GH. Evaluating the level of readiness of human resources for the realization of e-learning system in Iranian universities. *Organizational resource management research*. 2020 Mar 10;9(4):139-64. Persian.
- Rahmani F, Ahmadi H, Ghanbari E, Khorasani Kiasri SM. Feasibility and ranking of factors affecting the development of e-learning in higher education with a fuzzy multi-criteria decision-making approach. *Education technology*. 2019 Mar 21;13(2):284-98. Persian.
- Tenuto PL. Teaching in a global society: Considerations for university-based educational leadership. *Journal of Global Education and Research*. 2021; 5(1): 96-110.
- Fanoos A, He Y. Curriculum analysis of educational leadership master's programs in the university system of Maryland. *Educational Management Administration & Leadership*. 2021 Sep;49(5):841-58.
- Wiradendi Wolor C, Solikhah S, Fidhyallah NF, Lestari DP. Effectiveness of e-training, e-leadership, and work life balance on employee performance during COVID-19. *Journal of Asian Finance, Economics and Business*. 2020 Aug 28;7(10). 443-50.
- Antonopoulou H, Halkiopoulos C, Barlou O, Beligiannis GN. Transition from educational leadership to e-leadership: A data analysis report from TEI of western Greece. *International Journal of Learning, Teaching and Educational Research*. 2019 Sep 30;18(9):238-55.
- Alotebi H, Alharbi O, Masmali A. Effective leadership in virtual learning environments. *Int J Inf Educ Technol*. 2018 Feb;8(2):156-60.
- Hayashi CA, Fisher-Adams G. Strengthening Leadership Preparation to Meet the Challenge of Leading for Learning in the Digital Age: Recommendations from Alumni. *Educational Leadership and Administration: Teaching and Program Development*. 2015 Mar;26:51-67.
- Antonakis J, Day DV, Schyns B. Leadership and individual differences: At the cusp of a renaissance. *Leadersh Q*. 2012 Aug 1;23(4):643-50.
- Juntrasook A. 'You do not have to be the boss to be a leader': contested meanings of leadership in higher education. *High Educ Res Dev*. 2014 Jan 2;33(1):19-31.
- Arabsarkhi-Mishabi A, Musakhani M, Manian A. Providing a reference model to explain the security requirements in the field of e-learning from the perspective of different stakeholders. *Journal of Information Technology Management*. 2016 Mar 23;26(8):141-54. Persian.
- Jafarpour M. A model for accepting elearning in Iranian universities. *Smart Business Management Studies*. 2011;1(1):91-121. Persian.
- Lashkarian R, Khorshidi A, Barzegar N, Moghadasi H, Moradi S. Identifying the dimensions, components and indicators of e-learning for medical sciences universities in Tehran: a qualitative approach. *Nursing Management Quarterly*. 2022 Nov 10;11(3):76-88. Persian.
- Ismaili H, Rahmani Sh, Kazemi A, Ahmadi A. Evaluation of the state of electronic learning in the virtual education unit of the University of Sistan and Baluchistan. *Public management research*. 2017 Feb 19;9(34):221-41. Persian.
- Garcia I. Emergent leadership: Is e-leadership importance in the quality of virtual education?. *RIED: Revista Iberoamericana de educación a Distancia*. 2015 Jan 1.
- Fahlman D. Educational leadership for e-learning in the healthcare workplace. *International Review of Research in Open and Distributed Learning*. 2012 Apr;13(2):236-46.
- Hensellek S. Digital leadership: A framework for successful leadership in the digital age. *Journal of Media Management and Entrepreneurship (JMME)*. 2020 Jan 1;2(1):55-69.