Original Article

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_1221_22

Use of Massive Online Open Courses (MOOCs) model in virtual education development in first macro-region universities of medical sciences in countrywide territorial planning

Ensieh Pouladi, Maryam Taghvaee Yazdi[1], Mohammad Salehi[2], Siavash Moradi[3]

PhD Student in Higher Education Management, Sari Branch Islamic Azad University, Sari, Iran, [1]Associate Professor, Department of Educational Management, Sari Branch Islamic Azad University, Sari, Iran, [2]Associate Professor, Department of Educational Management, Sari Branch Islamic Azad University, Sari, Iran, [3]Visiting Associate Professor, Department of Educational Management, Sari Branch Islamic Azad University, Sari, Iran and Assistant Professor, Center for Studies and Development Education, Mazandaran University of Medical Sciences, Sari, Iran

Address for correspondence:
Dr. Maryam Taghvaee Yazdi, Department of Educational Management, Khazar Square, Km 7 of Darya Road (Farahabad), Sari Branch Islamic Azad University, Sari, Iran.
E-mail: m_taghvaeeyazdi @yahoo.comr

Received: 21-08-2022
Accepted: 24-11-2022
Published: 29-09-2023

Abstract:

BACKGROUND: Massive online open cources (MOOCs) are a new chapter in the topic of teaching–learning in higher education, which have been able to acquire a significant and valuable position in higher education and prestigious universities worldwide in line with the advancement of technology. The present study was conducted pursuing the goal to investigating the effect of use of MOOCs in the development of virtual education in universities of medical sciences in the first macro-region of countrywide territorial planning.

MATERIALS AND METHODS: This research is based on a mixed method and practical in terms of purpose, and it was carried out in 2021 and 2022 in first macro-region of countrywide regional planning Medical Sciences Universities. The data of the qualitative section were converted into a questionnaire using the method of qualitative content analysis in a purposeful and semi-structured interview with 24 experts in the field of virtual education who had sufficient experience in the field of MOOC courses. The statistical population of the quantitative section is 1938 faculty members of the first macro-region of countrywide regional planning, of which 324 were selected by stratified random sampling. Its validity was calculated by Lawshe and Waltz–Bausell method by R software, and the reliability was calculated using Cronbach's alpha method with SPSS-21.

RESULTS: Universities are facing challenges in structural, managerial, cultural, social, technological, and evaluation dimensions, and the current situation of using MOOCs in them is not appropriate.

CONCLUSION: Besides, the analysis of the optimal situation of using MOOCs in these universities indicates that technological, structural, managerial, evaluation, educational, and personal dimensions are the most important in the effect of using MOOCs on the development of virtual education.

Keywords:

Distance education, higher education, MOOCs, online education, online learning

Introduction

The advancement of technology and ICT in the present time world has exposed all aspects of human life to fundamental changes, and as a result, some new concepts have evolved. Education and learning are not an exception in this regard. Experts call the 21st century going through the shifts happening at an ever-increasing pace in science and technology. Distance education, E-learning, easy access to open educational resources (OERs), learning through virtual reality (VR) and simulators, and, recently,

How to cite this article: Pouladi E, Taghvaee Yazdi M, Salehi M, Moradi S. Use of Massive Online Open Courses (MOOCs) model in virtual education development in first macro-region universities of medical sciences in countrywide territorial planning. J Edu Health Promot 2023;12:326.

massive open online courses (MOOCs) are of such developments.

The MOOCs have originated from distance learning, E-learning practices, and the OER movement.[1] These courses are probably the most critical factor in the emergence of electronic learning in the past years.[2]

The contemporary world, termed as the world of speed and advancement, requires benefitting from the methods which allow people to access education in a time-saving manner and the expansion of virtual education and the penetration of remote facilities into the depth of communities whose goal is to provide education through novel methods, including the shortcuts that can achieve great goals.

On the other hand, virtual education can pave the ground for developing education effectively and quickly with immediate access to the course, reducing the costs, and improving the return rate on education capital to be realized. The importance of virtual education, especially since January 2020, as the onset of coronavirus disease 2019 (COVID-19) pandemic outbreak has disrupted the daily routine of life and education across the world, is felt more than ever. Now that because of the imposed restrictions resulting from the spread of the very COVID-19, face-to-face classes in the universities and educational centers are inevitably being held by benefitting from virtual education, and concerning the rapid developments taking place in the surrounding environment, the implementation of virtual systems in order to provide novel service and technologies in teaching and learning has been focused as a fundamental requirement.

Nowadays, virtual education has been institutionalized in the worldwide top universities.

In the world of the Internet-oriented learning, MOOC has been one of the most inclusive learning methods in recent years thanks to its educational structure as being absolutely consistent with real-time university education. MOOC is the realization of one of United Nations Educational Scientific and Cultural Organization's dreams: the restriction-free education for everyone everywhere, regardless of racial, religious, and gender discrimination.[3]

This research is conducted for the first time with the purpose of providing a model of the relationship between the two variables "virtual education development" and "mock" in medical sciences universities. In the document of the transformation and innovation project in the education of medical sciences, the following goals are among the ones specified for the development of virtual education:

- Designing and launching the national MOOC software package for the countrywide universities of medical sciences.
- Compilation of the medical sciences-related electronic contents and presenting them through MOOCs with the full participation of the universities of medical sciences.

The current study was conducted with the goal to investigate use of MOOC-induced effects on the development of virtual education in the universities of medical sciences in the first macro-region.

Material and Methods

Study design and setting

This descriptive-applied research was performed in 2021 using a mixed method (quantitative and qualitative) in order to present the model.

Study participants and sampling

In the quantitative section, the statistical community consisted of all teachers of the universities of medical sciences in the first macro-region of the health sector in the country, including Babol, Semnan, Shahroud, Golestan, Guilan, and Mazandaran Universities of Medical Sciences, as 1938 individuals in number, of whom 324 ones were selected as the statistical sample by the stratified random sampling pursuant to academic credit based on Cochran's formula at 95% confidence level and α=5% measurement error, and the questionnaire was distributed among them. Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were used to check the suitability of the sample size, and confirmatory factor analysis was used to evaluate the research factors.

Data collection tool and technique

First off, we employed the exploratory factor analysis to investigate whether the question structures had the potential to measure the goal or not. Generally speaking, the purpose of exploratory factor analysis is to find out the main dimensions of the structure designed to measure the desired variable.

To conclude if the desired data (the sample size and the relationship between the variables) were suitable for factor analysis or not, KMO index of sampling adequacy and Bartlett's test of sphericity were used. KMO is an index of sampling adequacy that examines the smallness of partial correlation between the variables. This index is in the range of 0–1. If the index value is close to 1, the desired data (sample size) are suitable for factor analysis; otherwise (usually less than 0.5), the results of the factor analysis are not much suitable for the question data, and if its value is between 0.5 and 0.69, the data are moderate

and should be extracted with more caution, and the values greater than 0.7 indicate the sample size being adequate. Also, in order to grasp the relationships between the variables and present the model and validation, three stages, that is, fitness of the measurement models (with three criteria of combined reliability and convergent and divergent validity), fitness of the structural model, and fitness of the overall model, were carried out.

Data analysis

In the following, the results of exploratory factor analysis and the process for determining the factor loading of each of the main components of MOOC educational components are discussed with the main factors and Varimax Rotation.

Because the proposed questionnaire has measured two parts (the individuals' opinions about the use of MOOC education and its extent in the universities of medical sciences), in order to investigate this question considering the variables' sample size, the single sample T-test is applied. It is worth mentioning that the t-value signifies the variables' effect of significance. If the t-value is greater than 1.96 or, equivalently, the *P* value is less than 0.05, the effect is significant. Also, if the confirmatory factor coefficients are above 0.6, it indicates a robust relationship between the two variables; if it is between 0.3 and 0.6, there is a moderate relationship, and if it is below 0.3, there is a poor relationship.[4]

The operation dedicated to the structural equation modeling was carried out with the partial square approach using the partial least squares (PLS) PLS-3 software.

Reliability and convergent and divergent validity were used to fit the model. According to Fornell and Larker (1981), reliability in PLS method is measured using factor loading coefficients, Cronbach's alpha coefficients, and composite reliability (CR).[5,6] The appropriateness criterion of factor loading coefficients is higher than 0.4.[7] Unlike Cronbach's alpha, which implicitly assumes that each index has the same weight, CR relies on the true factor loadings of each construct and provides a better measure of reliability. The CR should be greater than 0.7 to indicate the internal stability of the structure.

The operation for the structural equation modeling was carried out using the partial square approach with PLS-3 software.

Reliability and convergent and divergent validity were employed to measure the fitness of the model. As Fornell and Larcker (1981) stated, the reliability in PLS method is measured using factor loading coefficients, Cronbach's alpha coefficients, and CR.[5] The criterion to decide about the factor loading coefficients being appropriate is higher than 0.4.[7] Unlike Cronbach's alpha, which implicitly assumes that each index has the same weight, CR relies on the true factor loadings of each construct and offers a better measure for reliability. The CR should be greater than 0.7 to indicate the construct's internal consistency.

Ethical considerations

All ethical issues were taken into consideration. Before data collection, participants were informed that their responses will be kept confidential and data will be used for research publication.

The purpose of the study was explained in the survey form. This study was approved by the ethical committee under the code of (IR.IAU.SARI.REC.1400.086).

To maintain the confidentiality of data and participants, all interview transcriptions were labeled with a participant's number before analysis. The names of any individuals taken during the interviews were removed and denoted as ABC and XYZ for anonymity.

Results

In the qualitative section, having analyzed the results out of the interviews with the experts, eight main dimensions, namely, structural, educational, technological, cultural, managerial, individual, evaluation, and social, were identified in the development of virtual education of the first-macro region universities of medical sciences of the regarding MOOCs, and 112 components were extracted for the above eight dimensions and converted into a questionnaire.

The value of KMO (sampling adequacy) is 0.924, and the significance level of Bartlett's sphericity test is 0.0009. Therefore, besides the sampling adequacy, performing the factor analysis based on the study correlation matrix will also be justified [Table 1].

The initial statistical characteristics gained by analyzing the main components for the construct of MOOC-oriented education components can be seen in Table 2 [Table 2].

The eigenvalues of all eight factors is greater than 2, which accounts for almost 45% of the total variation,

Table 1: KMO index and Bartlett's test results for the construct of MOOC education components

Construct	Kaiser–Meier goodness-of-fit test and Bartlett's test	
MOOC education components	KMO	0.924
	Bartlett	19031/646
	Df	6216
	P	0.0009

among which the eigenvalue of the first factor equals 7.44; that of the second factor equals 7.04; for the third factor, it equals 5.89; for the fourth factor, it equals 5.69; for the fifth factor, it is equal to 5.35; that of the sixth factor is 4.77; that of the seventh factor equals to 4.71; and the eigenvalue of the eighth factor is 4.03. In Varimax Rotation, by removing 19 items, all research factors were verified. The eigenvalue of all factors is greater than 2, which accounts for almost 45% of the total variation. Among them, the eigenvalue of the first factor is equal to 7.44; that of the second factor is equal to 7.04; for the third factor, it is equal to 5.89; for the fourth factor, it is 5.69; for the fifth factor, it is 5.35; for the sixth factor, it is equal to 4.77; for the seventh factor, it is 4.71; and for the eighth factor, the eigenvalue is 4.03. The data can be seen in Table 2.

The model is at a very satisfactory level in terms of all three criteria, as can be seen in Table 3 [Table 3].

Another criterion measured is divergent validity. According to Magner, the criterion for verifying convergent validity is to have an average variance extracted (AVE) more than 0.5 and if the square root value of the AVE values of each construct is greater than its correlation with other constructs, it has divergent validity.

In Table 4, the main diameter of this matrix contains the square root of the AVE values of the research constructs, and it can be seen that the square root of the AVE values of each variable is higher than its correlation with other variables; it indicated that the items of each variable have more correlation and interaction with their indicators and the divergent validity of the model can be verified [Table 4].

If the value of Q^2 (the criterion for the predictive power) acquires three values as 0.02, 0.15, and 0.35, which indicate poor, medium, and strong predictive power, respectively, the achieved Q^2 value is 0.288, which signifies a strong predictive power and verifies the fitness of the research structural model once again.

In the overall review of the model in the section as the use of MOOC model in developing the virtual education, the SRMR value of the root mean square of the standardized residual as an approximate value of the model's goodness of fit is equal to 0.097, which is considered appropriate and acceptable [Figure 1].

In the following, the factor measurement indicators and factor determination coefficients are analyzed.

The data obtained from the field study were implemented in SMART-PLS software, and the following results were gained [Table 5].

In the model's general review in the section on the use of MOOC model in the development of virtual education, the SRMR value of the root mean square of the standardized residual, which is an approximate value of

Table 2: Extracted factors and variance percentage explained by MOOC education components

Component	Initial eigenvalues			Sum of the square powers of the extracted factor loadings			Sum of the squared factor loadings after Varimax Rotation		
	Total	Variance %	Cumulative variance%	Total	Variance%	Cumulative variance%	Total	Variance%	Cumulative variance%
1	27.28	24.36	24.36	27.28	24.36	24.36	8.33	7.44	7.44
2	4.56	4.07	28.43	4.56	4.07	28.43	7.88	7.04	14.48
3	4.02	3.59	32.02	4.02	3.59	32.02	6.60	5.89	
4	3.42	3.05	35.07	3.42	3.05	35.07	6.37	5.69	
5	3.26	2.91	37.98	3.26	2.91	37.98	5.99	5.35	
6	3.17	2.83	40.82	3.17	2.83	40.82	5.34	4.77	
7	2.69	2.41	43.22	2.69	2.41	43.22	5.28	4.71	
8	2.41	2.15	45.38	2.41	2.15	45.38	4.52	4.03	

Table 3: Convergent validity and composite reliability in the fitness of the MOOC model's dimensions in virtual education

	Cronbach's alpha reliability coefficient	Composite reliability coefficient (CR)	Average variance extracted (AVE)
Educational dimension	0.921	0.932	0.514
Social dimension	0.919	0.932	0.577
Evaluation dimension	0.882	0.906	0.547
Structural dimension	0.929	0.938	0.501
Individual dimension	0.937	0.946	0.613
Cultural dimension	0.920	0.932	0.556
Technological dimension	0.924	0.936	0.593
Managerial dimension	0.942	0.949	0.591

Table 4: Correlation matrix and divergent validity analysis of the MOOC model's dimensions in virtual education according to Fornell and Larcker (1981)

	Educational dimension	Social dimension	Evaluation dimension	Structural dimension	Individual dimension	Cultural dimension	Technological dimension	Managerial dimension
Educational dimension	0.717							
Social dimension	0.487	0.760						
Evaluation dimension	0.442	0.503	0.740					
Structural dimension	0.514	0.506	0.468	0.685				
Individual dimension	0.489	0.518	0.464	0.503	0.783			
Cultural dimension	0.462	0.446	0.405	0.494	0.447	0.746		
Technological dimension	0.364	0.411	0.366	0.435	0.424	0.403	0.770	
Managerial dimension	0.437	0.459	0.475	0.599	0.453	0.419	0.371	0.769

Table 5: Table of coefficients of direct path and their significance coefficient for confirmation model for use of MOOC model in development of virtual education

Path between variables	Path coefficient	*t*-statistic	*P*	Result
Educational dimension Use of MOOC model	0.178	18.501	0.0009	Significant
Social dimension Use of MOOC model	0.159	19.744	0.0009	Significant
Social dimension Evaluation dimension Use of MOOC model	0.114	17.634	0.0009	Significant
Structural dimension Use of MOOC model	0.231	22.288	0.0009	Significant
Individual dimension Use of MOOC model	0.184	20.972	0.0009	Significant
Cultural dimension Use of MOOC model	0.157	16.559	0.0009	Significant
Technological dimension Use of MOOC model	0.139	14.978	0.0009	Significant
Managerial dimension Use of MOOC model	0.207	21.089	0.0009	Significant

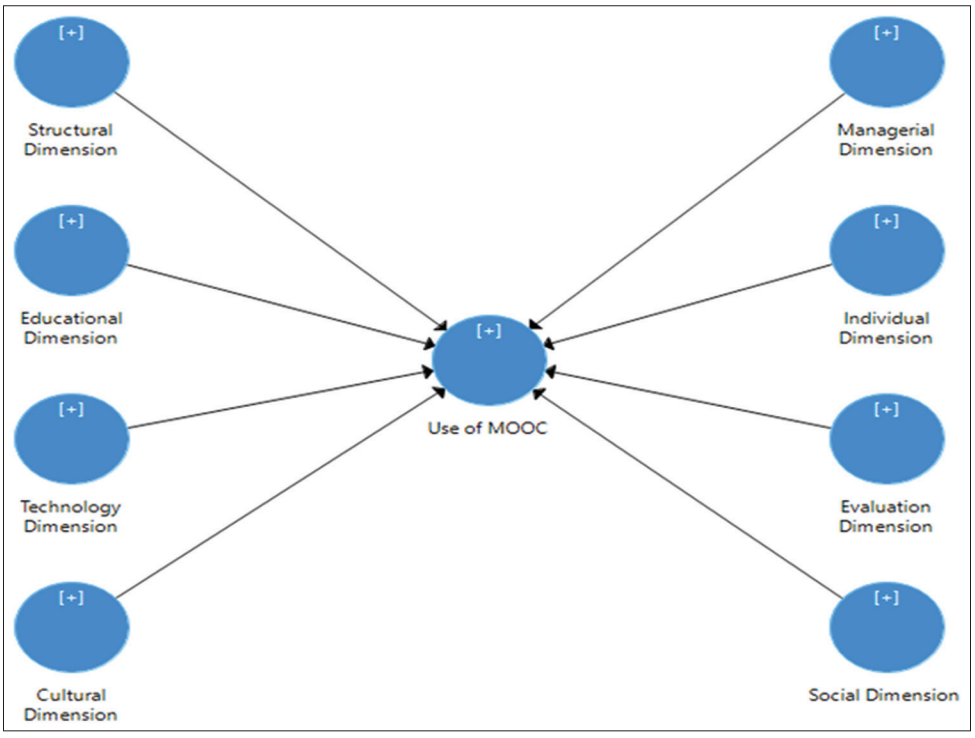

Figure 1: Use of MOOC model in virtual education

the model's goodness of fit, is equal to 0.097, considered as appropriate and acceptable.

After checking the fitness of measurement models, it is the time to measure the fitness of the confirmation model. Unlike the measurement model, the part related to the structural model has nothing to do with the items (observable variables) and only the latent variables and their relationships are examined [Figure 2].

Discussion

Employing online educational innovations has got more common in recent years, and it is hoped that it will increase human capital and reduce inequalities.[8]

This study was conducted in a mixed method which aims to use MOOCs in the development of virtual education in the universities of medical sciences. Investigating the dimensions of use of MOOC model in the universities revealed eight main dimensions.

The present study extracted results regarding the factors that lead to MOOCs' success disclosed that the technological, structural, and managerial factors are greatly influential on launching and using MOOCs in the universities of medical sciences of the first macro-region, which is consistent with the results of the studies of Ghazi Mirsaeed *et al*. (2018), Farzan *et al*. (2018), and Rodriguez and Armellini (2017) in terms of considering the structural and technology factors.[9-11]

In their research, which is corresponding with the current research, Yousefi Nojookambari *et al*. (2019)[12] concluded that to effectively implement and use MOOCs depends on paying attention to the internal and immediate factors (computer factor and communication tools, user interface design factor, implementation, evaluation and measurement, information factor, program acceptance and management, and learner-oriented factor), the external factors and the mediating higher education policies, and technology-related culture.

Zeinabadi and Mousavi (2017)[2] in their research titled reflection on MOOCs in Iran drew this conclusion that the due challenges are because of the educational and organizational, management, technological, and education and teaching method issues.

In their study, Jafari *et al*. (2018)[13] reported that the most important strategies in facing MOOCs in higher education curricula include efficient curricular planning for MOOCs, promoting the international communication in higher education, paving the social and cultural ground for the use of MOOCs, being equipped with strategic planning on MOOCs in higher education, and adopting appropriate management measures in line with the optimal use of MOOCs.

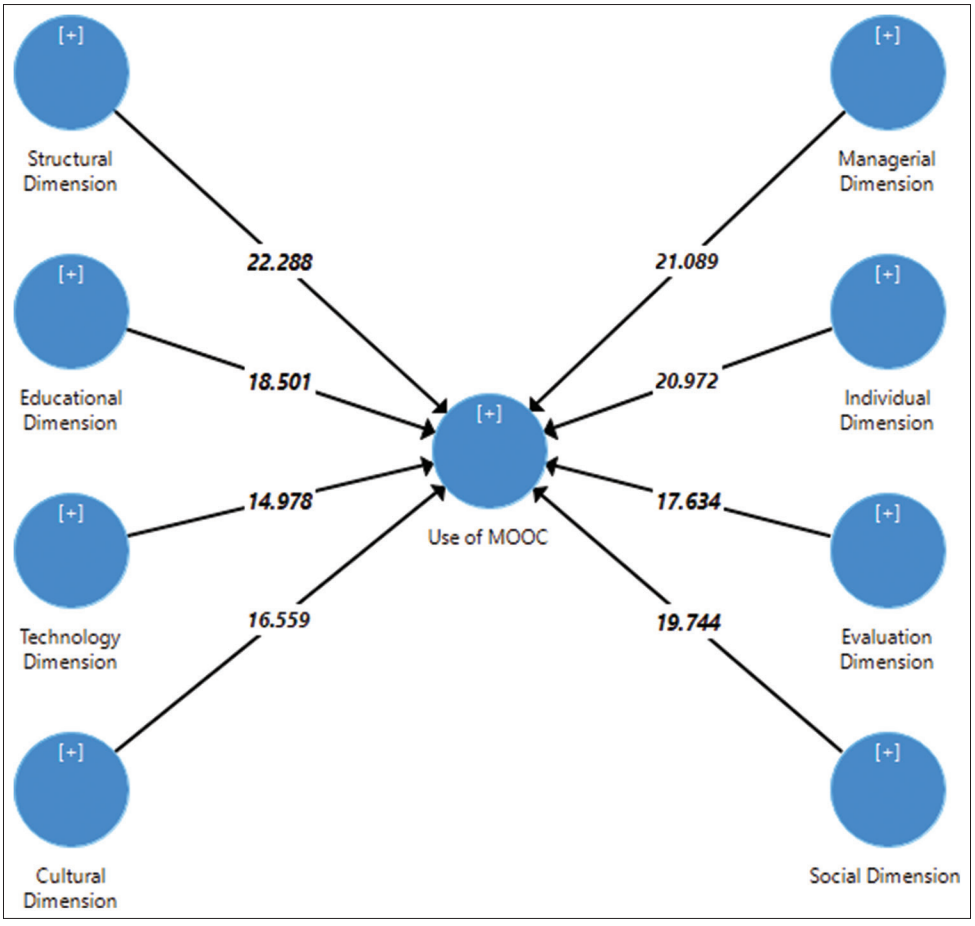

Figure 2: Confirmation model for use of MOOC model in virtual education in terms of significant state of coefficients

Moeinikia *et al*. (2019)[14] in their research indicated that many factors affect the implementation of MOOCs in the countrywide higher education, and executing such courses requires specialized strategies, which is not inconsistent with the results derived from the present study.

Kumar *et al*. (2022)[15] stated in their research that the probable prospective of e-learning could be innovative or revolutionary because this helps in both theoretical-related and clinical-related advancements, and it is possible only with e-learning in developing countries to meet the quality in education.

A significant finding of the Saurav Basu *et al*. (2020)[16] study in UG medical education in India was that one in three participants were utilizing MOOCs for updating their medical education or for teaching purposes, which could be improved through further awareness.

Our study findings can inspire the university lecturers, course designers, and students to analyze and improve the instructional scalability of their courses.[17] Regarding the increasing number of the students and the growing significance of digital technologies in university campus education, which is now even more due to the COVID-19 pandemic, this study is highly significant for representing the MOOCs and online or blended education as part of education and also its potential to be generalized to all universities in the country.

In order to develop and expand the knowledge in the country, it is required to consciously use new educational methods so that education gets directed toward creativity and vitality and paves the ground for the talents getting flourished. Educational justice, lifelong learning, self-directed learning, and easy access to educational resources are among the merits of the use of MOOCs in higher education.

Because there are different stakeholders in the MOOC development process in the universities, such as faculty teaching groups and university management, the goals, the objectives, and the motivations of different stakeholders should be regulated in such a manner to be able to supply sufficient budget for the courses' development. This leads to branding of that institution or university so that it can be recognized as an institution with the potential to provide the students with sustainable and high-quality online learning experiences.[18]

This research is conducted for the first time with the purpose of providing a model of the relationship between the two variables "virtual education development" and "mock" in medical sciences universities. One of the limitations of this study was that the large number of questions in the questionnaire led to some faculty members not completing it and made data collection time-consuming.

It is suggested that for future studies, other dimensions of the use of MOOCs in the development of virtual education in universities be extracted and all components be carefully analyzed in order to improve the quality of education.

The dimensions identified in this study, in which we have challenges, should be carefully analyzed, and suitable implementation solutions should be provided at the level of educational policy makers in the country to solve them.

Conclusion

University, as the production center of science, should take advantage of the most up-to-date technologies in all dimensions. Education, which is the main mission of the university, is required to use the most up-to-the-minute methods to better access and promote knowledge along with the advancement of technology. In today's competitive market, a university is successful if it is aligned with novel technologies; otherwise, it is doomed to destruction.

It is suggested that in the universities, especially the universities with an audit board, the intra-university MOOC curriculum be designed and compiled through the participation of the experts in virtual education and educational technology, faculty members, university officials, and student representatives as the principle stakeholders of the education based on the authority delegation regulations in the development and revision of the curricula. The all-round support of the authorities and deputies of the universities and higher-education centers of MOOCs will lead to facilitating the institutionalization of the MOOC-oriented curriculum model and will reduce the clashes of ideas in its implementation.

Acknowledgements
This research is a part of PhD thesis and we'd like to sincerely appreciate the university teachers and faculty members patiently cooperating with us in completing the present research questionnaires.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1. Shrivastava A, Guiney P. The Arrival of MOOCs: Massive Open Online Courses New Zealand: Ministry of Education, Tertiary Education Commission 2014. Available from: https://apo.org.au/node/39803. [Last accessed on 2022 Aug 15].
2. Zeinabadi HR, Musavi Amiri T. Investigate the status of education based on Mooc in Iran's Higher Education; Challenges and Solutions. Int J Entrepreneurship Innov 2018;6:41-56.
3. Sarrafzadeh M. Libraries and Librarians in the MOOC age. STIM 2016;2:11-32. Persian.
4. Chin WW, Marcolin BL, Newsted PR. A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. INFORMS 2003;14:189-217.
5. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Mark Res 1981;18:39-50.
6. Shrestha N. Factor analysis as a tool for survey analysis. AJAMS.2021;9:4-11
7. Hulland J. Use of partial least squares (PLS) in strategic management research: A review of four recent studies. Strateg Manag J 1999;20:195-204.
8. Hoxby CM. The Returns to Online Postsecondary Education, NBER Working Papers 23193, National Bureau of Economic Research, Inc. https://ideas.repec.org/p/nbr/nberwo/23193.html. 2017. Available from: https://policycommons.net/artifacts/1392686/the-returns-to-online-postsecondary-education/2006950/.
9. Ghazi Mirsaeed SJ, Ommati E, Eebrahimi M. Motivation, reasons and knowledge of learners In use of MOOC. JMIS 2018;4:26-34. Persian.
10. Farzan N, Shams Mourkani G, Rezaeizade M, Ghahrami M. Identifying the effective indicators in designing the MobileMooc system for virtual teaching of employees: A qualitative study. JEDU 2020;11:1-28. Persian.
11. Rodriguez BCP, Armellini A. Developing self-efficacy through a massive open online course on study skills. Open Praxis 2017;9:335-43
12. Yousefi Nojookambari Z, Mahmoudi M. The role of MOOCs in learner retention in the e-learning environment. J Behav Sci Stud Res 2020;2:50-6. Persian.
13. Jafari E, Fathi Vajargah K, Arefi M, Rezaeizadeh M. Developing a Mooc-based curriculum model for higher education based on grounded theory: Case Study; Iranian Higher Education. TEJ 2019;13:581-93. Persian.
14. Moeinikia M, Aryani E, Zahed Bablan A, Mousavi T, Kazemi S. Perusal the factors affecting on the implementation of Massive Open Online Courses (MOOC) in higher education (Mixed Method). Educ Strategy Med Sci 2017;9:458-70. Persian.
15. Kumar P, Gottumukkala S, Ramesh K, Bharath T, Penmetsa G, Kumar C. Effect of e-learning methods on Dental education: An observational study. J Educ Health Promot 2020;9:235.
16. Basu S, Marimuthu Y, Sharma N, Sharma P, Gangadharan N, Santra S. Attitude towards mobile learning among resident doctors involved in undergraduate medical education at a government medical college in Delhi, India. J Educ Health Promot 2020;9:321.
17. Kasch J, Van Rosmalen P, Kalz M. A Framework towards Educational Scalability of Open Online Courses. J Univers Comput Sci 2017;23:845-67.
18. Young JR. Inside the Coursera contract: How an upstart company might profit from free courses. The Chronicle of Higher Education 2012;19:2012.