An Investigation of the Effective Components Considered in Designing E-Learning Environments in Higher Education and Offering a Framework for E-Learning Instructional Design

Yousef Mahdavinasab[1]*, Esmaeil Sadipour[2], Mahsa Moradi[3]
1. Assistant Professor, Faculty of Psychology and Education, Kharazmi University
2. Associate Professor, Faculty of Psychology and Education, Allameh Tabatabai University
3. Ph.D. candidate, Faculty of Psychology and Education, Allameh Tabatabai University

Abstract

The Instructional design plays a key role in the effectiveness of various educational courses. Studies have shown that the Instructional design is one of the key factors that affect the quality of e-learning courses; however, not enough attention has been paid to the instructional design for designing and implementation of e-learning courses. As a result, we face courses and programs which lack quality. Therefore, exploring the effective components of e-learning designing in the literature and offering an e-learning instructional design for higher education was the purpose of this study. To this end, the study used a systematic review and some keywords related to the instructional design were searched for in scientific databases. After reviewing the articles, 33 studies, conducted between 2015 and 2019, were reviewed. The findings showed that needs analysis, content analysis, learner analysis, instructional principles and strategies, learning environment design, electronic content development, messages design, guidance and support, and assessment and evaluation were the primary components affecting the effectiveness of e-learning. Finally, having reviewed and analyzed the results, examined their relevance to the instructional design, and taken into account the experience of authors in the field of e-learning, a framework was proposed for e-learning instructional design, hoped to be utilized by researchers and e-learning practitioners.

Introduction

Over the past few decades, we have seen the widespread use of modern technologies in educational systems. The integration of educational technology with communication technologies has led to e-learning as an alternative or complementary method to traditional teaching methods that are subject to time and space constraints. The need for easier access to a wider range of information, along with the demand for affordable and low-cost education, paved the way for increasing the use of the Internet in learning environments [1]. The growth of this phenomenon and its materialization in the area of learning have made experts in this field reflect on the necessity of educating learners by setting up e-learning course that can address many educational goals such as learning without time and space constraints, cooperative learning, self-assessment, and self-management [2].

  Clarke and Meyer (2012) argue that the media trends used in the past decade have shown a steady increase in the market share of digital learning. As of the early 2020s, e-learning accounted for 36.5% of education and constituted a large portion of the training provided to the workforce. Nevertheless, one of the challenges facing e-learning is the need to improve the quality of electronic learning systems [1]. The question is whether we are utilizing opportunities offered by e-learning and cashing in on its affordable and appropriate learning

environments effectively. In e-learning, the question is whether using technology and media alone are sufficient to improve learning [3]. Studies have shown that the mere use of technology to provide training does not provide timely and efficient access to learning content.

Clarke (2001) believed that technology was merely a means of providing training but not necessarily enough to foster success. Meyer and Clark (2012) stated that the results of more than 60 years of media comparison did not show the supremacy of any media over others. Bernard et al. (2004) also examined findings of research on the comparison of electronic distance learning with traditional classes and concluded that there was no significant difference between these two types of training. From studies on media comparisons over the past 60 years, we concluded that it was not the medium which led to learning, but rather the learning method. Teachers use e-learning in a simple way and just to present materials to their students; one of the solutions to this simplification is that more attention should be paid to the instructional design [4]. Much of the research on e-learning has emphasized the key role of instructional design in the effectiveness of e-learning courses [5; 6; 7; 8; 9; 10; 11; 12; 13; 13].

Anderson and Elloumi (2004) stated for learners to improve their thinking skills in e-learning, learning environments should provide dynamic and challenging activities so that learners by accomplishing them can link up the new information with the old information and gain meaningful knowledge. This can be made possible by devising suitable instructional designs for electronic courses. Moreover, the results of the previous research have shown that among the yardsticks considered in the evaluation of the quality of online training courses, instructional design has been referred to as the most crucial criterion because it encompasses other elements and criteria [2].

Based on a study conducted by Fresen and Boyd (2005), a good instructional design was seen as a necessity for creating effective learning environments [1]. Due to the fact that learning in the digital age requires a rethinking of teaching and learning, a simple use of new technology alongside with the existing practices is not enough [15]. Rather the use of e-learning as a learning model requires us to be conversant with instructional design and the appropriate instructional design which suits our specific situation [16]. Despite the fact that a great number of studies have focused on the model of instructional design in e-learning, few have systematically attended to the processes and methods involved in developing an instructional design and most have been obsessed with the end result. Also, and with regard to the educational system in Iran, there is much electronic content out there that may be graphically in a good position, but, in terms of instructional principles, they are weak. Therefore, the present study was undertaken and aimed to seek the essential components constituting an instructional design for e-learning in higher education and offer a framework for devising an e-learning instructional design in higher education.

Literature Review

In a systematic review, Leo et al. (2019) identified and compared the methods used in the evaluation and assessment of e-learning for medical students. The findings show that the research done on this area has focused on the evaluation, usability, and motivational attributes of instructional designs, as well as the use of a learning style established on theories of instructional design. Having analyzed the data, Leo et al. (2019) stated that there was a pressing need for validated and tested evaluation tools in the area of e-learning.

Bashir et al. (2018) studied the quality of e-learning design among 837 students participating in e-learning courses at various universities. The results showed that the quality of content, user interface design, educational strategies, interactive content, and feedback

were the key determinants of the quality of e-learning instructional design.

Farid et al. (2018) reviewed a survey of factors influencing e-learning success according to the viewpoint of 97 experts. Findings indicated that access to the local language, the quality of the educational system, the use of the instructional design, the attention to the quality of software, the quality of services, the attention to students' satisfaction, and the creation of appropriate learning models were other elements influencing and deciding the success of e-learning.

Gomez et al. (2016) conducted a systematic review of the research on computer-based educational software and computer-based instruction. The results indicated that the reviewed studies were varied on their focusing points and also showed that many software systems were being developed. It appears that practitioners in this field have paid heed to the previous recommendations about computer-based instruction. The future research needs to focus on the learner-centered approaches, the use of reusable software programs for specific learning environments, and online activity analyses that can track improvement and predict future demands.

Instructional design in e-learning courses
Instructional design, as the heart of Instruction, is one of the key elements affecting learning. Leshin, Pollock, and Reigeluth (1992) argued that design meant inventing, thinking or setting a mental theory, drawing, designing, devising a draft of a map, and preparing a work plan for obtaining what had been arranged. They also suggested that teaching was a set of decisions and actions taken one after the other aimed at enabling students to obtain their preplanned educational goals. Based on the above definitions, Instructional design can be defined as preparing specific maps on how to achieve Instructional goals. Instructional design is well accepted in business and industry, government, and military settings, and its use in colleges and schools is growing [19], with some Known models have already been introduced to this field [20; 21]. However, some issues have not been addressed in e-learning yet, and this poses a challenge to e-learning which may, in turn, diminish its effectiveness and overshadow its outcomes. Merrill (2012) stated that many courses provided a large amount of information with minimal interaction or even without any interaction. Many courses do not succeed in demonstrating the skills to be learned. Courses that merely include remember "what-I-told-you" exercises and do not provide any opportunity for the use of the learned material are highly unlikely to foster any growth and improvement in learners. These courses may rely heavily on multimedia, but, more often than not, multimedia is used in them in ways that do not encourage or facilitate learning; rather it impairs learning. Social networking which promotes interaction between learners but does not help learning disrupts learning and fails to create learning.

Providing information and regarding it as instruction is one of the most common instructional problems. What would you find if you have a cursory look at the existing educational materials? Pages flooded with text and a great deal of information. Many courses cannot be understood as anything more than just online books. Sometimes, they use "remember what-I-told-you" questions to gauge your learning and understanding. This is called "Shovelware" training, which means that you receive information and upload it on the internet. Training, however, is more than providing information. Even if the author adds a few questions to remind you of what information has been imparted so far, he/she cannot claim that training, let alone learning, has taken place [21]. Therefore, e-learning optimizing requires a specialized look at the instructional design. That highlights why the results of research into e-learning instructional design and principles essential in devising e-learning instructional design should be taken more seriously.

Method
The present study was a systematic review in which the findings of research carried out germane to the components affecting the effectiveness of e-learning instructional design were examined using the PRISMA model. In this study, research keywords, including "e-learning instructional design", "e-learning educational design", and "e-learning" were trawled for through search databases such as "Pumped", "Science Direct", and "Google Scholar".

Inclusion and exclusion criteria: The articles for using in this study have to had two criteria. First, they had to either be related to the integral components of the instructional design in e-learning courses or address other related subjects. Secondly, the articles had to be in English. Reports, those articles which were presented at conferences, articles that their population and research samples were not related to higher education, and articles that were not empirical and could not be applied to e-learning instructional design were excluded from the systematic review carried out in this study. The articles left were English articles which addressed e-learning instructional design and had been published from 2015 to 2019.

The quality evaluation of articles: After selecting the articles from the databases, two specialists in the field of educational technology who also are authors of this paper, evaluated all of them based on some interested keywords for the current study like "e-learning instructional design", "e-learning educational design", and "e-learning". In order to calculate the internal reliability, the inter-rater reliability between the codifiers was measured and it showed a mean reliability of 85%.

Of the 258 articles which emerged in the initial search, after deleting articles which did not meet the inclusion criteria of the study, 33 articles were finally included and studied fully and meticulously (Figure 1). For the 33 articles selected, a matrix, i.e. a content analysis form, was created and the relevant components and elements of interest to this study were extracted. The results are briefly summarized in Table 1.
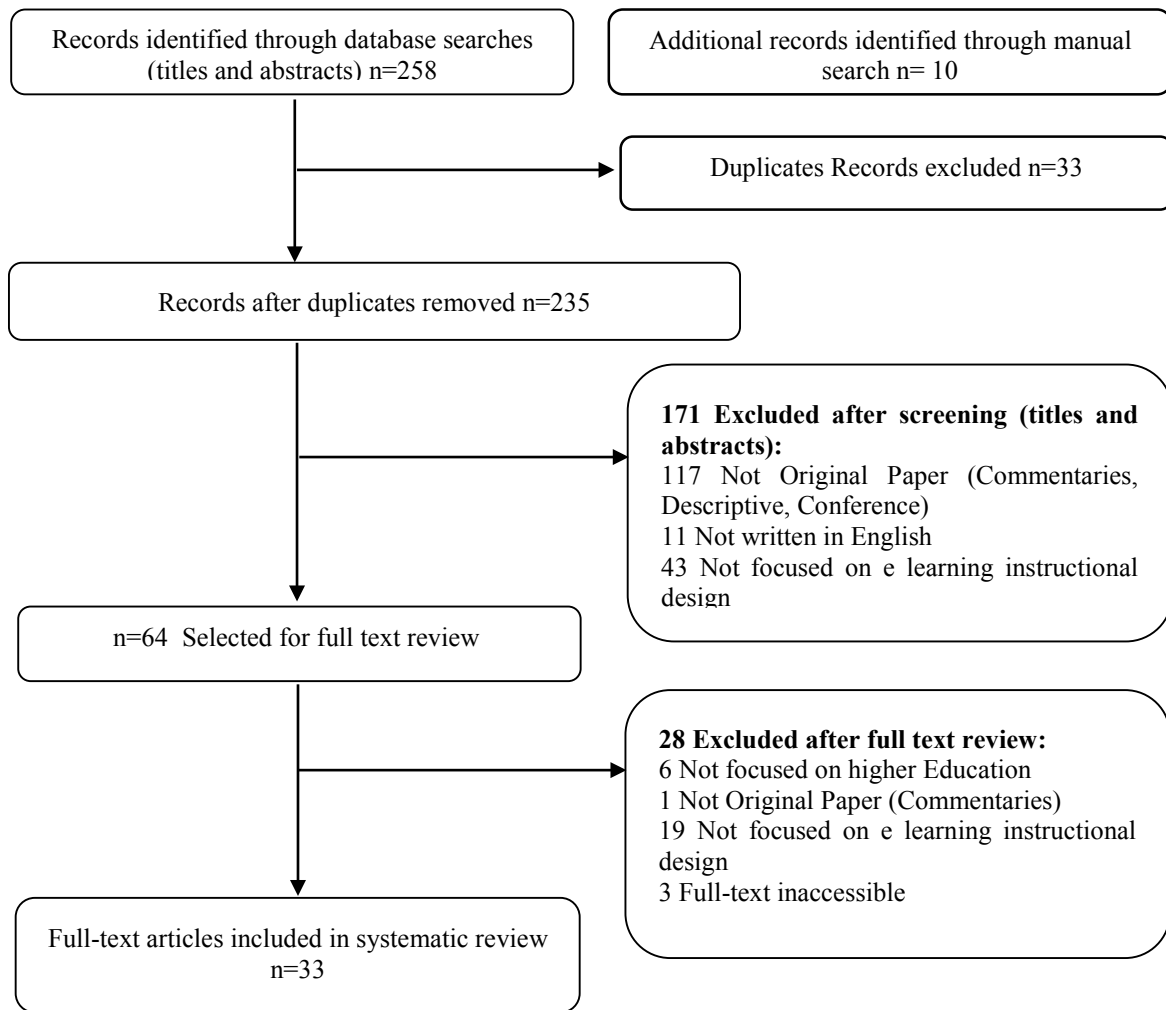
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│ Records identified through database │       │ Additional records identified through│
│   searches (titles and abstracts)   │       │        manual search n= 10          │
│              n=258                   │       │                                     │
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                   │                           │ 19 Not focused on e learning         │
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                   │                           │ 3 Full-text inaccessible             │
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Figure 1. Flow diagram of study selection.

Results

With regard to the first research's question, "What are the effective components of instructional design for e-learning courses based on the research done in this area?", the analysis of the 33 articles included in this study revealed that the following components were deemed effective in developing an instructional design for e-learning courses.

Table 1. The effective components in e-learning instructional design

components	Description	Reference
analysis	Learner analysis: Personal differences, prior learning, age, gender, socio-cultural, religious, and historical background, disabilities, internet access, and digital skills	Said & Syarif (2016); Kuo et al. (2015); Hadullo et al. (2018); Lee et al. (2016); Sameer et al.(2017); Park & Lim (2018); Zhang & Duan (2017); Bashir et al. (2018); Sun & Chang (2016); Chin et al. (2016); Lange (2018)
	Content analysis	Said & Syarif (2016); Lee et al. (2016); Zhang & Duan (2017); Sun & Chang (2016); Chin et al. (2016)
	Need assessment and need analysis	Orooji & Taghiyareh (2018); Chopra et al. (2018); de Leeuw et al. (2019); Koohang & Paliszkiewicz (2016); Lee et al. (2016); Saleem Haddad (2018); Bashir et al. (2018); Zhang & Duan (2017); Lange (2018); Sun &

components	Description	Reference
		Chang (2016)
instructional principles and strategies	Principals and models of instructional design	Debattista (2018); Orooji & Taghiyareh (2018); Lee et al. (2016); Ghonim (2018); Sun & Chang (2016); Park & Lim (2018); Costley & Lange (2017); Kuo et al., (2015); Pribadi et al. (2016)
	Motivational design (Arcs model, positive beliefs and hope, reducing anxiety and fear)	Kuo et al. (2015); de Leeuw et al. (2019); Hadullo et al. (2018); Orooji & Taghiyareh (2018); Bashir et al. (2018); Kuo et al. (2015); Chopra et al. (2018); Park & Lim (2018)
	Fast and proper feedback	Debattista (2018); Orooji & Taghiyareh (2018); Kuo et al. (2015); de Leeuw et al. (2019); Lee et al. (2016); Hadullo et al. (2018); Koohang & Paliszkiewicz (2016); Sameer et al.(2017); Bashir et al. (2018); Park & Lim (2018); Chin et al. (2016); Trenholm et al. (2016); Saleem Haddad (2018)
	Project-based learning, problem-based learning	Said & Syarif (2016); Orooji & Taghiyareh (2018); de Leeuw et al. (2019); Heather A. Robinson et al. (2017); Donnelly (2016); Park & Lim (2018); Hew (2015)
	Authentic learning and situated learning	Kuo et al. (2015); de Leeuw et al. (2019); Hadullo et al. (2018); Hew (2015); Kuo et al. (2015); Park & Lim (2018); Orooji & Taghiyareh (2018); Chopra et al. (2018)
	Constructivism and learner-oriented approach	Heather A. Robinson et al. (2017); Hadullo et al. (2018); Orooji & Taghiyareh (2018); Taveira-Gomes et al. (2016)
	Proper examples	Kuo et al. (2015); Hew (2015); Park & Lim (2018)
	Practice and lesson activities (applying learned lessons)	Hew (2015); de Leeuw et al. (2019); Lee et al. (2016); Bashir et al. (2018); Park & Lim (2018); Zhang & Duan (2017); Ghonim (2018); Kuo et al. (2015); Hadullo et al. (2018)
	Collaborative learning and teamwork: Learning community and sharing resources	Said & Syarif (2016); Debattista (2018); Orooji & Taghiyareh (2018); Heather A. Robinson et al. (2017); Hadullo et al. (2018); Donnelly (2016); Sameer et al.(2017); Park & Lim (2018); Chin et al. (2016); Orooji & Taghiyareh (2018); Donnelly (2016)
	Active and engaging learning strategies (creating challenges, learning artifacts, learners' presentations, learner reflection, pre-training, and activating previous knowledge	Hew (2015); Orooji & Taghiyareh (2018); de Leeuw et al. (2019); Kuo et al. (2015); Sadeghi (2017); Debattista (2018); Bashir et al. (2018); Park & Lim (2018)
	Fun elements: Gamification and edutainment	Farid et al. (2018); Park & Lim (2018); Hew (2015); Zhang & Duan (2017); Lee et al. (2016)
	Teaching peers and peers evaluation (voting and peer feedback)	Donnelly (2016); Debattista (2018); Orooji & Taghiyareh (2018); Chin et al. (2016)
	Clear objectives	Sadeghi (2017); Said & Syarif (2016); de Leeuw et al. (2019); Debattista (2018); Hew (2015); Hadullo et al. (2018); Lee et al. (2016); Park & Lim (2018); Ghonim (2018)
learning environments design	Interaction (student-student, student-faculty, student-content)	Hadullo et al. (2018); Hew (2015); Farid et al. (2018); Heather A. Robinson et al. (2017); Debattista (2018); Donnelly (2016); de Leeuw et al. (2019); Chin et al. (2016); Zhang & Duan (2017); Chopra et al. (2018); Orooji & Taghiyareh (2018)
	Forum (possibility to send and manage messages and discussions)	Hew (2015); Hadullo et al. (2018); Park & Lim (2018); Chin et al. (2016); Zhang & Duan (2017); Ghonim

components	Description	Reference
		(2018); Sun & Chang (2016); Orooji & Taghiyareh (2018)
	Rich and interactive learning environment: Interactive lab, links for additional resources, memo, wiki, online conferencing, simulation, simultaneous and asynchronous learning capability, images and charts, email, blog, whiteboard, chat, message sending, drag and drop, search possibility	Debattista (2018); Hew (2015); Zhang & Duan (2017); Heather A. Robinson et al. (2017); Fathema et al. (2015); Lehmann et al. (2019); Park & Lim (2018); Zhang & Duan (2017); Bashir et al. (2018); Chin et al. (2016); Lange (2018)
	Learners' preferences: Provide multi-faceted and diverse resources and the opportunity to evaluate and learn, adaptive learning and personalization, pay attention to individual differences and learning styles	Debattista (2018); Sadeghi (2017); Hew (2015); Orooji & Taghiyareh (2018); Kuo et al. (2015); Kuo et al. (2015); Chopra et al. (2018); Donnelly (2016); Sameer et al. (2017); Bashir et al. (2018); Park & Lim (2018); Chin et al. (2016); Lee et al. (2016)
	Visibility and traceability of learners' progress and their evaluation results	Zhang & Duan (2017); Orooji & Taghiyareh (2018); Bashir et al. (2018); Chin et al. (2016); Chopra et al. (2018); Taveira-Gomes et al. (2018)
E content development	Principles of multimedia instruction (Clark and Mayer's multimedia principles, cognitive processes, cognitive load, the use of videos, animation and images, and the use of audio in the practice guide)	Mayer (2017); Hew (2015); Orooji & Taghiyareh (2018); de Leeuw et al. (2019); Hadullo et al. (2018); Sameer et al.(2017); Chin et al. (2016); Kuo et al. (2015); van Nuland & Rogers (2017); Costley & Lange (2017); Sun & Chang (2016); Sameer et al.(2017); Park & Lim (2018); Rigas & Algahtani (2015); Lehmann et al. (2019)
	Preparation and production of content and materials (proper quality, reliability and accuracy of materials, appropriate volume, sound recording)	Said & Syarif (2016); Sadeghi (2017); Debattista (2018); Lee et al. (2016); Saleem Haddad (2018); Koohang & Paliszkiewicz (2016); de Leeuw et al. (2019); Ghonim (2018); Chopra et al. (2018); Farid et al. (2018); Hew (2015); Fathema et al. (2015); Kuo et al. (2015)
	Reusability, SCORM and Technical Standards	Saleem Haddad (2018); Zhang & Duan (2017); Ghonim (2018)
	Appropriate scenario and lesson plan	Sadeghi (2017); Zhang & Duan (2017); Park & Lim (2018)
messages design	Learner control over the content of the course according to the learners' levels; the table of contents, seekbar	Hew (2015); de Leeuw et al. (2019); Koohang & Paliszkiewicz (2016); Bashir et al. (2018); Lange (2018); Ghonim (2018); Orooji & Taghiyareh (2018); Park & Lim (2018)
	Message design (quick recognition of key points, highlighting, underlining, identify the links, proper font)	Koohang & Paliszkiewicz (2016); Mayer (2017); Park & Lim (2018); Sun & Chang (2016); Bashir et al. (2018)
	Appearance and aesthetics (the compatibility and coordination of the contents, the appropriateness of color, the context, and proper graphics)	Koohang & Paliszkiewicz (2016); Ghonim (2018); Sun & Chang (2016); Chopra et al. (2018); Park & Lim (2018)
	The structure of the course and content (flowchart, infographic and concept map, and summary and lesson conclusion)	Koohang & Paliszkiewicz (2016); Sadeghi (2017); Chopra et al. (2018); Hadullo et al. (2018); Farid et al. (2018); Kuo et al. (2015); Bashir et al. (2018); Park & Lim (2018); Chin et al. (2016); Ghonim (2018)
	Interfaces design	Debattista (2018); Hew (2015); Farid et al. (2018); Kuo et al. (2015); Sameer et al.(2017); Bashir et al. (2018); Park & Lim (2018); Chin et al. (2016); Fathema et al. (2015); Sun & Chang (2016); Rigas & Algahtani (2015); Chopra et al. (2018); Saleem Haddad (2018); Koohang & Paliszkiewicz (2016)
	Proper navigation	Chopra et al. (2018); Koohang & Paliszkiewicz (2016);

| components	Description	Reference
		Bashir et al. (2018); Park & Lim (2018); Zhang & Duan (2017); Fathema et al. (2015); Ghonim (2018)
guidance and support	Educational, technical, and managerial-emotional support: Scientific and academic consultations_ monitoring teaching methods	Debattista (2018); Chopra et al. (2018); Lee et al. (2016); Hadullo et al. (2018); Park & Lim (2018); Zhang & Duan (2017); Fathema et al. (2015); Orooji & Taghiyareh (2018); Hew (2015); Kuo et al. (2015); Saleem Haddad (2018)
	Easy accessibility and promoting perceived ease of use	Farid et al. (2018); Chopra et al. (2018); Debattista (2018); Fathema et al. (2015); Saleem Haddad (2018); Park & Lim (2018)
	Course tips and information: Required Plugins, aim, time, course schedule and headings, prerequisites, workload, requirements, including acceptance schedule, course concept map, and its infographic	Debattista (2018); Koohang & Paliszkiewicz (2016); Park & Lim (2018); Ghonim (2018); Sun & Chang (2016); Bashir et al. (2018); Zhang & Duan (2017); Hew (2015); Hadullo et al. (2018); Lee et al. (2016); Ghonim (2018)
	Training how to use the e-learning management system	Zhang & Duan (2017); Fathema et al. (2015); Kuo et al. (2015); Hadullo et al. (2018)
	Requirements and infrastructure	Park & Lim (2018); Hadullo et al. (2018); Fathema et al. (2015); Sameer et al. (2017)
	Create positive attitude toward e-learning and its usability	Hadullo et al. (2018); Sameer et al.(2017); Fathema et al. (2015)
	Data and information security: Training users about it	Chou & Chen (2016); Farid et al. (2018); Chopra et al. (2018)
assessment and evaluation	Experimental implementation and evolution of the program and redesign	Said & Syarif (2016); Farid et al. (2018); Hadullo et al. (2018); Lee et al. (2016); Sun & Chang (2016); Fathema et al. (2015)
	Formative evaluation	Hadullo et al. (2018); Lee et al. (2016); Sameer et al.(2017); Orooji & Taghiyareh (2018)
	Summative evaluation: Define objectives, evaluation indicators, and scoring	Said & Syarif (2016); Debattista (2018); Lee et al. (2016); Lee et al. (2016); Hadullo et al. (2018); Zhang & Duan (2017); Kuo et al. (2015); Sun & Chang (2016); Bashir et al. (2018); Park & Lim (2018)
	Course evaluation (from the perspective of learners and experts)	Hadullo et al. (2018); Debattista (2018); Lee et al. (2016); Park & Lim (2018); Zhang & Duan (2017); Bashir et al. (2018); Sun & Chang (2016); Pribadi et al. 2016
	Self-assessment	Hew (2015); Orooji & Taghiyareh (2018)
	Lesson tests: Types of interactive test	Hew (2015); Kuo et al. (2015); Lee et al. (2016); Bashir et al. (2018); Park & Lim (2018); Zhang & Duan (2017); Ghonim (2018)
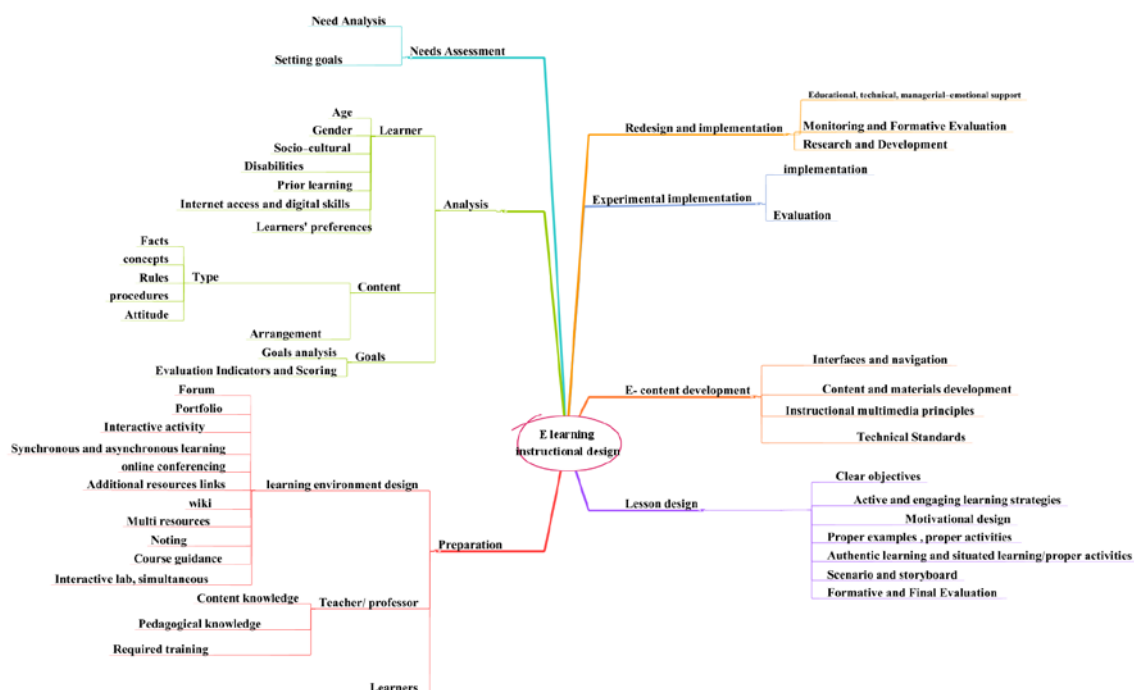
Figure 2. E-Learning Instructional Design

As regards the second research's question, "What would a suitable e-learning instructional design framework be comprised of?", having reviewed and analyzed the results in Table 1 and integrating that analysis with the experience and expertise in the area of instructional design, steps were extracted as the pillars of an operational framework hoped to be used by e-learning researchers and practitioners. To further illustrate the features of an e-learning instructional design, in what follows, we will explain some of the steps in the proposed model (Figure 2).

Table 2. Needs Assessment

level	Title	action
1	Need assessment	A review of the required courses, A comparative study of available courses, An interviewing with experts, An interviewing with the addresses, An analysis of need assessment techniques, Goal setting

In the need analysis stage, we can recognize the learners' demands and the courses required to meet those needs by doing a comparative review, interviewing experts, and using the need analysis techniques.

Table 3. Analysis

level	Title	Action
2	Analysis	**Analyzing goals** Setting educational aims and objectives
		Content analysis Determining the type of content (facts, concepts, procedures, rules), Determining the materials and facilities necessary to provide each section, Determining the required knowledge, Arranging the main components
		Learner analysis Individual differences, prior learning, age, gender, socio-cultural, religious, and historical background, disabilities, internet access, and digital skills Pre-test Prerequisite content design

Such analysis is one of the important steps in developing an instructional design for e-learning courses since at this stage, the subject, the content, the objectives, and the audience are analyzed and this acts as the basis for the preparation and development of the desired content.

Table 4. Lesson design

level	Title	action
3	Lesson design	**Lesson Plan** ✓ Reviewing the conducted analyses, ✓ Identifying the principals and models of instructional design, ✓ Determining sections/chapters and content ✓ Clear objectives, ✓ Active and engaging learning strategies (problem-based learning, learning artifacts, learners' presentation, pre-training, and activating previous knowledge, etc.), ✓ Authentic learning and situated learning ✓ Proper examples, ✓ Proper activities, ✓ Feedback, ✓ Motivational design, ✓ Formative evaluation, Summative evaluation

The next stage is preparation. At this stage, the educational environment is designed and improved in accordance with our analysis. In addition, steps will be taken to prepare the instructions and the materials that would be demanded by both the audience and course instructors.

Table 5. E- content development

level	Title	action
5	E-content development	**Preparation and development of content and materials:** Videos, animation and images, audio, multimedia, etc., Principles of multimedia instruction, Message design Technical Standards (SCORM and other standards), Interfaces and proper navigation design

At this stage, the lesson is devised and micro-instructional design models were used. Instructional design at the micro level is defined as the prediction of how to combine the smallest components of instruction and the piece together these components based on the educational objectives (Frednash, 2006). The model proposed by Merrill (2012) is one of the models that can be used at this stage.

Table 6. Experimental implementation

level	Title	Action
6	Experimental implementation	**Experimental implementation and evolution of the program** • Collaboration with the teacher • Technical and educational support **Course Evaluation** • Interview with teachers • Interview with learners See learning results

In the process of preparing and producing content in accordance with the previous analysis, various materials and elements can be used. We also need to consider the principles of multimedia instruction

in developing electronic content. Clarke and Mayer (2016) stated that all the principles of multimedia instruction in e-learning were based on the findings of a multitude of studies that had been done in this area and they had powerful theoretical foundations. To support the practical and empirical nature of each of these principles, the theory of information processing and sensory channels, in particular the cognitive load, are emphasized. At this stage, a part of the training is conducted in a pilot to prevent the potential cost that may be incurred by error and to modify the course where necessary. During this process, the training process is recorded and reviewed. After analyzing the results and attending to the feedbacks, steps are taken to either modify or rectify the course. Afterward, the seventh stage is implemented. In this stage, the necessary technical and educational support is provided, and the course is monitored and evaluated continuously, for evaluation is one of the basic elements in developing an instructional design that can show us the progression of the course and the degree to which the intended objectives of the course have been achieved.

Discussion and conclusion
According to the results of this research, instructional design is one of the main factors influencing the quality of e-learning. Thus, developing a proper instructional design is one of the responsibilities of organizations which provide e-learning. In Iran, due to the increasing popularity of universities and higher education institutions regarding e-learning, it is imperative to pay specific attention to the instructional design, generate appropriate content for it, and track its progression. The present study sought to develop a framework for the development of instructional design based on the related research. Findings indicated that learners' needs, content and learner analysis, instructional principles and strategies, learning environment design, electronic content development, guidance and support, assessment and evaluation were among the components which had a pivotal role to play in the effectiveness of e-learning. Furthermore, the findings of the study revealed that proper analysis was one of the influential factors considered in evaluating the quality of e-learning. By analyzing the learners' need, the ultimate goals of education and the stages to be followed to achieving those goals are identified. Due to the nature of e-learning and the limited possibility of face-to-face interaction, it is important that the analysis is conducted as carefully as possible so that the instruction is tailored to a given learner's specific circumstances and proper learning takes place for him/her.

Also, the dissection of the research studies selected for the systematic review in this study showed that instructional principles and strategies were among the most significant components of e-learning. In the literature, the use of active methods and techniques (project-centered, problem-oriented, attention-taking, and role-playing), adequate exercises, evaluations, and feedback were also emphasized. These factors were also highlighted in other instructional design models, because failure to pay attention to these elements causes a lack of proper training and interaction. According to Merrill (2012), information is not instruction. In training, we must consider different conditions. A learner's mind has to be activated, his curiosity has to be stimulated, he/she should be provided with support and guidance, and there should be enough exercises and activities that can help him/her evaluate his/her learning, which is the main purpose of instruction. In the studies examined in this research, specific attention had been paid to constructivism and strategies such as collaborative learning and group work, authentic learning, content, and practices related to the learners' experiences and life. If the goal of training is learning; then, this can be achieved only if our training and teaching are followed by activities that are relevant and appropriate to the individuals' real lives. Moreover, issues such as collaborative activities, problem-solving activities that are associated with real issues and learners' lives, which are highlighted in new learning perspectives, are of great significance.

E-learning has a variety of capabilities; for it to fulfill its promises, it should enjoy a design tailored for facilitating instruction. Attention to the possibilities of interaction, including learner-to-learner, learner-to-content, and learner-to-teacher interactions, and collaborative learning opportunities, such as the forums, can contribute significantly to the enrichment of learning. Merrill (2012) believed that learners learned better when they collaborated. Learning communities are of interest to many learners,

especially those who use online discussion boards. Also, designing and using features, such as interactive lab, additional resource links, memo, wiki, online conferencing, simulation, simultaneous and asynchronous capability, email, blog, whiteboard, chat, message sending, drag and drop, searching, and other additional but necessary add-ins can provide ambient conditions in which learners' preferences and differences are taken into account and instruction is tailored to learners in different condition.

Electronic content development is another component heeded in the research. In developing electronic content, the following elements were emphasized: The principles of multimedia instruction (Clark and Mayer's multimedia principles, cognitive processes, cognitive skills, the use of videos, animation and images, and the use of audio in the practice guide, etc.), the production of desirable educational content and materials (proper quality, reliability and accuracy of materials, appropriate volume, sound recording), technical standards and scenarios, and appropriate lesson plans.

Clarke and Mayer (2016)[3] stated that all the principles of multimedia instruction in e-learning were based on a large number of studies conducted with strong theoretical foundations. To support the practical and empirical nature of each of these principles, he added, the information processing theory and sensory-motor channels, especially the issue of cognitive load, had been pointed out by researchers. For example, dual channels theory can be supported by multi-sensory and multimedia principles. This theory, posed by Paivio (1986)[23], states that short-term memory consists of two distinct memories, of which one stores verbal information and the other keeps mental images (Paivio, 1990). Consequently, and according to this theory, the information that can be encrypted in both visual and verbal forms is learned more easily and retained more effectively [22].

Furthermore, other components such as learner control (learner control over the content of the course according to the his/her level, the table of contents), the design of a suitable training message (quick recognition of key points, highlighting, line drawing, links to be identified, appropriate font), the elements of appearance and aesthetics (the compatibility and coordination of the content presented, the appropriateness of color, the context, the proper graphics), the organization and structure of the course and content (flowchart, infographic perspective and conceptual map, summary and lesson conclusion), and the proper navigation were found to have been classified as significant in the articles examined in this study. Paying attention to the principles of designing the educational message and the principles of aesthetics will attract and keep learners' attention to education. The program control and navigation features and the proper use of interface make learners interact and communicate better with the content, thus resulting in better learning.

Another component that has been considered in the research is guidance and support offered in the field of e-learning, which includes educational, technical, managerial, and emotional support, accountability, ease of access, course guides and information (required plugins-objectives, language, time, course schedule, headings, prerequisites, workload, , acceptance and infographics), the use of an e-learning systems, and training on data security and information. Guidance and support are important factors in securing users' satisfaction with e-learning courses and creating positive attitudes toward the ease of use of e-learning courses.

One of the most important issues left unnoticed in the implementation of e-learning system is the lack of any quality assessment indicators. The findings of the present study indicated that attention to the process of quality measurement and the pilot implementation of e-learning courses before they will be used by the targeted learners will help us identify the existing shortcomings and this, in turn, can help us modify and revise the course where and if necessary. Moreover, designing and presenting appropriate indicators for evaluation will improve learning owing to the fact that evaluation can determine the path to learning. Also, according to the findings, research on developmental evaluation, as a strategy for gaining knowledge about the learning environment and receiving feedback on education, as well as its correction, has been focused on in some studies.

In the present study, after reviewing and analyzing the results, integrating them with the concepts in the area of instructional design, and taking into account the experience of the authors in the field of

e-learning design and education, a framework was proposed for developing e-learning instructional design, hoping that it will be used by researchers and practitioners in the area of e-learning. Nevertheless, there is a need for further research in this regard due to the dynamic nature of technology and educational technology. For example, the results of the present study showed the importance of both collaborative learning and a rich interactive environment, but the organization of the groups and the classmates that result in enhanced learning, the appropriateness of each facility interacting with different types of content, supporting teachers and learners, the use of appropriate pre-instructional strategies in e-learning, the use of various e-learning environments in accordance with the type of educational content (facts, concepts, methodology, rules), and more require further research.

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