

Multi-Dimensional Quality Evaluation Modelling of E-Learning Courses from Learners' Perspective

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Abstract

Background: With the growth of e-learning in recent decades, research on the evaluation of e-learning standards sought to optimize and make e-learning effective. This study was conducted on the necessity of quality evaluation of e-learning systems from the learner's perspective, having the purpose of multi-dimensional quality evaluation modelling of e-learning courses using learner-based approach.

Methods: With respect to nature and purpose, the present study is an applied research, and with respect to the data collection method, it was a descriptive and survey type of research. The population of the study comprised all the students pursuing an MA in e-learning at Tehran University in 2013 - 14. Samples including 201 [F1] students were selected using a simple random method in 2014.

Data was collected using a researcher-made questionnaire to analyse the factors that influence the satisfaction of learners in e-learning courses. The questionnaire was validated by three professors of Education Sciences, while stability achieved using the Chronbach's alpha method ($\alpha = 81\%$). To analyse data the path analysis model was used. The dominant influential components of learners' satisfaction were introduced, and a causal model was designed. The influential factors for learners' satisfaction and the factors' impact on the dependent variables were analysed. Finally, the suggestive fitting model was measured using Lisrel software version 8.5.

Results: According to the obtained fitting indexes for the components, the indexes were very appropriate. The relationship between variables in the model of learners' satisfaction represented the significance of the relationship between the factor (learners' satisfaction) and latent variables (first-grade factors) at the level of 0.01%.

Conclusions: The results showed that, based on standard scores related to the variables that influence learners' satisfaction, it is possible to estimate learners' satisfaction with e-learning using a good-fitting model and real-world data.

Keywords: Modelling, Quality, Evaluation, E-Learning Courses, Learner Approach

1. Background

E-learning is considered a new method in modern education, and application of e-learning systems has increased over the years. However, the rate of failure in these courses is significant at the same time. Nevertheless, there is little information as to why users leave e-learning courses. There are many studies to ensure the quality of e-learning courses, but only a small number of these studies analyse the quality of such education from the learners' perspective. In fact, the increasing use of the internet as a platform for rapid delivery of information, the increasing importance of distance education due to spatial limitations, and the individual process of education have prompted universities to use their resources in creating e-learning courses. On the other hand, continuously developing e-learning systems has become a challenging task for those who offer such courses (1).

The quality of e-learning courses should be created with cooperation of learners and the providers of these courses at the time of teaching and learning in an electronic environment (2). Therefore, the views of learners regarding the quality of e-learning courses and correct understanding of the courses with definitions should be ensured. Unfortunately or fortunately, however, quality is a value-based concept that might be defined differently by different beneficiaries (3). For example, governors may evaluate the quality of e-learning courses based on the results of their socio-economic benefits, while educational institutions that offer these courses might be more interested in managing strategies, analysis of expenses, benefits, learners' satisfaction, course completion, the rate of graduation, as well as training regarding different aspects of teaching. Though the views of the different beneficiaries of e-learning courses are valuable, understanding learners' views is just as important, since learners are the main ben-

eficiaries of every type of education including e-learning (4). The quality of e-learning courses is a complex and multi-dimensional topic, and due to the differences of this type of teaching from traditional face-to-face education, the quality of these courses should be evaluated using specific and standard criteria (5). E-learning course components include factors such as asynchrony of interactions, access to wide scientific resources, learners' needs for consultation and support, motivation, interaction, cooperation, and learners' stronger commitment compared to the traditional education system, which makes measurement and ensuring quality a difficult task (6).

On the other hand, scientists believe that many institutions offering e-learning courses fail to reach their main purpose, i.e. learning; therefore, quality evaluation, analysis, and promoting e-learning courses should be their main goals (7). In the process of development and enriching e-learning, there should be a clear theoretical framework for designing and performing this type of education. In fact, the best strategy is to have a wide approach, which means that learners' requirements should be processed precisely as determined assumptions during or prior to designing any e-learning, so that the development of e-learning should be directed towards learners' needs and preferences. But orientation to e-learning needs a stronger conceptual framework of e-learning systems. In this respect, two purposes are considered investigating the dimensions of an e-learning system and learners' satisfaction. Thus, the present paper investigates the dimensions and influential components of the quality and efficacy of e-learning courses that result in learners' satisfaction and provides a comprehensive complementary theoretical framework.

"Guaranteeing quality in higher education is not possible without evaluating it." Providing a relatively complete definition of evaluation, Kiamanesh defines it as "the process of collecting and systematic interpretation of evidences which finally results in a value judgment expecting a specific activity." This definition includes four key elements. The first element is systematicity, which represents a degree of attention and programming for data collection. The second element is the interpretation of evidences, while the third is evaluating a value that promotes the evaluation of descriptive amount. The fourth element "expecting a specific action" indicates that evaluation is conscious in order to achieve something in the future (8). Especially in higher education, evaluation could include student evaluation, faculty membership, lesson planning, as well as other general inputs and processes of educational system such as e-learning. In addition, evaluation helps in supervising the quality of applying each process so as to use the output evaluation guide in a proper direc-

tion. Therefore, using evaluation, it is possible to provide valuable information about social profit, the appropriateness and efficacy of a process, product, or a programme like e-learning in order to offer suggestions for action and to rationalize decision-making. However, the most important purpose of evaluation in higher education is to help to improve and reinforce university education quality and, as planners believe, modifying the university system is a necessary and inevitable matter (9). Therefore, to analyse the quality of e-learning in higher education, it is possible to use evaluation in order to improve e-learning and guarantee its quality. Regarding the quality and codification of standards for quality evaluation, it is possible to reach an agreement that this issue is not possible simply due to differences in variables that interfere in education. In addition, in many cases there is no agreement on such variables. Many influential factors of education are not known, but such factors should not lead to a neglect of the codification of related standards (10).

E-learning creates grounds, concepts, and new subjects that are different from traditional learning environments. This form of learning occurs in a wide range of technology-based activities comprising different forms of learning and teaching that are distinct from traditional environments. Therefore, evaluating e-learning programmes in the case of online learning and teaching is necessary and inevitable.

Satisfaction is a condition of content or pleasure, such as when a person performs a job or acquires something that is suitable to him/her. In the literature, satisfaction refers to a set of personal understandings or views towards factors that influence a specific condition (11). In respect of mutual relationship between human beings and computers, satisfaction or pleasure of the user can be defined by reflecting on the effects of mutual interaction (12). It means that the user's satisfaction is a perceptual set in the result of experiences related to such interactions formed by elements and influential factors (13). In the case of the pleasure and satisfaction of an e-learning user, it is used for reflecting on the form of comparison in line with the dimensions and needs of that course or lessons (14).

Quality in the field of e-learning includes the designing experiences of e-learning, implicit experiences of learners, and criteria for learning outcomes. Many studies dealt with ensuring the quality of e-learning courses, but a limited number of these studies investigated the quality of this type of education from the learners' point of view. Most of these works studied the quality of e-learning courses from the view of the course providers, evaluators, governments, and experts (4). Therefore, it is necessary that with the growing popularity of such courses, dimensions of quality evaluation be processed entirely on

the basis of comprehensive studies with a rich conceptual framework. In the past, many researchers trying to measure users' satisfaction showed that this structure is a complex one and that their components can be discussed from a broader perspective. Before 1980, users' satisfaction was discussed using terms such as visual attraction, efficacy, and effectivity (15), but from the beginning of 1980s many e-learning researchers started their systematic studies to find a wide set of factors necessary for users' satisfaction. For example, Pearson and Baily created a tool with 39 components to measure users' satisfaction with e-learning courses. Elson, Barodi, and Ayouz suggested a tool that entitles users' satisfaction information composed of three sections electronic processing of information, staff, and services (16). Dal and Turkzadeh designed a questionnaire using 18 components in the form of 5 main frameworks system content, system efficacy, form of reports, simple application, and time limitations of system to measure the rate of final user's satisfaction (17). To a great extent, new scales that were codified in the previous decades were based on the stated components. In fact, the application of e-learning courses was along with development in creation of scales for measuring learners' satisfaction with these courses that is itself taken from the scales of teaching quality regarding educational psychology. Anyway, the result was not sufficient because each of these scales lacked important aspects of general satisfaction with e-learning. According to Arbagh, the main factors for learners' satisfaction with e-learning courses include application and efficacy, simple application, flexibility interaction with other learners, and the type of applied technology (18).

In this regard, Pisoli posited the following factors as the main factors for satisfaction completeness, motivation, simplicity of application, attitude towards technology, anxiety related to computer/technology, ethical beliefs, technology control and its type, self-efficacy, accessibility, mentality and objective, quality, stability, and frequent application (19). MacLeaon and Delon discussed success standards of e-learning in the sextet dimensions of system quality, information quality, quality of services, educational tools, learners' satisfaction, and the advantages and disadvantages of e-learning. Learners' satisfaction dimension, their general satisfaction, enjoyable experiences, general successes, and suggesting the courses to others were also discussed (20).

The present study aimed to offer a conceptual model to measure the quality of e-learning courses from the learners' perspective. Accordingly, a comprehensive model involving a number of dimensions regarding the evaluation of e-learning courses from the point of view of learners is proposed. The present study provides a synthesized model comprising seven main dimensions and 30 components

related to it (Figure 1).

The first dimension (learner) consisted of three main components basic knowledge of computer, self-efficacy in using the internet, and the possibility of controlling the learning process.

The second dimension (educational features) comprised timely delivery of sufficient content, proper timing, order and sequence, diversity in the methods of offering subjects, motivation, evaluation, and rapid feedback to learners.

The third dimension included interaction and establishing communication learners' interaction with each other, learners' interaction with teachers and other providers of courses, formation of discussion, discourse sessions, and flexibilities of interactions regarding temporal and spatial dimensions.

The fourth dimension (supporting) included the following responsibility and accessibility of teachers and providers of the courses, consultation and support, transparency, clarity about the course structure and its purposes, appropriate support and services with respect to the needs of learners, and features of the course.

The fifth dimension (technology) comprised technological quality of the offered period, variety of media, simple application, accessibility, efficacy, feedback, and technological coordination with the purpose of the course.

The sixth dimension included the application of different methods for measurement and evaluation, consideration of speed conditions in applying the results of evaluation for modification, and completing processes and transparency in informing and reporting in this area.

The seventh dimension (management) involved managers' commitment to providing a learning environment, creating conditions of evaluation, continuous improvement of learners' and workers' satisfaction, modification of performance in this area, and investment in the e-learning courses.

After reviewing studies regarding the evaluation of e-learning courses from the learners' point of view, the most important research hypotheses were codified as follows:

1. Learners' features influence their satisfaction with e-learning courses.
2. Educational features of the course influence learners' satisfaction with e-learning courses.
3. Interaction and communication influence learners' satisfaction with e-learning courses.
4. Support influences learners' satisfaction with e-learning courses.
5. Application of technology influences learners' satisfaction with e-learning courses.
6. Evaluation influences learners' satisfaction with e-learning courses.

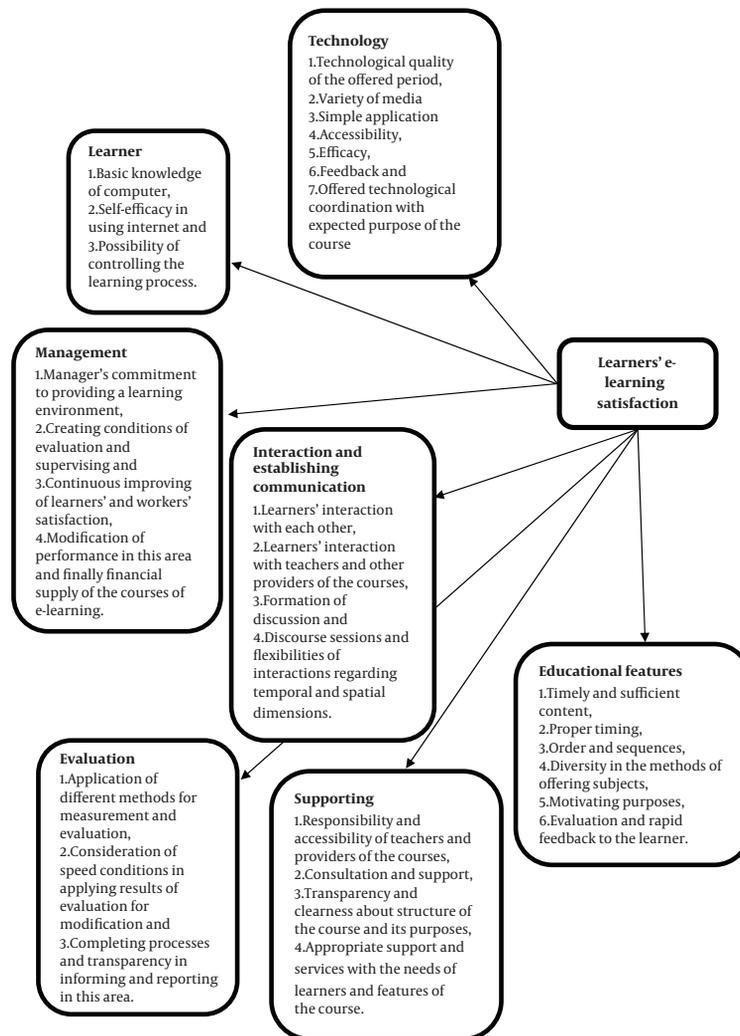


Figure 1. Basic Model for Learners' Satisfaction

7. Management influences learners' satisfaction with e-learning courses.

2. Methods

In terms of its nature and purpose, this research is an applied research; in terms of the data collection method, it is a descriptive and survey study. The population of the study comprises 420 students pursuing an MA in e-learning at Tehran University in the academic year 2013-14. To specify the sample size, Cochran's formula was used and in 95% confident and P value 5%. The sample consisted of 201 students. For data collection, the researcher prepared

questionnaires with 32 items that covered the seven dimensions and components of the proposed model regarding the evaluation of e-learning courses from the learners' perspective. After analysing content validity, an approval factorial analysis was administered to analyse the structural validity, and the stability of the questionnaire was determined using Cronbach's alpha.

To measure content validity, three professors of educational sciences checked the primary questionnaire, and necessary modifications were done according to their ideas, so that the questionnaire was able to specify 73% of variances for research variables. The results of the application of factorial analysis for estimating structural validity showed that the structure of the seven factors re-

garding differentiation between questions and correspondence with principles was appropriate. To specify stability of the questionnaire, Cronbach's alpha using SPSS 16.0 was used. The result of Cronbach's alpha for the questionnaire was 81%.

Data was acquired from answers of respondents to the quality of e-learning courses that were designed according to a five-point Likert scale, and then the data was analysed using LISREL software version 8.5 and SPSS 16.0. Based on the coefficients and assumed structural relationships, the suggested pattern was tested. The path analysis used in the research is a generalization of ordinary regression that can represent direct, indirect, and general impacts of each independent variable on the dependent variables and interpret relationships and correlations between them using a logical reason.

3. Results

Figure 2 shows the result of the approval factorial analysis; the seven-factor pattern of the structure for learners' satisfaction with e-learning courses includes application of technology, educational features of the course, evaluation, support, interaction, learner management, and appropriate fitting.

In the factorial matrix each column represents one factor. The values of each column stand for the factorial load of each variable with one factor. The value of the special load of each factor is the determined variance equal to its square factorial load (E: Eigen value).

In second-grade approval factorial analysis the latent variable was learners' satisfaction. The items (Pers: Perspective components) for each of the variables were represented in the following diagram:

Applying technology (7 items), items of educational features of the course (6 items), evaluating items (3 items), supporting items (4 items), interaction items (4 items), management items (4 items), and user items (4 items). The latent variables of learners' satisfaction were used in the approval factorial analysis.

According to Figure 2, the items of latent variables in the first-order factorial analysis were significant and fitting indexes approved such a significant. Relationships between variables in the model of learners' satisfaction represent the rate and significance of the relationships between the factor (learners' satisfaction) and its latent variables (first-order factors).

Table 1 shows the fitting index of the research model. Most of the indexes in this table represent appropriate fitting of the main model of the study. Since the X2 test as a fitting statistic is sensitive to the sample size, the test is significant when the sample size is greater. Different researchers

have considered using the following fitting indexes of the model, such as RMSEA: the root mean square error of approximation less than 0.08, CFI: comparative fit index, GFI: goodness of fit index, and adjusted goodness-of-fit index: AGFI greater or less than 0.90 as the sign of fitting. Therefore, due to the fitting index for each component, the indexes generally benefit from proper appropriateness.

Table 1. The Fitting Index of a Conceptual Model for Learners' Satisfaction

Fitting Wellness Index	Value
CMIN/DF (less than 0.05)	3.43
P (less than 0.05)	0.116
(Chi Square) (less than 0.03)	1779.605
CFI (more than 0.9)	0.789
NFI (more than 0.9)	0.881
GFI (more than 0.9)	0.846
RMSEA (less than 0.08)	0.06

Table 2 shows that all the paths of the research model are significant, because the criteria for significance of these paths are less than the threshold of 0.001 with 99% confidence. Moreover, we can conclude that the all the research hypotheses were approved.

4. Discussion

The purpose of this study is the dimensional evaluation modelling of e-learning courses using a learner-based approach. Our findings showed that the paths of the research model were approved. It means that with access to standard scores related to influential variables on learners' satisfaction, it is possible to evaluate their satisfaction from the courses of e-learning and the proposed model had a proper fitting with real-world data.

Though the discussed dimensions and their components were previously proposed individually in different studies in the area of systems such as information, psychology, and education, they are considered the most important e-learning variables. However, the general consideration of the influential factors from one learner's perspective obliged the researcher to use a complementary approach for analysis of influential factors that influence learners' satisfaction with a system of e-learning.

The potential benefits of quality standards of the course included the experience of better learning, satisfaction, and more educational growth of learners, though e-learning is yet to be generally accepted to support the standards of quality (21). The codified standards lack sufficient

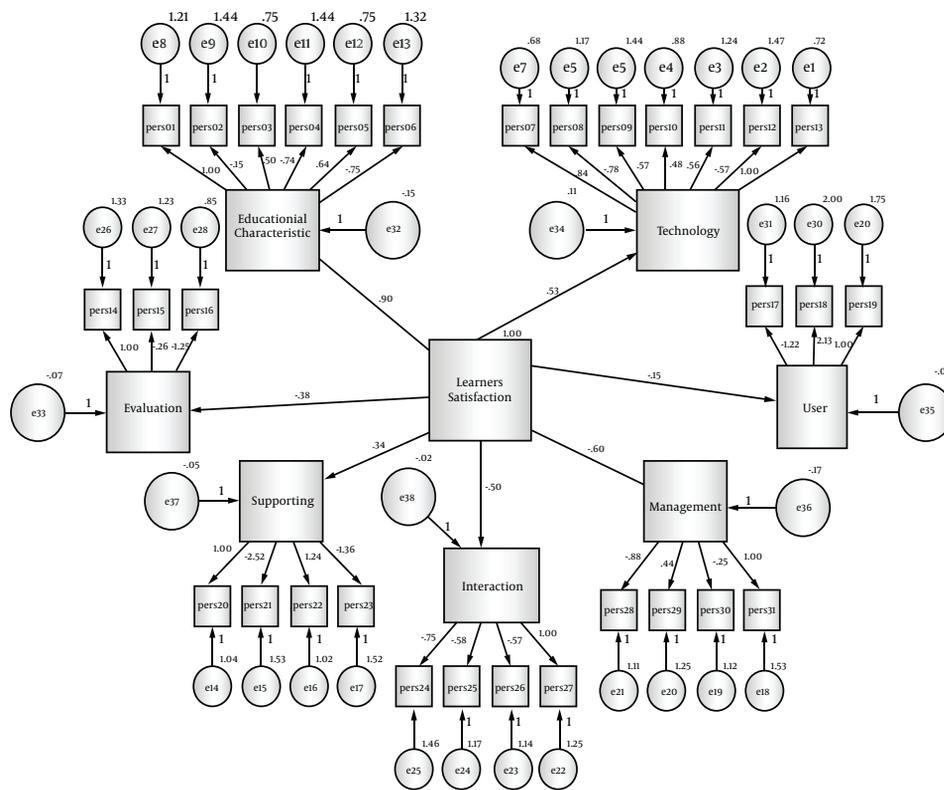


Figure 2. Diagram of Second-Order Approval Factorial Analysis of the Model for Learners' Satisfaction

details to be used as specific indexes of quality (22). But according to the results of the study and testing hypotheses, there was a significant relationship between learners' satisfaction and all the seven components including features of the course, characteristics of learners, interaction and communication, support, technology application, evaluation, and management in the conceptual framework of the study. However, by linking the results of the present study with the results of previous studies, it is possible to test the results and support them.

According to Pisoli, the main factors in this area include completion, motivation, simple usage, attitude towards technology, anxiety related to computer/technology, ethical beliefs, controlling technology, in addition to self-efficacy, accessibility, mentality or objectivism, quality, stability, and frequent application (19). On the other hand, Arbagh considered factors including flexibility of media, practicality and effectiveness, variety of media, instructors' previous experiences, direct and straight virtual behaviours, and interactions (20). Hang and Holton considered factors that included gender, age, learning style, basic computer knowledge, cooperation

with instructors, cooperation with other learners, activities related to educational courses, and allocated time to each period (21).

Using the seven dimensions as learners' preferences in e-learning, Ahlerz considered support by course providers, cooperation and interaction, effective technology, costs, expectations and advantages, information transparency related to the course providers, course structure and its transparency, and educational features of the course (2).

Jang studied the seven dimensions of evaluating the quality of e-learning including interaction, staff support, strategies of guaranteeing the quality of institution, informing, activities related to learning, learners' support, as well as the success of the course and institute (22).

Wang relied on the criteria of evaluating learners through effectiveness of teaching and previous criteria regarding learners' satisfaction, and performed a study on learners of e-learning courses. The results showed that 17 applicable criteria for measuring and evaluating users' satisfaction can be classified as follows: personalized content or the personalization of the population of learners and practical. Content dimension includes components in-

Table 2. Path Coefficients of the Research Model

	Standard Coefficient	Hypothesis	SE ^a	Critical Ratio C.R.	P Value	Result
Learners' satisfaction ← application of technology	0.395	H1	0.148	3.551	b	Approved
Learners' satisfaction ← learner	0.494	H2	0.209	4.662	b	Approved
Learners' satisfaction ← interaction	0.493	H3	0.150	5.038	b	Approved
Learners' satisfaction ← management	0.394	H4	0.067	7.007	b	Approved
Learners' satisfaction ← support	0.534	H5	0.067	7.960	b	Approved
Learners' satisfaction ← educational features	0.660	H6	0.092	8.746	b	Approved
Learners' satisfaction ← Evaluation	0.486	H7	0.085	6.474	b	Approved

^aSE: standard error.

^bIt shows that P is less than 0.001.

cluding updated, sufficient, proper, and practical information. The second dimension or personalization includes components of controllability of the learning process and the possibility of registering the performance of learners. The third dimension involves the population of learners including simplicity of communication and discourse with other learners or teachers, access to shared information. The fourth item of being practical includes four components of simple application, supporting and helping users, simplicity in receiving and understanding, and performance stability (23). Research in the area of e-learning systems is an interdisciplinary issue in which researchers with scientific backgrounds in computer, information systems, psychology, education and educational technology for evaluating such systems did their best. It is interesting that previous studies from one to several dimensions were in line with the result of present study. E-learning imparted through the traditional education frameworks aims at a learner-based system that provides many advantages for learners especially in the case of cost, benefit, time, and flexible access to education (7). E-learning in Iran is a new industry in educational technology and virtual learning. But Iranian educational institutions and centres, especially universities, use proper patterns with educational and cultural structures regarding designing e-learning environments according to international standards. In fact, by developing e-learning, higher education can also test assumptions used in traditional education. Though discussion about the evaluation and standards of e-learning is a recent phenomenon, some standards were needed for optimizing e-learning and designing its dimensions effectively (24). Probably higher education demands the most pressure for quality standards. In higher education, higher quality education means that services and products of e-learning (courses and degrees) provide proper experiences that are updated and in line

with learners' requests (25).

Finally, in recent decades evaluation has come to be considered as an integral aspect of e-learning systems in academic circles, leading to growing studies. Promotions in the field of studies resulting from evaluation effectively influence and guarantee the future of e-learning. Quality assurance based on learners' satisfaction components leads to positive and effective results in line with successful e-learning and education, and finally to developments in the field of modern education.

With respect to the above-mentioned issues, there are suggestions that need to be taken into account:

1. It is suggested that institutions specifically implement e-learning courses with a view to guaranteeing the quality of the courses and involve experts who are active in this field.
2. Universities and virtual learning centres try to apply quality assurance standards by emphasizing learner-centred approach and attracting learners' satisfaction in order to reform their educational processes based on the standards.
3. The evaluation of e-learning needs to be converted from paper to executing dimensions at all stages of education to train experts in this field.
4. Fundamental investment and allocation of credits are required to provide appropriate technology and equipment for different types of learning in e-learning centres.
5. Multiple interactions in e-learning and comprehensive strengthening of its execution should be emphasized by the executors of courses.
6. The differences between and the individual needs of learners, diversifying methods, equipment, and the e-learning environment need to be considered.

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