

The Relation of E-learning with the Perception of a Constructive Environment: The Mediating Role of Learner and Teacher Abilities

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ABSTRACT

Background: As we entered the 21st century, the necessity for educational transformation became clear, with technology playing a key role. Although many studies have explored virtual education, research on enhancing online learners' experiences to achieve educational goals is still lacking. The current research investigated the relationship of e-learning with the perception of a constructive environment and the mediating role of learner and teacher abilities in high schools in Kerman City, Iran.

Methods: This correlational study was performed using the Structural Equation Model (SEM) between 2020 and 2021. The study population consisted of 1,157 high school principals, experts, teachers, and students from high schools in Kerman City. A total of 150 participants were selected through convenience sampling. Among these, 30 were experts and school teachers, while 120 were high school students. The data gathering tool was a 45-question researcher-made questionnaire of the factors related to the enrichment of online education and a questionnaire of the perception of the constructivist learning environment based on Haghayeghi and Karsheki (2014). The face validity of the researcher-made questionnaire was confirmed based on the experts' opinions, and the exploratory factor analysis confirmed the 4-factor structure of the questionnaire. The reliability of the questionnaire was confirmed based on Cronbach's alpha coefficient. Data analysis was done using the structural equation modeling method in AMOS software.

Results: Using structural equation modeling, the relationship between family structure, educational system, learner ability, teacher ability, and perception of constructivist learning environment was investigated. The values of path coefficients and indirect effects showed that family structure with a path coefficient (0.45) and educational system with a path coefficient (0.18) indirectly influenced the perception of the constructivist environment through the students' ability. Also, the educational system with a path coefficient (0.26) indirectly influenced the perception of a constructivist environment through the teacher's ability. The mean and standard deviation of the sample group's scores in learner ability were 27.39 ± 4.10 , teacher ability was 21.37 ± 4.08 , and perception of the constructivist learning environment was 79.05 ± 7.79 . These variables represented different dimensions, with score ranges of 2 to 10, 2 to 4, and 10 to 50, respectively.

Conclusion: The results of this study indicate that the design and management of the online learning system should focus on enhancing multiple aspects, including knowledge, learners, educators, and families.

Keywords: Distance, Family Structure, Educational System, Perception, Constructive, Environment, Aptitude

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Introduction

E-learning is the act of learning how to use electronic tools and procedures. Web-based learning, computer-based learning, virtual classrooms, and online collaboration are all examples of e-learning methods and applications. Capabilities of the Internet, intranet, extranet, satellite TV, and CD-ROM with multimedia (1). are all used to provide content at the beginning of the 21st century; the necessity of evolution and change in education has become clear to everyone, and technology is the starting point of this evolution because it has affected our daily life. By entering the era of information and communication and due to the investing problems in education as well as air pollution caused by the transportation of teachers and students and the high cost of education, conventional education no longer meets the current needs of the new generation (2).

Another reason for the necessity and importance of virtual education is to speed up learning according to desired process. Certainly not everyone's learning speed is the same. In traditional methods, students must adapt to the speed of the class. Some students need more repetition to memorize information; some need to increase the speed of learning; otherwise, they spend boring hours in class. One of the advantages of online education is that we can learn at our own pace, which makes the learning process much more enjoyable. Therefore, another reason for the importance of virtual training is the possibility of repeating the videos multiple times, which personalizes the learning speed for students (3).

One of the most popular reasons for the importance of online education is that we can attend the class online or receive the class file completely in case of absence. If one participates in e-learning classes online, he/she can stay in the course of teaching, and if one has any doubts or questions, he/she can simply ask them. E-learning is a very suitable option for working people and people who have a lot of work. Daily work may not give enough time to sit in face-to-face classes, and

in case of persistent absences, one will have to cancel the lesson. In this case, one may not understand the subject even by reading his/her classmates' pamphlets. However, in e-learning, we don't have to attend all online classes (4).

One of the problems that exists in all societies and countries is the imbalance between facilities in different cities and regions. Undoubtedly, the quality of education and the facilities of the same subject in an educational institution in a small city are much lower than a higher institution in a big city like Tehran. However, in electronic education, this problem has been completely solved. Whether it is in one of the border and remote villages or in the center of Tehran, an electronic education class with the same quality will be held. This issue can undoubtedly be considered as one of the reasons for the necessity and importance of electronic education, which creates equal and suitable conditions for all people (5). One of the problems of face-to-face training and classrooms is the limited educational facilities and the lack of use of visual, digital, and online aspects in education. Imagine that in a face-to-face class, the teacher talks about the growth and development of a plant. In e-learning classes, one can watch the steps in the form of videos, animations, simulators or any other visual aspects along with the instructor's explanations and learn the concept completely and forever. Flexibility is another reason for the importance of e-learning, which increases the quality of education to a great extent (6).

In the traditional education method, place and time are very important for participating in an educational course, but these barriers have lost their meaning in online education. Many times, it might have happened to those who have been looking for a training course for a long time and after a while they find out that the course is held in another city (7). The cost of commuting, the difficulty of the road, taking leave from work and other reasons make stop going to the training course despite the inner desire. However, another

advantage and reason for the importance and necessity of e-learning is that one can participate in courses abroad without any time limit. Therefore, another advantage of virtual education and its importance is that this method can provide the students with a new window of learning opportunities because many international courses will help get more ideal job opportunities in the future. (8). E-learning is a very suitable educational method for people who have physical disabilities, and it is difficult for them to go to face-to-face courses. These people can easily register in all online courses and participate in online classes at their own home with no need to go to another place. Another positive feature of e-learning is that the learning environment is removed from the competitive mode, and learning becomes more self-learning. In this situation, people can easily exchange information and data with each other or form groups to carry out their own research and projects (9). If one knows that several trees are cut down to prepare pamphlets, books, and daily notebooks, he/she will undoubtedly become a fan of e-learning. One of the most serious reasons for the importance of the virtual education system is to help preserve the environment by reducing traffic, air pollution, and the amount of paper used. By using this educational method, we will also help to preserve our environment in addition to benefiting from all the above benefits (10). Another issue that is important regarding virtual and electronic education, especially for learners at younger ages, is the structure of the family in terms of computer literacy; access of families to electronic audio-visual facilities; ; economic, geographical and social status of families and the family's attention to the importance and necessity of virtual education and accepting this educational system instead of traditional and face-to-face education. There is much room for discussion and research (9).

One of the reasons for the importance of virtual education for students is that this method will not limit the class capacity. All face-to-face classes and courses have a

limited capacity for the number of students. It is natural that each classroom has a certain capacity, and the high number of people reduces the quality of education to a great extent. E-learning also solves this problem and holds online classes without the limitations of face-to-face classes (11). In the online training course, students try to improve their skills and technical knowledge of using educational tools such as computers. Also, in this method, they should use different learning management programs and software, which will improve their software and technical skills (12). For this reason, educational institutions are inclined to use new educational approaches, including virtual education. In the educational system, the issue of improving the academic and curricular level and academic progress of learners is one of the main concerns of designers and policy makers in the field of education, and their academic success is assumed as one of the important bases for the continuous improvement of educational quality, which helps to identify some bottlenecks and problems of the education system and providing scientific and suitable solutions (13).

Therefore, it is necessary to examine the success and academic performance of students to understand the current situation and improve it and facilitate educational decision-making. (14). On the other hand, virtual education is a type of educational technology that is based on values such as being person-centered, independent learning, and self-directed and active process. Of course, each society applies this type of learning according to its specific social and cultural conditions. In the education system of Iran, the implementation of virtual education was officially started in 1380 with the efforts of both public and private sectors. In this issue, the important point is that the confrontation of the traditional method of education with the virtual education method has changed the educational outcomes of the learners, but the new culture of learning without the presence of a teacher cannot be easily applied; as a result, the new environment of teaching

and learning is associated with challenges (15). The research results show that for the development of online education in schools and its enrichment, effective factors, limitations, and challenges in the design of the electronic learning environment must be well identified to choose suitable solutions to speed up the development process of virtual training (16).

In his research, Esposito divides the problems of enriching virtual learning by teachers and in schools into two categories: external problems towards teachers (access, time, support, resources, and training) and internal problems towards teachers (attitudes, beliefs, activities, and resistance) (17).

Hooper and Hanafin's research also shows that structural and organizational factors such as funding and lack of up-to-date technology facilities are among the obstacles in the use of computers by teachers (18); others include hardware and software facilities, lack of trained manpower in the field of computer use; lack of clarity of goals in the field of computer use in education; low motivation due to not providing enough training to teachers and students; gender inequality among students in terms of access to computers; lack of familiarity with English; and lack of a valid scientific model.

Also, Xu found in his research that the use of information technology was directly influenced by the feeling of the usefulness of the information technology and personal factors. On the other hand, according to professors' and teachers' opinions, communication with learners and their active participation is an important motivating factor for learning (19). Therefore, problems such as the lack of creativity and new ideas, teachers' lack of technology knowledge, and lack of motivational factors are among the obstacles to the educational experience of virtual teachers. Also, not having deep conversations, not being understood by others, not having reciprocal understanding and recognition of others, and not having modeling and learning are the other limitations of online teaching-learning (20).

Higher online teaching efficiency by completing online courses (21), teaching preparation qualifications (22), and long-term flexibility of educational systems (23) are the other factors of recognition of the century for the effectiveness of virtual education.

Although many studies have been conducted in the field of virtual and electronic education and learning, there is not any research that examines the enrichment of online learners' teaching-learning experiences to achieve all the main goals of education and training. The present study compiled the model and tested it by combining the results of previous studies to achieve a more comprehensive explanation of the constructivist learning environment (Figure 1).

Methods

Study Design and Setting

This correlational study was performed using the Structural Equation Model (SEM) during 2020 to 2021 in a high school in Kerman City, Iran

Participants and Sampling

The statistical population of this research consisted of two groups; the first group comprised experts (school principals and education experts and teachers). The second group consisted of male high school students of Kerman city, which according to the preliminary statistics were 1157 individuals.

Inclusion criteria: All high school females aged 13-15 years who had a smartphone, ability to work with the Internet, and willingness to participate in the study, expertise in the field of technology and education, and experience of at least 10 years of activity and teaching. People who refused to continue cooperation or did not answer more than 20% of the questions were excluded.

Data Collection Tools

A) Questionnaire of effective factors in enriching the online teaching-learning process

A researcher-made questionnaire was used to measure the factors affecting the

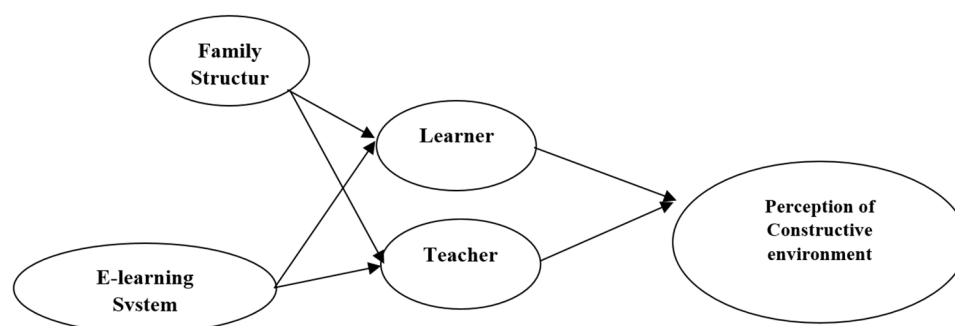


Figure 1: Conceptual model of research

enrichment of online education. To create this questionnaire, first, the effective factors were identified based on the theoretical and practical basis of the research and with the Delphi method and exploratory factor analysis. To measure these factors, we developed questions based on the identified factors. After examining the opinions of the experts, at the end of 45 questions, we formed the final form to be implemented in the final sample group (principals, teaching assistants, and teachers). The questions were scored based on a 5-point Likert scale from completely disagree to completely agree and the scores ranged from 1 to 5.

Validity: In order to check the face validity of the questionnaire, some experts such as the supervisor and the consultant confirmed the quantity and quality of the questions in the questionnaire.

In order to determine the content validity of the questionnaire, we gave the questions to 14 educational psychologists, and they were asked to answer each of the questions using “it is necessary”, “it is not necessary, but it is useful”, and “it is not necessary”. The answers were calculated based on the CVR formula and adapted to the Lawshe table. Numbers higher than 0.59 were accepted. After determining and calculating CVR, content validity was checked based on Waltz and Base’s CVI. For this purpose, the questionnaire was again given to 14 experts and they were asked to comment on each of the three criteria: relevance, simplicity, and clarity. Then, the content validity index was calculated based on the formula CVI. The acceptance of the items was based on the CVI score higher than 0.79. The total average was reported 0.80.

After the findings were obtained from the experts’ opinions regarding the importance of each of the identified factors, they were evaluated and analyzed through the Delphi method. Then, to conceptualize, formulate, and analyze the factors identified in the Delphi method, we used the method of exploratory factor analysis. Exploratory Factor Analysis Reveals Key Dimensions and Sub-Factors in enriching the online teaching-learning process. The results of the EFA showed that the questionnaire had a good fit to the data, as indicated by the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett’s test of sphericity. The KMO value was 0.82, which exceeded the recommended threshold of 0.6, and the Bartlett’s test was significant ($\chi^2=2345.67$, $df=990$, $P<0.001$), indicating that the correlation matrix was not an identity matrix. The EFA extracted four factors that corresponded to the four main dimensions of the questionnaire, and each factor had several sub-factors that were loaded on it. The four factors explained 62.3% of the total variance. The titles of the components are given in Table 1. Delphi method and factor analysis were used for analysis of the data.

Reliability

Questions related to each component along with reliability coefficients are reported in Table 1.

Definition and Measurement of Variables

The definition of conceptual and operational variables for the two questionnaires are as follows: Questionnaire of effective factors in enriching the online teaching-learning process:

Table 1: Dimensions of the questionnaire factors affecting the enrichment of education and reliability coefficients

Dimensions	Questions	Cronbach's alpha
Capability of the educational system	1-17	0.77
Teacher competence	18-27	0.74
Learner competence	28-37	0.81
Family structure	38-45	0.80
Overall scale	-	0.75

- The main conceptual variable is the enrichment of online education, which is defined as the improvement of the quality and effectiveness of online teaching and learning processes by considering various factors that influence them.

- The four sub-conceptual variables are the capability of the educational system, teacher competence, learner competence, and family structure, which are defined as follows:

- Capability of the educational system: The extent to which the educational system provides adequate resources, infrastructure, policies, and support for online education.

- Teacher competence: The extent to which the teachers have the necessary skills, knowledge, attitudes, and motivation to facilitate online education.

- Learner competence: The extent to which the learners have the necessary skills, knowledge, attitudes, and efficacy to participate in online education.

- Family structure: The extent to which the family environment influences the learners' online education in terms of media literacy, interaction, possibilities, and attitude.

- The operational variables are the 45 questions that measure these sub-conceptual variables on a 5-point Likert scale. Each question is a specific and observable indicator of the underlying sub-concept. For example, question 1 asks "The educational system has a clear vision for online education" as a way of measuring the capability of the educational system. Questionnaire of perception of constructivist learning environment:

- The main conceptual variable is the constructivist learning environment, which is defined as a learning environment that fosters the active and collaborative construction of knowledge by learners based on their prior

experiences and perspectives.

- The seven sub-conceptual variables are authentic learning, teacher facilitation, problem-centeredness, self-assessment, encouraging teamwork, attention to standpoints, and emphasis on previous learning, which are defined as follows:

- Authentic learning: The extent to which the online learning activities are based on real-world problems and situations that are relevant and meaningful to the learners.

- Teacher facilitation: The extent to which the teachers provide guidance and feedback to the learners in online learning without imposing their own views or solutions.

- Problem-centeredness: The extent to which the online learning activities involve problem-solving and inquiry-based learning that challenge the learners to think critically and creatively.

- Self-assessment: The extent to which the learners can

set their own goals, monitor their own progress, and reflect on their own results in online learning.

- Encouraging teamwork: The extent to which the online learning activities promote cooperation and collaboration among learners through communication and interaction tools.

- Attention to standpoints: The extent to which online learning activities respect and consider different views and opinions of learners in challenging activities within the framework of their belief system.

- Emphasis on previous learning: The extent to which the online learning activities connect with the prior knowledge and experiences of learners and build on them.

- The operational variables are again the 45 questions that measure these sub-conceptual variables on a 5-point scale. Each

question is a specific and observable indicator of the underlying sub-concept. For example, question 6 asks “The online learning activities help me understand different perspectives on a topic” as a way of measuring the attention to standpoints component.

B) Questionnaire of perception of constructivist learning environment

To measure the perception of the learning environment, Haghayeghi and Karsheki's questionnaire (24) was used. This questionnaire has 45 questions and measures components such as authentic learning, teacher facilitation, problem-centeredness, self-evaluation, encouraging teamwork, attention to standpoints, and emphasis on previous learning. The face validity of the questionnaire was confirmed by the supervisor and the consultant. Questions are scored on a 5-point scale: never (1), rarely (2), sometimes (3), often (4), and almost always (5). In Haghayeghi and Karsheki's study (2014), the reliability coefficient of the questionnaire was obtained through Cronbach's alpha (0.89) and for the components between 0.51 and 0.82. In the present study, the internal consistency of the questionnaire for the whole scale (0.78), for the genuine learning component (0.74), for the self-evaluation component (0.72), for facilitation (0.70) and the problem-oriented component (0.75) was obtained. Also, the results of the corroborative factor analysis confirmed the existence of the main factor structure.

Sample Size

The Method of Sampling and Determining the Sample Size

The statistical population of this research consisted of two groups: the first group comprised experts (school principals and education experts and teachers). In the interview section, the first 25 people from technology officials (2 people), educational assistants of the administration (3 people), school managers (4 people), school secretaries (4 people), teachers (4 people), and representative of the association of parents and teachers of schools (4 people)

were selected and semi-structured interviews were performed. Then, in the quantitative and validation of research tools and models section, for the first group (expert), 150 people were selected using a convenience sampling method. Schumacher (2004; quoted by Ghasemi, 2018) used the ratio of the sample size to the observed variables to determine the sample size (25). He states that the minimum ratio is five to one, the average limit is 10 to one, and the upper limit is 35 to one. Accordingly, 35 people were considered for each observed variable. According to the 5 variables observed (final structural model), the sample size was 175 people. Given the possibility of dropout, the questionnaires were administered to 175 students, and at the end, after removing the incomplete questionnaires and screening the data, 150 questionnaires were analyzed.

Statistical Analysis

For the analysis of the data, descriptive statistics such as mean, standard deviation and inferential statistics, including exploratory factor analysis and confirmatory factor analysis were used. Also, to fit the conceptual model of the research, we applied structural equation modeling (SEM) using AMOS20 software.

Results

The mean $\pm$ SD of the experts and teachers' age were 37 ± 7.50 years, and those of the students' age were 13 ± 2.25 . Table 2 shows demographic features of the students' participants.

Table 3 shows the average and standard deviation of the scores of the sample group in the variables investigated in the research.

The results of Table 3 show that the mean and standard deviation of the research variables are higher than the average.

Structural Model Evaluation

Structural Equation Modeling (SEM) was used to determine the adequacy of the model proposed in this study. The results obtained from fitting the initially proposed

Table 2: Demographic characteristics of the students' participants (N=120)

Variable		Number	Percentage
Grade	Seventh	62	41.34
	Eighth	53	35.33
	Ninth	35	23.33
Order of birth	First	56	37.33
	Second	33	22
	Third and more	61	40.67
Father's education	High school and less	27	18
	Diploma	36	24
	BS	59	39.33
	MS and more	28	18.67

Table 3: The mean and standard deviation of research variables (N=150)

Variable	Mean	The standard deviation	Kurtosis	Skewness
Psychological	34.33	2.97	-0.42	-0.253
Attitude	26.47	3.80	0.156	-0.290
Media literacy	29.26	3.19	0.171	0.153
Efficacy	23.87	3.56	0.162	-0.666
Media literacy	27	4.06	0.074	0.631
Interaction	10.64	4.26	0.053	-0.698
Possibilities	2.47	0.94	0.002	-0.899
Attitude	2.74	0.92	-0.11	-0.931
Infrastructure	2.70	1.02	-0.252	-1.07
Efficient staff	7.92	2.00	0.096	-0.505
Education	9.28	2.50	-0.316	-0.537
Participation	8.49	2.92	-0.048	-0.351
Motivating	17.78	3.45	-0.181	-0.661
Access level	21.37	4.08	-0.363	-0.317
Teaching skills	13.64	2.94	0.272	-0.417
Media literacy	22.29	3.62	0.066	-0.421
Authentic learning	21.78	3.12	0.016	-0.525
Self-assessment	79.05	7.79	0.297	-0.647
Problem-driven	18.86	3.75	0.131	0.234
Facilitation	21.87	4.89	0.444	0.377

model showed that the data did not fit well with the model. The results obtained from fitting the initially proposed model showed that the data did not fit well with the model. To achieve a better fit, we removed the family structure path from the ability of the teacher, and in the next steps, the covariance of errors in the components of attitude and efficiency in the construct of the learner and the teacher's teaching and media literacy skills were added to achieve the desired fit (Figure 2).

Table 4 shows the results of fitting the initial and final hypothetical models with

the data.

According to the contents of Table 4, all the presented indicators show the complete fit of the presented model. According to the contents of Table 4, in the final model, the ratio of the chi-square to the degree of freedom or the relative chi-square was 2.747, the goodness of fit index (GFI) was 0.945, the adjusted goodness-of-fit index (AGFI) was 0.942, the incremental fit index (IFI) was 0.952, the Tucker-Lewis index (TLI) was 0.935, the normalized fit index (NFI) was 0.927, and the root mean square error (RMSEA) was 0.044.

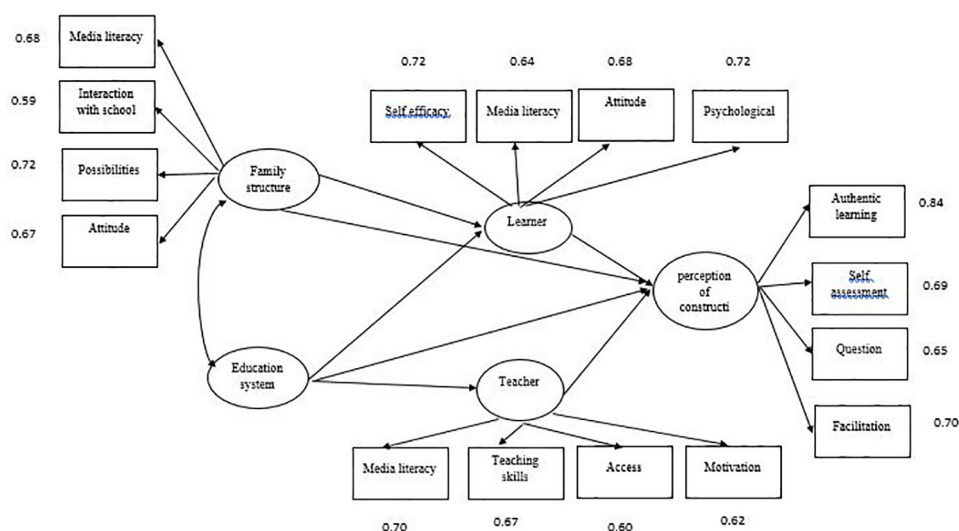


Figure 2: Final research model along with standard path coefficients

Table 4: Fitting the proposed model and the final model with the data based on the fit the indices

Indicators	χ^2/df	GFI	AGFI	IFI	TLI	CFI	NFI	RMSEA
Proposed model	14.19	0.842	0.742	0.760	0.714	0.758	0.752	0.121
Final model	2.747	0.945	0.942	0.952	0.935	0.852	0.927	0.044

Table 5: Indirect effects of variables

Affiliated. Independent	Indirect effect	Standard error	P
On perception from constructive perspective	0.45	0.174	0.002
From the family structure through the competence of the learner (student)			
On perception from constructive perspective	0.18	0.052	0.001
From the ability of the educational system (school) through the competence of the learner (student)			
On perception from constructive perspective	0.26	0.075	0.002
From the competence of the educational system (school) through the competence of the teacher (teacher)			

Indirect Coefficients of the Structural Model

Table 5 shows the test of hypotheses regarding the indirect effects of the variables. In this Table, the indirect coefficients, significance level, standard error of estimation, and total effect are reported for the investigated paths.

Discussion

The findings of the research in the field of the proposed model showed that, by modifying the route, the final model had a good fit and was a significant predictor for the perception of the constructive environment. Although in the background of the research,

no similar model or competing model was found for comparison, regarding the association between the family structure and the educational environment with the abilities of the learner and the teacher, the findings support the results of previous research in Iran (12, 20). They have confirmed the role of the family and the educational system in the perception of learning.

Approaches related to social capital were used for the theoretical explanation of the compiled model. Wright and Fitzpatrick defined social capital in the family as family support networks, intimacy, closeness, and informal links of family members with each

other, which is the level of participation of two partners, trust, awareness, and monitoring and provision of the prerequisites for emotional and cognitive development and the necessary facilities in this field (13).

Also, as Wright and Fitzpatrick (2006) defined social capital in school, it includes the facilities and conditions that the school provides for education, the connections of teenagers with each other, their attachment and sense of belonging to the school, and their participation in social educational, art and sports associations (13). The expected limit for each index was 0.67. The value obtained by the researchers was 0.99.

The school is referred to as a second home. Most of the students enter school upon entering school age and spend most of their time in the school environment after the family environment. The school environment has an undeniable impact on the future of education, career, and in general all aspects of children and teenagers' lives. A school is a social institution where students from families belonging to different subcultures and ethnic groups study together (23). Of course, since in modern and industrial cities, families live in different neighborhoods, according to their socio-economic base, and in each school, most students living in the same neighborhoods are enrolled, the range of differences is reduced. However, the school is a conduit to enter the general community. Teaching families about online education, facilities of the educational system (Internet, etc.), the level of skill of teachers in working with virtual space and virtual platforms, the facilities that the family provides to the student, teachers' teaching skills, families' attitude to virtual education, students' motivation to study, coordination between family and school, teacher's teaching method, and students' freedom and activeness in online education have been pointed out. Providing learning content based on the goal in different formats and related links, as well as giving learners the right to choose the time, place and speed of learning and matching with different learning styles (flexibility and adaptability) are also special

features of electronic learning environments that Arane refers to as quality education in these environments (14).

The expected limit for each index was 2.0, and a large amount of this arrangement and similar works were done by Hong and Gao (10), indicating that e-learning normative consciousness and behaviors and self-efficacy played significant and mediating roles between the students' perceived family support and e-learning engagement. Specifically, these two individual variables fully mediated the relationship between students' perceived family support and e-learning engagement.

If the virtual learning environment is considered as a system, the high importance of this factor, compared to other important factors, can be easily understood due to the role it can play in providing the desired inputs for the activity of the system. The first factor that can be effective in providing a quality educational product or service in a learning environment is its inputs, which are prepared by the management of the educational system, which, along with the provision of the required resources, can ensure quality and infrastructure. Fallahi et al.'s study (2017), in line with the results of this research, shows that the infrastructure factor and system quality are the most important factors affecting the success of virtual learning (26).

In general, parents play an important role in their children's lives, especially their academic lives, and they are one of the most important elements that can have a direct impact on their learning. Changing the teaching method from face-to-face to virtual and online education due to the global corona pandemic has been one of the most challenging educational events in recent years. This change in learning style has placed more responsibility on the shoulders of parents, and now families are considered one of the most basic and important foundations of virtual education in the country. Since it is not possible to physically attend the class in the virtual education method and each learner learns at home, the space experienced by each of them may be different. An important task

that parents have is to bring the space and environment of the home as close as possible to the classroom environment and keep it calm at least until the end of the virtual class. In fact, the atmosphere that families create at home during virtual education is very effective in the teaching and learning process, as well as proper educational planning. The educational role of parents is another task that they must perform during virtual education. Parents should encourage learners to use the virtual method and, along with teachers and teaching staff, learn to use the technological facilities that are required to master this new educational method and teach their children and increase their media literacy; also, for planning, which is the most basic pillar of virtual education, they should have a detailed and codified plan for their children and to some extent control and supervise them, so that learning is done in a good way and prevent children from wrong dependence on the virtual space (10).

Limitation and Suggestion

The current research had some limitations. The evaluation of the criteria is based on the opinions of experts and e-learning specialists, which are self-reported and may be biased. Also, since the previous studies were limited to identifying the quality criteria of online education and did not prioritize them, it is not possible to directly compare the findings of the study with another research.

Conclusion

Based on the findings of the present research, it is suggested that the criteria identified in the research should be used as a basis for formulating the evaluation criteria for the quality of education in virtual learning environments; in the design and management of various processes of the online learning system, authorities should consider empowering various dimensions related to this system including students, teachers and families; designing and managing various processes of the online learning system; keeping in mind the empowerment of various

dimensions related to this system, namely knowledge, learner, teacher, and family.

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Authors' Contribution

LK, MK, ZMZ, AMT devised the study concept, designed the study, supervised the intervention, data collection and analysis, participated in the coordination of the study, and critically revised the manuscript. LK, MK, ZMZ, AMT collected the data, ran the study intervention, participated in the study concept, performed the analyses and revised the manuscript. LK, MK, ZMZ, AMT contributed to the design and analysis of the study data, and drafted the manuscript.

Conflict of Interest

None declared.

Ethical Considerations

This study was approved by the Ethics Committee of Islamic Azad University of Kerman (IR.IAU.REC.1400.027). The research samples were obtained with the written knowledge and consent of the people, and in the meantime, there was no risk for the participants; the ethical principles were observed during the research, and the methodology of the research, was based on our university rules and regulations.

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References

- 1 Mehni S, Chahartangi F, Tahergorabi M, Dastyar N, Mehralizadeh A, Amirmijani A. Relationship between Kolb's Learning Styles and Readiness for E-learning: A Cross-sectional Study in the Covid-19 Pandemic. *Interdiscip J Virtual Learn Med Sci*. 2023;14(2):99-107. doi: 10.30476/ijvlms.2023.97515.1200.
- 2 Flores MA, Barros A, Simão AM, Pereira

- D, Flores P, Fernandes E, Costa L, Ferreira PC. Portuguese higher education students' adaptation to online teaching and learning in times of the COVID-19 pandemic: personal and contextual factors. *Higher Education*. 2022;83(6):1389-408. doi: 10.1007/s10734-021-00748-x.
- 3 Caladine R. Enhancing E-Learning with Media-Rich Content and Interactions. *Education, Computer Science*. 2008. doi: 10.4018/978-1-59904-732-4.
 - 4 Nezhadiyan E, Keshavarz H, Gholamali Lavasani M. The Impact of online training of Positive Thinking Skills on Social Adjustment and Alexithymia in Transsexual Students. *Interdiscip J Virtual Learn Med Sci*. 2022;13(4):247-55. doi: 10.30476/IJVLMS.2022.96666.1180.
 - 5 Matin far N, Kian M. On the Efficacy of an Integrated Curriculum of Social Studies and Art in Improving Academic Performance of Students in the Social Studies Course. *Journal of Curriculum Research*, 2021;10(2):66-83. doi: 10.22099/jcr.2021.6046.
 - 6 Egielewa P, Idogho PO, Iyalomhe FO, Cirella GT. COVID-19 and digitized education: Analysis of online learning in Nigerian higher education. *E-learning and Digital Media*. 2022;19(1):19-35. doi: 10.1177/20427530211022808.
 - 7 Mkrttchian V, Bershadsky A, Bozhday A. *Handbook of Research on Estimation and Control Techniques in E-Learning Systems*. Hershey: Information Science Reference, IGI Global; 2015.
 - 8 Esposito A. Research ethics in emerging forms of online learning: issues arising from a hypothetical study on a MOOC. *Electronic Journal of e-Learning*. 2012;10: 315-25.
 - 9 Sayaf AM, Alamri MM, Alqahtani MA, Alrahmi WM. Factors influencing university students' adoption of digital learning technology in teaching and learning. *Sustainability*. 2022;14(1):493-510. doi: 10.3390/su14010493.
 - 10 Gao H, Ou Y, Zhang Z, Ni M, Zhou X, Liao L. The Relationship between Family Support and e-Learning Engagement in College Students: The Mediating Role of e-Learning Normative Consciousness and Behaviors and Self-Efficacy. *Front Psychol*. 2021;12:573779. doi: 10.3389/fpsyg.2021.573779. PubMed PMID: 33613373; PubMed Central PMCID: PMC7890012.
 - 11 Raza SA, Khan KA. Knowledge and innovative factors: how cloud computing improves students' academic performance. *Interactive Technology and Smart Education*. 2022;19(2):161-83. doi: 10.1108/ITSE-04-2020-0047.
 - 12 Taghiyareh F, Siadaty M. Key Selection Criteria of E-learning Authoring Tools. *Quarterly Journal of Research and Planning in Higher Education*. 2023;13(1):75-89. [In Persian].
 - 13 Wright DR, Fitzpatrick KM. Social capital and adolescent violent behavior: Correlates of fighting and weapon use among secondary school students. *Social Forces*. 2006;84(3):1435-53. doi: 10.1353/sof.2006.0077.
 - 14 Jamalnia S. Investigating restless leg syndrome and its severity in nursing students. *Nursing Development in Health*. 2018;8(2):25-30. [In Persian]
 - 15 Leone S. *Synergic Integration of Formal and Informal E-learning Environments for Adult Lifelong learners*. Hershey: IGI Global; 2013.
 - 16 Galanti TM, Baker CK, Morrow-Leong K, Kraft T. Enriching TPACK in mathematics education: using digital interactive notebooks in synchronous online learning environments. *Interactive Technology and Smart Education*. 2021;18(3):345-61. doi: 10.1108/ITSE-08-2020-0175.
 - 17 Sadeghi SH. *E-learning practice in higher education: A mixed-method comparative analysis*. Cham, Switzerland: Springer International Publishing; 2018. doi: 10.1007/978-3-319-65939-8.
 - 18 Hooper S, Hannafin MJ. The effects of group composition on achievement, interaction, and learning efficiency during computer-based cooperative instruction.

- Educ Technol Res Dev. 1991;39(3):27-40.27-40. doi: 10.1007/BF02296436.
- 19 Xu J. A person-centered approach to teacher motivation towards information technology: integrating achievement goal and expectancy-value perspectives. *Educ Technol Res Dev.* 2022;70(2):397-417. doi: 10.1007/s11423-022-10085-0.
 - 20 Pourkarimi J, Alimardani Z. Phenomenological Analysis of the Factors Affecting Interactions in the E-Learning Environment. *Research in School and Virtual Learning.* 2021;8(3):27-40. doi: 10.30473/etl.2021.49623.3106.
 - 21 Dolighan T, Owen M. Teacher efficacy for online teaching during the COVID-19 pandemic. *Brock Education Journal.* 2021;30(1):95-114. doi: 26522/BROCKED.V30I1.851.
 - 22 Oppermann E, Hummel T, Anders Y. Preschool teachers' science practices: Associations with teachers' qualifications and their self-efficacy beliefs in science. *Early Child Dev Care.* 2021;191(5):800-14. doi: 10.1080/03004430.2019.1647191.
 - 23 Engelmann K, Bannert M, Melzner N. Do self-created metacognitive prompts promote short-and long-term effects in computer-based learning environments? *Res Pract Technol Enhanc Learn.* 2021;16(1):1-21. doi: 10.1186/s41039-021-00148-w.
 - 24 Haghayeghi M, Kareshki H. Construction and Validation of a Questionnaire to Measure the Students' Perceptions of Social Constructivist Learning Environments. *Educational measurement and evaluation studies.* 2015;5(11):91-119. [In Persian]
 - 25 Ghasemi V. Structural Equation Modeling in Social Research using Amos Graphics. Tehran: Jameeshenasan; 2010. [In Persian]
 - 26 Falahi M, Khalifeh G, Qhasemi Sameni M. The Collaborative Learning in the e-Learning Environments. *Journal of Educational Studies.* 2017;9:31-39. [In Persian]