

# Applying Path Analysis Model in Explaining the Factors Affecting the Quality and Usefulness of E-Learning: The Students' Perspective

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## ABSTRACT

**Background:** E-learning is considered as one of the most important learning environments and the efforts and experiences of this type of learning have been studied and implemented in many countries. The purpose of this study is the application of path analysis model in explaining the factors affecting the quality and usefulness of e-learning through the student's perspective.

**Methods:** The research method is descriptive-correlation through using path analysis. The statistical population of the study consisted of 110 students of virtual courses of Payame Noor University (2018-2019); The questionnaire was provided to all of them through census and 70 students answered and filled in the questionnaire. A researcher-made questionnaire was used to collect data and the reliability coefficient of the questionnaire was obtained through Cronbach's alpha of 0.94 and validity was verified by 10 experts. Also, the validity was assessed through the internal consistency method which showed 0.87.

**Results:** The findings of the path analysis indicated that the quality factor of the type of technology with a coefficient of influence of 0.59 had the most effect on the quality and usefulness of the education from the students' perspective ( $P=0.001$ ) and Content agent with an impact coefficient of 0.26 indirectly affected on the quality and usefulness of e-learning ( $P=0.021$ ). Also learning methods with coefficient (0.51) directly affected on the quality and usefulness of e-learning ( $0.51=\beta$ ). The teacher agent with coefficient 0.27 has indirectly influenced on the quality and usefulness of e-learning.

**Conclusion:** Based on the results of this study, virtual education planners need to pay attention to the factors affecting the quality of courses.

**Keywords:** E-learning quality, E-learning usefulness, Students

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## Introduction

E-learning offers a new learning environment for the 21<sup>st</sup> century as an era of Information and Communication Technology (ICT). This new approach to learning focuses on directly engaging the learners in their education (1). E-learning is actually the most suitable and cost-effective option when a large audience needs training in a stable situation (2). E-learning complements the current forms of training and can occasionally replace them fully. Combination learning means the use of multimedia and comprises one of the major approaches to e-learning (3). In Iran, e-learning is a nascent industry in education and distance education; however, educational institutions, especially universities, are working to provide an e-learning model that is appropriate for the educational and cultural structure of this country (4). In the past decade, due to challenges such as increased demand for higher education, inadequate budgets, the lack of full-time faculty and the need to remove geographical constraints, e-learning has become a more serious subject of contemplation. All the definitions of this concept emphasize three points: Learning, technology and access. Over the past two decades, the issue of quality has gained prominence in universities and higher education institutions, and the interest in improving the quality of education has increased both nationally and internationally (5). Assessing the quality of learning is a process that helps improve the quality of e-learning and devise appropriate resolutions (6). The design and implementation of e-learning programs require the identification of factors that can contribute to the success of these programs (7). The results of a comparative study on successful models of electronic learning were used to identify the key factors affecting the success of an electronic learning system, which included learner, teacher, educational design, support services, technology infrastructure, financial management system, educational policies, educational rules and standards (8).

A study by Momeni Rad and Ali Abadi

regarding quality assurance in e-learning using the standards showed that the best and most effective way to ensure high-quality e-learning is to comply with the standards developed for this type of training in the form of prescriptive and descriptive specifications (9). In another study by Otarkhani and Delavari regarding students' satisfaction with the e-learning system, 15 factors were found to affect the satisfaction of virtual students, the most important of which included the flexibility of the educational units, the quality of the internet and technology available, the usefulness and ease of application of the system and the support services offered by the university (10). The results of a search by Khodadad Hosaini, Noori and Zabihi showed the acceptance of the use of e-learning in higher education. The application of flow theory, technology acceptance model and e-service quality showed that the characteristics of the educator and training materials through perceived usefulness and enjoyment also had a positive effect on the intention to use e-learning. Moreover, the perceived usefulness of the existing variables had the greatest impact on the intention to use e-learning (11). The results obtained by Kamkar et al. showed that, in Iran, the e-learning system is not in a desirable condition in terms of usability in learning (12). Daugherty and Fune examined a number of students who had attended both traditional and electronic classes and found that the students were more satisfied with e-courses because of their flexibility in terms of time and space and access to information. (13). Brown and Lidholm argued that the interaction between the teacher and the learner is an important element of e-learning environments, and creating interactive learning environments enhances satisfaction and improves learning (14). Quoting Bobb, Outz stated that learners' satisfaction with e-learning has been high when professors have posted their lecture presentations or requested other learners to post their notes. Learners' satisfaction with e-learning is affected by the way the teachers present materials during classes (15). A study

by Bary et al. examined learner satisfaction with e-learning and showed that learners are generally more satisfied with e-learning than traditional classes. Their study considered characteristics such as learner-teacher interactions, learner-content, learner-learner, learner-interfaces and learner independence and revealed that learners have high levels of satisfaction and success in this environment (16). This study was conducted to investigate the factors affecting the quality and usefulness of e-learning from the students' perspective using a path analysis model.

## Methods

The general purpose of this research is to explain the factors affecting the quality and usefulness of e-learning from the students' point of view through the application of path analysis method. The statistical population of the study consisted of 110 students of virtual courses of Payame Noor University (2018-2019).

The questionnaire was provided to all of them through census and 70 students was answered and filled in the questionnaire. Questionnaires were sent to students via email and responses were received via e-mail). According to the selected participants, the inclusion criteria included: The sample must be a postgraduate student in educational science in Payam-e-Noor University who was studying in 2018-2019 academic year and from a system-based e-learning environment. The Learning Management System (LMS) was used in the virtual classroom and answered the questionnaire questions during the research period. Exclusion criteria were: failure to answer questionnaire questions, absence during the study period for 2018-2019 academic year and lack of consent to participant in the study.

In order to collect the data, a researcher-made questionnaire was used. To collect the questionnaires after studying the existing resources and compiling the initial questionnaire, researchers gathered the opinions of the experts in the field of e-learning and finally, by integrating the comments

and implementing the reforms, researchers ensured that the questionnaire evaluated all the factors desired by the researchers, and so Content validity has been verified. Also, the validity was assessed through the internal consistency method which showed 0.87. To verify the reliability of the questionnaire, a pilot questionnaire was performed on 30 samples and via the retest method which showed the Cronbach's alpha coefficient was 0.94. For this research, a questionnaire was developed for 54 questions in which the component of the type of technology and support services was filled with 14 questions, the content and information of the electronic courses with 11 questions, the importance and role of the teacher in the electronic courses with 5 questions, the quality and learning methods with 13 items were evaluated with quality and usefulness and in general satisfaction with 11 questions. The questionnaire was two-dimensional and set to Likert scale. Given that in the first section, the factors affecting quality, the spectrum of responses was never greater than ever, and the corresponding score was from 1 to 5, so the score of 1 indicates a very inappropriate condition, and the score of 5 indicates the very appropriate state of the agent. In the second part of the questionnaire, the quality and usefulness of the electronic course, the range of responses from very low to very high and the corresponding score of 1 to 5, and score 1 indicates a very bad situation, and the rating of 5 indicates a very good quality status and Usefulness of electronic courses. The questionnaire was designed on a Likert scale and Questionnaires were distributed via e-mail and then collected.

The findings were analyzed through the path analysis model. Concerning the ethics of the study, it was noted that prior to conducting the study and submitting the questionnaire, consent was obtained from all participants and if the student did not wish to participate in the study, he / she would not be forced. The study samples were assured that the demographic information was confidential and used only for research purposes. At

the end of the study, participants could be informed of the research results if they so desired. The findings were analyzed through using SPSS21 and path analysis model.

## Results

Data were analyzed through application of spss21 after collecting and the central and dispersion indices were used to describe the observations. Path analysis was used to investigate the factors affecting the qualitative effectiveness of electronic courses. The significance level was considered less than 0.05. The sample is 70 people, half of whom are men and half women. They are studying humanities. The sample is also between the ages of 23-56 years.

The mean score of students was 12 to 17 with a mean of 15.87 and a standard deviation of 1.08. Based on the findings of this study, the descriptive statistics of the main variables are as follows: Mean Quality of Technology and Technology Type 48.90 and standard deviation 10.14, The mean factor of content and information was 47.90 and its standard deviation was 10.14, The mean teacher factor was 14.57 and its standard deviation was 3.38, The mean of quality and learning styles was 48.71 and its standard deviation was 10.12 and the mean of quality and usefulness of training was 50.39 and its standard deviation was 9.54 (Table 1).

In the path analysis, a theoretical model is tested, which ultimately leads to an empirical model with the implementation of the analysis. Therefore, it is natural that the empirical model that comes from the path analysis is not the same with the theoretical model obtained from the theoretical framework. The general rule in conducting path analysis is that the variables whose beta

values are not significant at the error level of less than 0.05 is eliminated from the model. This research was aimed at identifying the most important factors affecting the effectiveness of e-learning courses of Noor-e-Kerman students. Therefore, after reviewing theoretical fundamentals of research and related research, the theoretical model of research was set. The most important factors affecting the quality effectiveness of e-learning courses are: quality factor and learning practices, factor of the quality of the type of technology used, and support provided, teacher and agent of the content and information. The theoretical and conceptual model for examining the factors affecting the effectiveness of e-learning courses was as follows (Figure 1).

Using the SPSS 21 software, a path analysis method is performed whose results are presented in the Table 2.

To interpret the results, the standardized regression coefficients of Beta are used. The Table 2 shows that quality factors and learning methods with beta of 0.511 have the greatest impact on the quality and usefulness of education from the students perspective. Based on this result, a standard deviation in the quality factor and learning methods will change the quality and usefulness of the training by a standard deviation of 0.511. Also, the results indicate that the quality factor of the type of technology has a significant effect on the quality and usefulness of the training, but the content and Teacher factors have no significant effect on the quality and usefulness of the education from the student's point of view.

Therefore, the next model of path analysis is presented in Figure 2.

The results showed that quality factor and

**Table 1:** The shows the descriptive indicators of the main variables of the research

Variables	Minimum	Maximum	Mean	Std. Deviation
Quality factor of the type of technology	17	67	48.90	10.14
Content and information agent	17	67	47.90	10.14
Teacher factor	5	20	14.57	3.38
Quality factor and learning method	17	65	48.71	10.12
Quality and usefulness E-learning	15	55	39.50	9.54



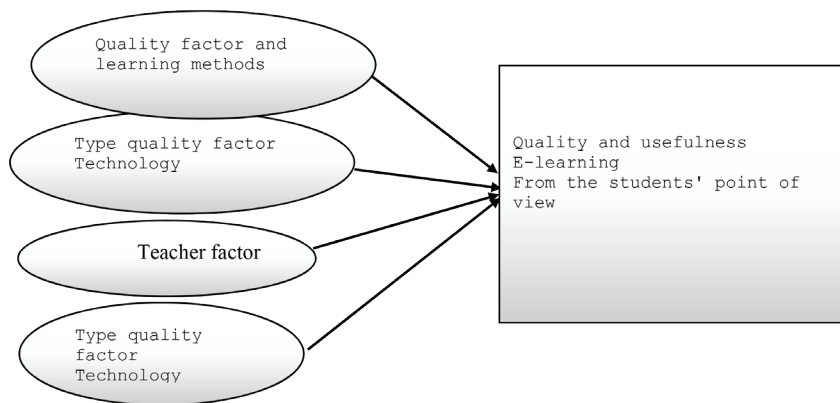


Figure 1: Path Analysis Model

Table 2: path Analysis using the dependent variable of the quality and usefulness of e-learning from the student's point of view

Variables	Not standardized $\beta$	Standard error $\beta$	Standardized $\beta$	t	sig
Quality factor of the type of technology	0.369	0.119	0.393	3.092	0.003
Content and information agent	0.060	0.215	0.038	0.282	0.779
Teacher factor	0.525-	0.334	-0.186	-1.570	0.121
Quality factor and learning method	0.482	0.131	0.511	3.672	<0.001

Dependent variable: the quality and usefulness of e-learning

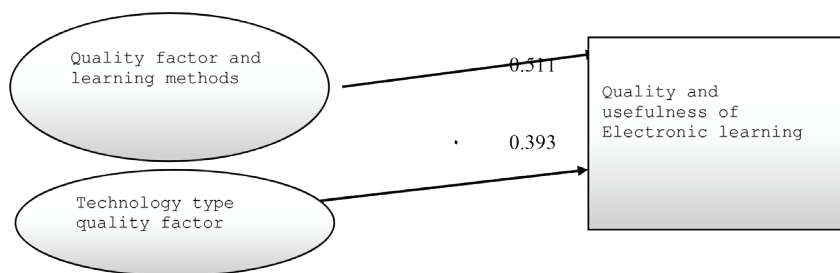


Figure 2: path Analysis Model

learning methods have the greatest impact on the quality and usefulness of education. Therefore, at this stage, the quality factor and learning methods as the dependent variable are entered into the regression equation and the effect of other independent Variables (factors) is tested on it. The results are presented in Table 2.

The table shows that the quality factors of technology type ( $P < 0.001$ ), content ( $P = 0.021$ ) and teacher factor ( $P = 0.006$ ) have a significant effect on the quality factor and learning methods. So the next model of path analysis is presented in Figure 3.

Finally, the quality factor of the technology type is entered into the equation to test the effect of the independent variables on it. The results are presented in Table 3.

Now using the results of Table 4 which shows that content factor has a significant effect on technology type quality factor ( $P < 0.001$ ) but teacher factor does not have significant effect on technology type quality factor ( $P = 0.175$ ). The path analysis model can be set as follows.

The path analysis model can be set as follows (Figure 4). Summarizing the results of the path analysis at different stages.

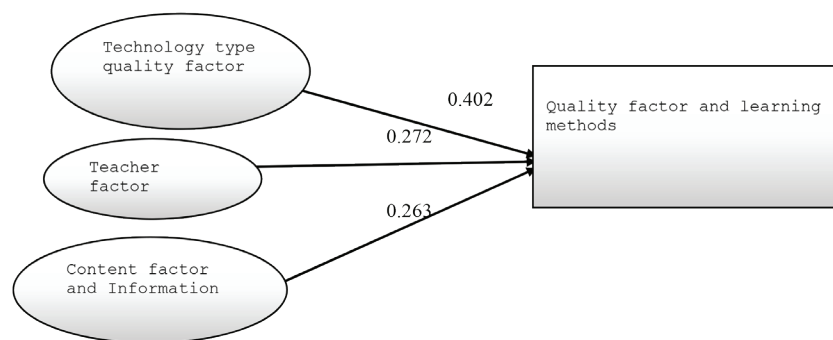


Figure 3: path Analysis Model

Table 3: Path analysis using technology- quality (dependent variable)

Variables	Not standardize $\beta$	Standard error	Standard error	The amount of t	sig
Content agent and information	031.1	191.0	615.0	396.5	<0.001
Teacher factor	468.0	342.0	156.0	369.1	175.0

Dependent variable: Technology type quality factor;

Table 4: Path analysis using dependent variables quality and learning methods

Variables	Not standardize $\beta$	Standard error	Standardize $\beta$	t	sig
Technology type quality factor	401.0	096.0	402.0	4.163	<0.001
Type quality factor Technology	440.0	186.0	263.0	365.2	0.021
Teacher factor	813.0	285.0	272.0	854.2	006.0

Dependent variable: Quality factor and learning methods

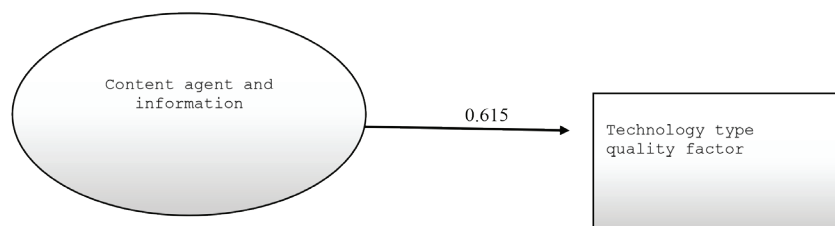


Figure 4: Path Analysis Model

After summarizing the results of the path analysis Figure 4, which is shown in the form of three tables, figures and interpretations.

In this section by combining these three results, researcher analyze the path in three steps and finally bring them into the experimental model and then This model fits with the theoretical model of research (Figure 5).

The Table 5 is also designed to show the sum of the direct and indirect effects of independent variables (factors) on the

dependent variable (quality and usefulness of e-learning):

According to the Table 5, the quality factors of the type of technology and the quality of learning methods have a direct impact on the quality and usefulness of e-learning, respectively.

In addition to its direct impact, the quality factor of technology has had an indirect effect on the quality and usefulness of e-learning through the quality factor and learning methods. Both content and instructor factors

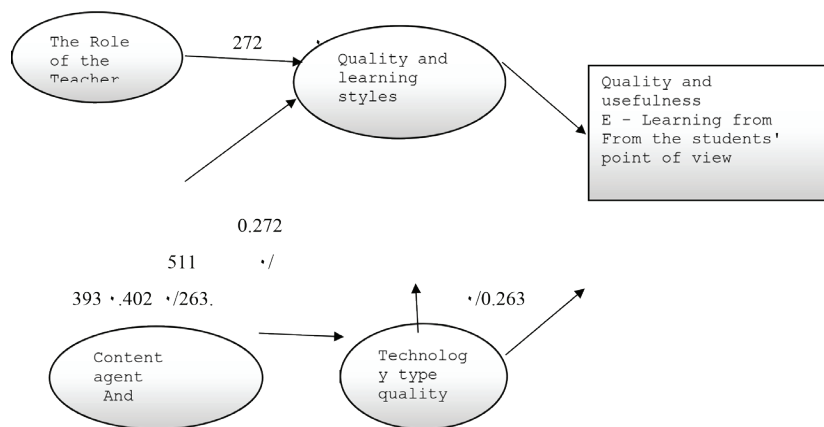


Figure 5: Experimental Models of Factors Affecting the Quality Effectiveness of Electronic Courses

Table 5: Summary of factors affecting the quality and usefulness of e-learning from the students’ point of view

Agents	Direct effect	Indirect effect	Overall impact
Technology type quality factor	0.393	0.205	0.598
Content agent and information	-	0.263	0.263
Teacher agent	-	0.272	0.272
Quality factor and learning methods	0.511	-	0.511

have had only an indirect effect on the quality and usefulness of e-learning.

Finally, the quality factor of the technology type and then the quality factor and the learning methods had the greatest overall effect on the quality and usefulness of e-learning from the students’ point of view.

### Discussion

The purpose of this study is to explain the factors affecting on the quality and usefulness of e-learning from the student’s perspective, The sample of the research is Postgraduate students of educational sciences studying in the virtual education system. The findings of Table 5 of the path analysis indicated that the quality factor of the type of technology had the greatest impact on the quality and usefulness of e-learning, learning methods direct effect and content and instructor factors have had an indirect effect on the quality and usefulness of e-learning from the student’s perspective. This result is consistent with Investigations of Sanaie, Cuellar, Hsu H, Minchiu et al. Hosseini et al. Khooe et al. Qasemi and Shahriari Fard (17-22). Online learning is so

effective and well provided sor today that it is difficult to argue against being successful (23) Rafiee et al. have suggested technical and technological factors (Web access and security and website support) as the most influential factor in the success of an e-learning program and student satisfaction. (24). Antonio argues most everyday activities require some type of intuitive planning in terms of determining at set of tasks whose execution allows to reach some goals under certain constraints (25). Similar studies by Sun & et al. also yielded the same result as Sadri and Seifi studies, which may be due to strong technological infrastructure in these countries, which is not considered as a satisfactory factor (26). The results of research Cuellar showed that integrated e-learning management systems using semantic web and social networks could provide a suitable environment for learning learners (18). Also Yi-Hsuanlee & et al. showed that the proper organization of support structures in understanding the usefulness of electronic systems is very important. And also the individual experience of work with computer and computer self-efficacy has an

important impact on the perception of the suitability of the electronic environment (27). The results of the research by Hsu H, Minchiu et al. showed a direct and significant relationship between the design structure of the online learning environment and learning and satisfaction in this environment (18). In explaining this research, it can be said that technology is the focus of all the sections that are technologically used in electronic learning systems. It is meant to support the services provided by the e-learning system to the stakeholders of this type of training to facilitate the learning process for learners (16).

Also the results Table 5 indicate that content factor indirectly affects the quality and usefulness of e-learning. results of research is consistent with Investigations of Sanaie, Bray, Hosseini et al., Khooie et al. Based on research results the content agent is one of the most important factors in the success of implementing an e-learning program and satisfaction of students (17, 16, 20, 21). Rafie et al. suggest content agents as one of the factors of the efficiency and development of e-learning which was consistent with the findings of the present research (24). Ghasemi and Shahriari Fard referred to the causative agent as a part of educational factors and considered it as one of the effective factors on the quality of e-learning. (22). Rujechao Finds the quality of content as a way to achieve quality education consistent with goals (28). Mohammadi research showed that the quality of the system and the quality of the content of information are among the first factors that make users eager and more satisfied with the use of e-learning environments (29). In explaining this goal, it is necessary to express the content and information to features such as course syllabuses, course goals, lesson assignments, curriculum, lesson organizing, volume of content, continuous retrieval, and demand-driven learning content, and features in learning content. Electronic, such as credit, accuracy, updating, basic skills development, communication with the needs of the audience, attractiveness, interactivity, similarity to real life content, multimedia,

the relationship between content and pre-organizers, compliance of content production with standards and Different generations of electronic content production Which is very important for their proper organization and organization in the perception of the usefulness of electronic systems (29). Also, analysis Table 5 showed direct impact of quality and learning methods on the quality and usefulness of e-learning . This result is consistent with the results of Rezaei Rad that considers learning methods and practices as part of the content of the program as one of the most important factors in the success of an e-learning program (30) also Sanaie, Seraji & Seif, Qasemi and Shahriari Fard, Rafiee et al. researches Has been consistent with the present research which identifies the learner as one of the indicators that affect the quality and efficiency of e-learning and student satisfaction (17, 22, 24, 31). But Zaman Pour and Mirzabeighi do not consider the learner's features and learning management effective on the success of e-learning learners (32). The results of the research Hrastins showed that simultaneous communication in the electronic environment increases their satisfaction, and simultaneous communication over asynchronous communication increases the motivation of individuals in the application of electronic learning systems and increases the coherence and significance in these environments (33). The results of Hsu & Minchiu research showed that Internet self-efficacy or people's belief in their ability to organize and use electronic classes is very effective in enrolling them from classrooms (19). Benth et al research. showed that feedback and collaborative activities in e-learning classes are important in promoting learning (34). The results of Johnson et al. (2008) study showed that perceived usefulness through interactions in the environment and computer self-efficacy would enhance learning and proper function in the learning environment (35). In explaining this goal, it can be said that different learner learning methods are based on the individual differences of learners with



different learning styles and due to the high flexibility of e-learning environments, all learning styles through various environments in the electronic environment are taken into consideration. And in the electronic environment, interactivity is the basis of learning formation and the interaction in e-learning is conscious. Therefore, there should be issues such as: conscious implementation of classroom engagement and engagement, continuous feedback to students, communication facilities, and technical infrastructure requirements for engagement (such as synchronous and asynchronous learning environments, simulations, projects, practical exercises, resolution Issue, discussion forums, Wikipedia, internet groups and the way teachers - students, students- students, students-content interactions. Responsibility for learning in distance learning is with learner, and he is completely autonomous in this and so the success of virtual education depends on the informed acceptance of the learner and Learner's willingness to learn. The results Table 5 indicate that the teacher's factor has indirectly affected the quality and usefulness of e-learning. This result is consistent with the results of Rezaei Rad, Rezaei Rad, Akbary Boorang et al. Hayeon, Khodadad Hosaini, Noori and Zabihi, Seraji and Seifi , Ghasemi and Shahriari Fard, Zamani & Madani, Hyochalim Which regards the competence, experience and skill of the teacher and academic staff as one of the indicators that affect the quality of education and the success factor in implementing the e-learning program (11, 22, 30, 31, 36-42). Hosseini & et al. also consider access to distance learning professors as admission factors for e-learning (20). The results of Chensun & et al reaserch. Showed that coaches and teachers in an e-learning environment can create a sense of satisfaction among learners and promote their motivation through a variety of environments and encourage them to use the electronic system. (39). Also, the results of research by Y ihsu an. showed that the relationship between learner learning and learner satisfaction is far higher than the

learner-teacher relationship in face-to-face environments (26). Because the learner has the ability to communicate with the instructor at the same time and get feedback from him through the electronic environment at the same time and asynchronously, he can provide himself with fully flexible assignments. The results of Hertanova & et al. showed that teachers' voluntary participation and their positive expectations of the electronic environment are very effective in accepting electronic environments and creating suitable space (40).in e-learning, the teacher acts as facilitator of the learning process, and identifies educational objectives, quality learning resources, learning activities, and evaluation practices. Teaching skills and experience in the system of electronic learning, computer literacy of faculty, full-time faculty; using the capacity of teachers of other universities; commitment to virtual space; cognitive, attitude and psycho-motor skills; and entrance skills of students from indicators(41, 42) This is the qualitative part of this section. Based on the results of this study, virtual education planners need to pay attention to the factors affecting the quality of courses.

### Acknowledgement

We thank students of virtual courses of Payame Noor University for assistance with collect the data and the experts in the field of e-learning for comments that greatly improved the manuscript.

### Declarations

Ethics approval and consent to participate

In this study, the following ethical issues were considered: After obtaining permission from the college officials, the training program began at the Payame Noor University. At the beginning of the training program after the researchers had introduced themselves, they explained the objectives of the study and the need to implement them to the virtual courses of Payame Noor University and the written consent was obtained from students of virtual courses of Payame Noor University

participating in the study. The population of the study was also assured that all information collected will remain confidential.

### Conflict of Interest

None declared.

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