



# Evaluating Instructional Design Quality of Iranian MOOCs Based on Merrill's and Margaryan's Principles

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## Abstract

A great deal of attention has been paid to the experiences of learners and stakeholders in assessing the quality of massive open online courses (MOOCs), while participants' experiences in MOOCs and stakeholders are highly important factors in this process. Therefore, this study aims at evaluating instructional design quality of MOOCs based on Merrill's first instructional principles and Margaryan principles. For this study, a method of evaluation research was used based on the expert standpoints. Statistical population consisted of 20 internally-developed platforms of MOOCs, which 40 courses (2 courses from each platform) were selected by using simple random sampling method. This study was carried out from February to July 2018. To do so, a check list of 28 questions was designed by researchers based on the prescriptive strategies of Merrill's first instructional principles (problem-oriented, activation, presentation, application, integration) and Margaryan's principles (collective knowledge, collaboration, distinction, authentic sources and feedback). Accordingly, instructional quality evaluation of MOOCs courses was carried out by the educational technology specialists. Descriptive and inferential findings revealed that instructional design quality of MOOCs based on the points of specialists is under-evaluated and does not address Merrill's first instructional principles as well as the ones of Margaryan. It is suggested that in addition to paying attention to the elements of the MOOCs platform and its facilities, the Merrill's and Margaryan's principles should be used in designing the MOOCs content.

**Keywords:** Massive Open Online Courses, MOOCs, Merrill Principles, Margaryan Principles, Instructional Design Quality

## 1. Background

Online learning, whose evolution and development have commenced since the advent of the Internet, has undergone significant changes over the past years. Massive open online courses (MOOCs) are a new form of online learning (1). The origin of the term "MOOCs" backs to educational researchers such as George Siemens and David Cormier (2, 3). The MOOCs, abbreviated from the initial letters of massive open online courses has specific attribute features: (1) A large number of participants (Massive): Unlike traditional e-learning and traditional distance learning, MOOCs accept an unlimited number of volunteers; (2) Openness: There are virtually no conditions, formal prerequisite and restrictions for attending these courses and they are free or cost-free, or course certificate can be obtained by a minimum fee; (3) Online: MOOCs are offered exclusively through the Internet and are not dependent on specific geographic locations; (4) Concepts learning (course): Learning content is structured in MOOCs, taking into account a specific educational concept; in other

words, courses are especially limited to a particular instructional field (4). Enrollment in these courses is free and out of common practices in universities and educational centers. Volunteers can participate by tuition-free payment or with a minimum registration fee. Participants can receive valid certificates even after completing the entire course and doing assignments and quizzes. Many of these certifications are approved by the scientific, academic, and business centers, and this has led to an increasing appreciation of these courses. Yuan and Powell (4) stated that the main purpose of these courses was to provide an opportunity for public education and free access to academic and university education for all applicants to educate. Gaebel (2013) describes MOOCs as courses of not so hard, unlimited, and unpaid demands (5).

In recent years, MOOCs have been welcomed by world-renowned universities, institutes, and organizations. Studies unveil that students and professors are interested in MOOCs and eagerly enroll in the MOOCs (6). According to the research review, nowadays, most of the world's lead-

ing universities, such as Stanford, MIT, Yale, Harvard, Sorbonne, and at least 563 other universities, began to hold MOOCs (7). Iran's higher education universities and institutes have emphasized the development of MOOCs platforms in their recent policies and programs to not keep up with this program. For instance, the Education Deputy of the Ministry of Health and Medical Education (2015) and Iran National Technical and Vocational Training Organization (2015) have repeatedly emphasized the need for paying attention to MOOCs in skills training and announced the organization's plans to launch MOOCs (8). Moreover, according to a meeting held by the researcher with Payam Noor University's Distance Education Director, the university is going to launch MOOCs. In addition, private companies and organizations in Iran stepped up and began to hold MOOCs.

MOOCs have recently become a popular subject, being the focal point of much research (9). Millions of people worldwide are learning in hundreds of MOOCs provided by public-private universities and organizations. However, little empirical research has yet been conducted to assess the training quality of MOOCs and their effectiveness (10). Evaluating MOOCs courses using quality indicators of education in order to identify the weaknesses in the design of education, training, and learning has been suggested (9). However, no system has been formally introduced to assess the educational quality of these courses (8).

There are several ways to measure the quality of a course. For example, the evaluation of courses can be based on the views of participants in the course and other key stakeholders and some studies have evaluated MOOCs in light of the learners' experiences (11-14). These studies have not addressed the evaluation of educational design quality and learning methods of learners.

Margaryan et al. (15) research demonstrates that the majority of MOOCs receive low scores in terms of instructional design principles, and many of them have a good performance in organizing and presenting courses. Indeed, while MOOCs are based on the concept of communicational learning theory, the findings of the research show that many of them still do not follow the principles of education and students' learning experiences are not appropriate (13, 14).

Studies have uncovered that the application of the fundamentals of Merrill's first instructional principles can improve learning outcomes for the learners (16-18). Merrill (19) believes that many web-based educational programs are not educational, but only provide information to users. He criticized lecture methods in education, saying, "Transferring information solely is not learning and education." Actually, education has the principles that he calls them "Merrill's first principles of instruction," which is the foun-

dation of effective instruction. In order to extract these principles, he examined various patterns and experiences of instructional designs. The theory of Merrill's first principles of instruction is one of the theories employed in instructional design patterns and in designing educational environments based on Merrill's view. These principles were mentioned in another paper in 2007 by Merrill himself and supported by other writers and researchers (20). First principles of instruction comprise five important educational principles that make the learning of learners meaningful and engage them more in the learning process. These five first principles of instruction are as follows:

(1) Problem-orientation: If learners deal with issues of real life, learning will be better done.

(2) Activation: When prior knowledge of learners is used to activate new knowledge, learning is enhanced.

(3) Demonstration: If new knowledge is shown to learners, learning will be better done.

(4) Application: If new knowledge or skills are used to solve a problem, learning will improve.

(5) Integration: When learners use new knowledge or skills in their real life, their motivation increases and learning improves (19, 21).

In addition, some newly introduced principles are presented in the literature (22) including:

(6) Collective knowledge: When learners participate in collective knowledge, learning is enhanced.

(7) Collaboration: When learners work together, learning is enhanced.

(8) Differentiation (Individual differences): As learning takes place considering the individual differences and the needs of learners and experiences, learning is enhanced.

(9) Authentic resources: When learning resources originate from the real world, learning is better done.

(10) Feedback: Learning increases when feedback is given on the learners' performance.

In research (19, 21), Merrill demonstrated that the above-mentioned principles are the basis for all models and instructional designing theories. Gardner's systematic review (16) confirmed that 22 contemporary instructional design theories support these principles. The results of research also indicate the effectiveness of using Merrill's first principles of instruction in improving student performance (16), comprehension, critical thinking, and metacognitive skills (23), creativity (24), learning and retention (17). In this regard, Adelipoor and Karami (25) investigated the quality of educational software using Merrill's first principles of instruction, whose results indicated the acceptability of instruction quality apart from the problem-orientation principle.

Most world's prestigious universities have turned to utilize MOOCs (7). Iranian universities have not been left

behind and laid the foundations for launching MOOCs, especially private companies that have stepped up and commenced to hold courses but having a lot to do with MOOCs. Which extending MOOCs to hold at home and abroad is quantitative, its quality, especially pedagogical quality and instructional design, has been less focused and limited largely to learners and stakeholders' experiences (15). Although the experiences of participants in MOOCs and stakeholders are very important, the quality of designing instructional courses is a vital indicator that is essential for learning and achieving the course goal, and needs to be regarded; moreover, it is a tool for evaluating the instructional quality of these MOOCs. Therefore, the main issue in this study is to evaluate the instructional quality of MOOCs based on Merrill's first principles of instruction and Margaryan principles.

## 2. Methods

Considering the aim of the study, which was to determine the instructional design quality of MOOCs based on the Merrill's first principles of instruction, the current research benefited a method of evaluation research based on expert opinions. Evaluation research is the use of scientific research methods to examine and implement educational or clinical programs and characterize their level of accessibility for desired purposes. In addition, evaluation research is a tool for obtaining valid and reliable evidence about the performance quality of instructional, social, and clinical programs. In the expert-oriented approach, the main emphasis is placed on the direct application of expert opinion in judging the quality of products and instructional activities (26).

The statistical population in this study encompassed the internal platforms of MOOCs, whose characteristics along with the web address and areas of activity are presented in Table 1. As can be seen, the number of platforms is 20. In total, 40 courses (two courses from each platform) were selected using a random sampling method and were handed over the specialized educational technology evaluators. It should be noted that the community of evaluators in this research was composed of PhD holders or PhD students in the field of educational technology at the University Tarbiat Modares and the University of Allame Tabatabai. The criteria for selecting evaluators were being at least a PhD student and educational technologist and having a learning experience with the MOOCs. Moreover, having an online platform and holding the course massively were the criteria for choosing a course from MOOCs.

Table 1 shows the title of platform, website, and subject areas of each of the Iranian MOOCs. The implementation process was based on the theories of Merrill's first

principles of instruction (19) and Margaryan's principles (22). A 28-item checklist was designed by the researchers to be applied for the evaluation of MOOCs quality in terms of compliance with the principles of problem-orientation, activation, demonstration, application, and integration (Merrill's first principles of instruction) and the principles of collective knowledge, collaboration, differentiation, authentic sources, and feedback (Margaryan's principles). The items of the checklist were scored on a five-point scale (never, low, medium, high, and very high) from 1 (never) to 5 (very high). The validity of the tool was confirmed by experts and its reliability was 0.83 using Cronbach's alpha. After the tool of research was finalized, the research checklist was presented online using Google forms. Thus, the checklist's web address, along with the platform web address, was sent to the instructional quality evaluators of the MOOCs. They randomly registered at one of the MOOCs and then commented on the research questions. Then, the required information was obtained to assess the quality of MOOCs instructional design. Finally, using SPSS version 20 software and due to having one sample, data analysis was carried out with the one-sample *t* test.

## 3. Results

Research findings were analyzed at two descriptive and inferential levels. Table 2 describes the averages and standard deviations.

Table 2 shows descriptive findings. The mean score of the Total Merrill's principles was 43.82 with a standard deviation of 7.61 and that of the Total Margaryan's principles was 26.70 with a standard deviation of 5.91.

As shown in Table 3, the descriptive and one-sample *t* test results indicate that the application status of Merrill's first principles of instruction in domestic MOOCs was weak and significantly lower than the desirable condition ( $P < 0.001$ ). In the demonstration principle ( $P = 20$ ), the quality was relatively desirable, but in other principles of Merrill, including problem-orientation, activation, application, and integration, the quality of instruction design was reported to be poor ( $P < 0.001$ ).

As shown in Table 4, the descriptive and one-sample *t* test results show that the status of applying Margaryan's instructional design principles in domestic MOOCs was weak and significantly lower than the optimal condition ( $P < 0.001$ ). In the principles of authentic resources ( $P = 0.88$ ) and collective knowledge ( $P = 0.55$ ), the quality was relatively desirable, but in other principles of Margaryan, such as collaboration, differentiation, and feedback, a poor instructional design quality was reported ( $P < 0.001$ ).

**Table 1.** Iranian MOOCs and Their Areas of Activity

Number	Title	Website	Areas of Course Holding
1	Kelas-e-dars	kelasedars.org	High school and pre-university courses
2	Faradaneh	faranesh.com	Business, programming, entrepreneurship, psychology, music, cooking
3	Hamamooz	hamamooz.com	Management, financial-economical, individual skills (lectures, letter writing, work management, expression skill, etc.), language, business, start-ups
4	Webyad	webyad.com	Exchange education, business management, marketing, computer and the Internet, art, Microsoft software training.
5	Behamooz	behamooz.com	IT, graphics and animation, individual skills (stress management, pre-marriage counseling, content production), business
6	Danaapp	danaapp.ir	Different topics for all levels of schools and adults
7	Ostad-online	ostad-online.com	Law (procedure, trade, civil, etc.)
8	Yadup	yadup.ir	Entrepreneurship, management, IT, language, personal development
9	Rocket	rocket.ir	Web and mobile web programming courses
10	Maktabkhooneh	maktabkhooneh.org	
11	Faradars	faradars.org	Programming, artificial intelligence, academic courses, software, public education
12	Team-learning	team-learning.ir	Management, network security, programming, game production
13	Iran-academy	iran-academy.org	Individual skills (anger control, emotional control, individual development), entrepreneurship, negotiation and phone call, management, marketing, art
14	Hacinhaseb	hacinhaseb.ir	Salary-wage, accounting
15	Salamzaban	salamzaban.com	Language teaching
16	Gotoclass	gotoclass.ir	Software, programming, marketing
17	Novinelc	novinelc.com	Management, technical engineering, writing and research, language, technical, trade, economics, computer and the Internet
18	A.P. online instruction	medu.iranlms.ir/course	Psychology of learning, measurement, letter writing, calligraphy, article writing
19	Aghaejازه	aghaejazeh.org	Business courses, languages, entrance exam
20	Vdars	vdars.com	Academic lessons, Hawza courses

**Table 2.** Average and Standard Deviation of Application Rate in Domestic MOOCs Instructional Design Principles from Expert Standpoints

Instructional Design Principles	Number of Questions	Number of Courses	Average	Deviation
Problem-orientation	5	40	11.63	3.98
Activation	3	40	7.22	2.74
Demonstration	3	40	9.55	2.68
Application	3	40	7.85	3.08
Integration	3	40	7.57	3.35
Total Merrill's principles	17	40	43.82	7.61
Collective knowledge	3	40	8.72	3.18
Collaboration	4	40	9.45	2.97
Differentiation	1	40	2.15	1.1716
Authentic resources	1	40	3.01	1.26
Feedback	2	40	4.20	2.09
Total of Margaryan's principles	11	40	26.70	5.91

#### 4. Discussion

In the spread of MOOCs in domestic and abroad, the focus has mostly been on quantity rather than quality; in par-

ticular, pedagogical quality and instructional design have been neglected (15). A low instructional design quality in

**Table 3.** One-Sample *t* Test Results from Experts' Views on Applying Merrill's First Principles of Instruction in Domestic MOOCs

Merrill's Principles	Average Difference	t Grade	Significance Level
Problem-orientation	-3.37	-5.35	0.001
Activation	-1.77	-4.09	0.001
Demonstration	0.55	1.29	0.203
Application	-1.15	-2.35	0.23
Integration	-1.42	-2.68	0.11
Merrill's first principles of instruction	-7.17	-5.95	0.001

**Table 4.** One-Sample *t* Test Results from Experts' View on Applying Margaryan Principles in Domestic MOOCs

Margaryan's Principles	Average Difference	t Grade	Significance Level
Collective knowledge	-0.27	-0.59	0.558
Collaboration	-2.5	-5.41	0.001
Differentiation	-0.85	-4.60	0.001
Authentic resources	0.5	0.25	0.88
Feedback	-1.8	5.44	0.001
Margaryan's principles	-6.30	-6.73	0.001

the MOOCs can affect the quality of learning and their effectiveness and prevent them from developing. This study aimed at evaluating the quality of MOOCs based on Merrill's first principles of instruction and Margaryan's principles. The results of the research upon descriptive and inferential levels showed that the instructional design quality of MOOCs stands at a low level. In order to enhance the qualitative level pedagogically, the content design of MOOCs should be fulfilled systematically. The result of this study was consistent with the results of some related studies, such as that conducted by Margaryan et al. (15) who evaluated the MOOCs' instructional quality. Contrarily, they were inconsistent with the findings of Adelipoor and Karami (25) who evaluated the quality of instructional software based on Merrill's first principles of instruction since their results revealed that the instructional software studied was acceptable in the principles of Merrill, except for the integration principle. The reason why the results were inconsistent is that the study evaluated the quality of software rather than MOOCs. In explaining the findings of the study indicating a low level of instructional design quality in MOOCs, according to the research review and experience of interviewing researchers with several ex-

ecutives of organizing companies, it can be uttered that most companies having run MOOCs concentrated largely on its technical and managerial aspects. Although decisions on launch, design, development, and maintenance of e-learning courses have a pedagogical aspect in addition to technical and managerial facets (7), they were not considered pedagogically in instructional design principles.

Based on this study, the problem-orientation principle was not at an acceptable level in MOOCs. This principle, recognized as one of the important factors of Merrill's first principles of instruction, will be run perfectly and effectively when learners are involved with problem or assignments. In other words, when a problem is presented, the learner engages in solving it; this activity and engagement contribute to learning; accordingly, owing to this engagement in problem-solving, the contents are formed meaningfully in the learner's mind. The results of Teimury et al. (17) and Gardner (16) studies indicate that the use of the problem-oriented principle has a positive effect on learning. Built on the theory of Merrill's first principles of instruction, after the problem is presented and students are activation, the instruction starts from where the learner is situated (21). In the evaluation of many instructions, especially the MOOCs, it is seen that the instructor begins the instruction and demonstrates the desired content regardless of previous or existing knowledge or experiences of learners. Nevertheless, it should be noted that learning would not be achieved if learners could not connect the new subject with the knowledge available in their minds. Therefore, it can be claimed that any educational tool that is effective in activating previous knowledge or lessons of learners will improve learning. The findings of Marzano and Pickering (27) even revealed that activation of students' prior knowledge is the most important factor in the success of Merrill's pattern.

The results of evaluating the demonstration principle showed its suitability in the MOOCs. MOOCs, based on electronic tools and addressing the graphical aspects, are susceptible platforms for demonstrating the content with videos, animations, and images. However, the principles of application and integration in the MOOCs did not receive an acceptable rating. In designing learning activities in web-based environments such as MOOCs should be considered the application principle. The application principle emphasizes the opportunity and the position to apply the knowledge gained in specific situations. Additionally, the integration principle, which is one of the neglected principles in instructions across the country, gives rise to motivation and improved learning (16). To achieve this principle, it seems that MOOCs should provide techniques for encouraging learners to integrate knowledge or new skills with their daily lives; it can provide learners with an

opportunity to show their knowledge or skills to others. It also gives students an opportunity to contemplate, discuss, and defend their new knowledge or skills, and ultimately gives learners an opportunity to create, invent, or explore new and personal ways to use their new knowledge and skills (21, 25).

Other findings extracted from this study were that the principles of collaboration, differentiation, and feedback from Margaryan instructional principles (22) were not evaluated at acceptable levels in domestic MOOCs, but the ones of collective knowledge and authentic resources were favorable. In explaining this finding, it can be stated that the platform of domestic MOOCs have not technically taken into account the possibility to interact instructor with learner or learner with learner; Moreover, the effectiveness of the principles of collaboration and differentiation and paying attention to individual differences and feedback on learning level and learner's motivation should be explored pedagogically. According to the researcher's experiences and the findings of the current research and several studies that examined the effectiveness of Merrill's first instructional principles in learning (16, 17), problem-solving (16), motivation and creativity (24), it is suggested that universities and companies that are commencing to launch MOOCs have a special focus on producing instructional courses and designing their learning activities and their content in accordance with the principles of Merrill and Margaryan. The lack of MOOCs held by the first-level universities in the country and the inaccessibility of researchers to them were the limitations of the present research. Therefore, it is recommended that Iranian universities turn to this new and effective phenomenon by considering that the high rank and prestigious universities in the world have started to create and launch MOOCs.

## Footnotes

**Authors' Contribution:** The authors 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. The authors collected data, ran the study intervention, participated in the study concept, performed the analyses, and revised the manuscript. The authors contributed to the design and analysis of the study data and drafted the manuscript.

**Conflict of Interests:** The authors declare that they have no competing interests.

**Ethical Considerations:** In this study, the following ethical issues were considered: after obtaining permission from the college officials, the training program began at

the educational company's located in Tehran. At the beginning of the training program, after the researchers had introduced themselves, they explained the objectives of the study and the need for implementing them to the participants and written consent was obtained from students participating in the study. The participants were also assured that all information collected would remain confidential. This study was approved by the Ethics Committee of the university.

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