Interdisciplinary Journal of Virtual Learning in Medical Sciences (IJVLMS)

# INTERDISCIPLINARY JOURNAL OF VIRTUAL LEARNING IN MEDICAL SCIENCES (IJVLMS)

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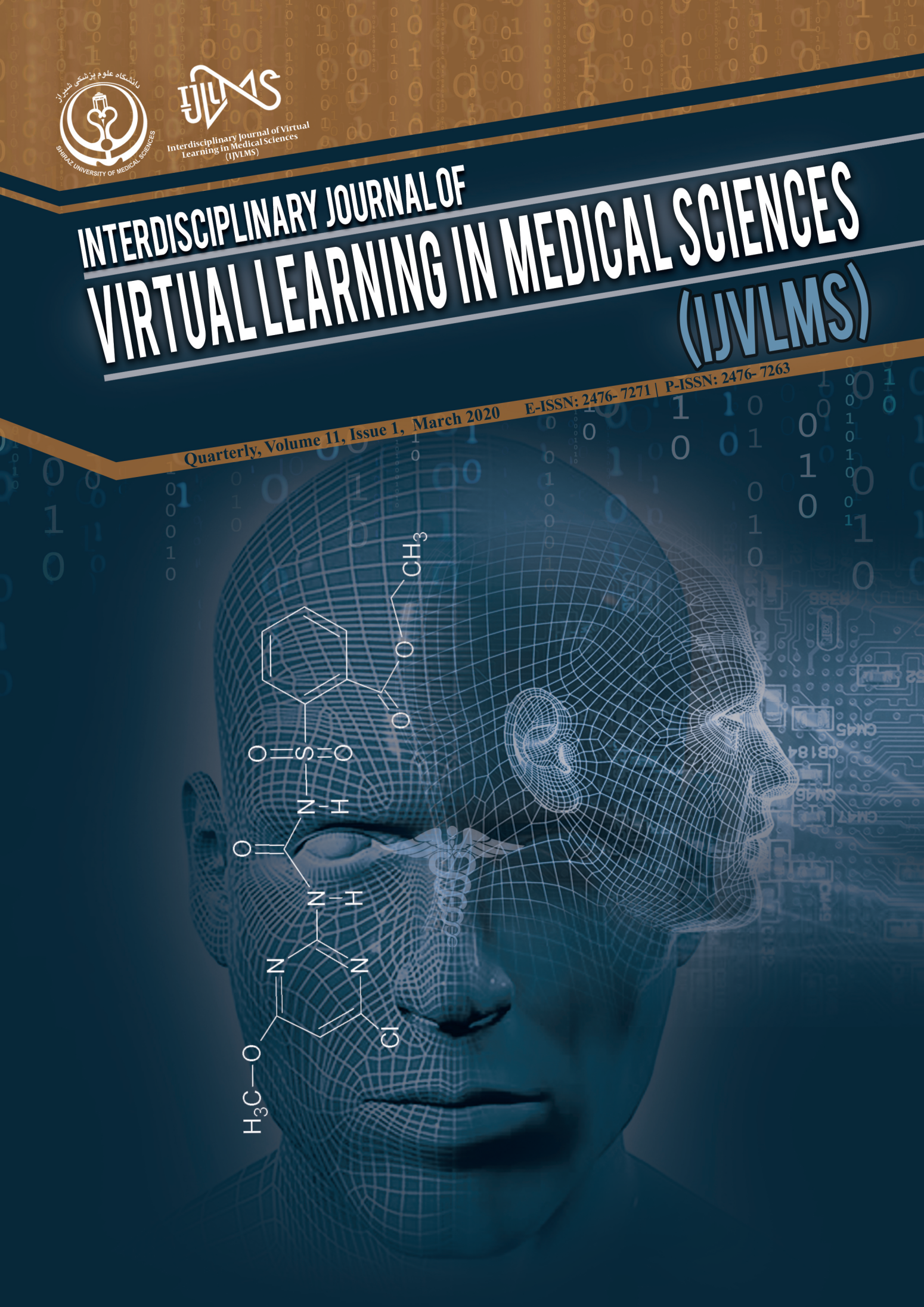

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Learning in Medical Sciences
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QUARTERLY, VOLUME 11, ISSUE 1, MARCH 2020

# JOURNAL INFORMATION

## ► AIMS AND SCOPE

*The Interdisciplinary Journal of Virtual Learning in Medical Sciences* (IJVLMS) aims at promoting and enhancing the quality of e-learning in formal and non-formal education. IJVLMS publishes research and scholarly articles concerned with electronic education and distance learning. The journal accepts Original Articles, Review Articles, Case Reports and Letters to the Editor. Papers in the following areas will be considered for publication:

### Online learning and distance education

Studying current trends and future developments in open, distance, blended, and distributed learning, and online education.

### Emerging technologies in learning

Evaluating new technologies developed to enhance the learning process ranging from internet and web-based applications, to collaborative software, Intelligent Tutoring System, Artificial Intelligence, machine learning, Virtual Reality, Augmented Reality, simulation, etc.

### E-course development and instructional design

Designing and implementing effective instructional modules and curriculums that can be applied in virtual settings and meet the learners' concerns and preferences.

### Social Networks

Analyzing the ever-growing role of social media platforms in education and innovative methods to integrate them in online and physical educational settings.

### Learning analytics and electronic assessment

Exploring various methods of traditional and on-line assessment for quality assurance, evaluation and validation of e-learning.

### Social, cultural, economic and political aspects of e-learning

Looking into the impacts of digital learning on people's lives and outlooks and the new opportunities it presents to different communities around the world.

### E-learning in medical education

Studying efforts in medical science to promote healthcare by utilizing educational technology, virtual learning environments, and online courses.

### The aims of the journal with regards to the mentioned areas include:

- Creating a basis for promoting knowledge and research in E-learning in the field of health
- Publishing scientific articles, research, analytical presentation of research results in order to promote the production of scientific knowledge
- To help develop e-learning in higher education in general and specifically in medical sciences
- Motivate researchers to conduct scientific research in the field of e-learning
- Creating suitable foundations for exchanging information on e-learning in general and specifically in medical sciences
- To help identify scientific experts in the country and to publish their related papers
- To help recognize and develop e-learning in medical educatio


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# Interdisciplinary Journal of Virtual Learning in Medical Sciences

QUARTERLY, VOLUME 11, ISSUE 1, MARCH 2020

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Interdisciplinary Journal of Virtual Learning in Medical Sciences

Original Article

# Proactive Teaching: Development and Validation of a Scale to Evaluate Constructivist Teaching in Higher Education

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## ABSTRACT

**Background:** Constructivist teaching is deemed beneficial across most educational contexts, and is particularly valued and utilized in tertiary settings. Yet to date, no tools have been made available for measuring and evaluating the construct.This study aimed at developing and validating a scale to evaluate the proactive teaching (based on Constructivism) in higher education.

**Methods:** The present research is an exploratory mixed methodology. The statistical population of the present study included all students of psychology, education, social sciences, medicine and management of University of Tehran during the 2015-16 academic years. The first phase of the research involved developing a tool within a framework of qualitative methodology and phenomenology based on semi-structured interviews collected from 100 students selected through purposeful sampling. The second phase incorporated the data collected from 500 students selected by stratified random-sampling to validate the six-dimension scale through exploratory and confirmatory factor- analysis.

**Results:** The result was the conceptualization of six dimensions of active learning: self-organization, constructivism, cognitive involvement, participation and cooperation, teacher as facilitator, and constructivist evaluation. The results showed that the Proactive Teaching Scale (which includes 6 components and 42 items) has adequate properties to evaluate this teaching method in higher education explaining 53.48% of the total variance. Ordinal Theta coefficient (0. 86 - 0.92) indicated good internal validity.

**Conclusion:** The Proactive Teaching Scale provides a valuable tool to evaluate constructivist teaching, and contributes to improved teaching and learning practices in higher education.

**Keywords:** Proactive teaching, scale, Development, Validation, Evaluate, Active learning, Constructivist teaching, Higher education

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## Introduction

In recent years, constructivism has emerged as a new approach in the philosophy and psychology of education. It has been influenced by the theories of Dewey, Piaget and Vygotsky as well as the evolution of ideas and explanatory foundations about knowledge. It has also challenged the underlying assumptions of behaviorist thoughts, and it has produced new goals and methods for education.

According to Piaget (1), learning is the process of cognitive development, which includes the making and remaking of learning experiences. This process aims to impact an individual's perception when activating his or her particular mental framework (2). They are not directly influenced by environmental information, perceptions, external or abstract experiences, or personal interpretation based on their cognitive construction (3). Therefore, learning is not the reflection or reception of the outer world derived from experience, education, or social communication. Instead, learning is an intelligent action based on the transformation and rehabilitation of cognitive organization (4).

Education is the opportunity to solve a problem in a real-life situation and have a social interaction that blends the balance of the mental framework and provides a context for continuous change, reconstruction, and adaptation within the cognitive structure. Vygotsky has expressed this theme with more emphasis on individual action in the context of social interactions. His point is that learning occurs in the mind of the active learner based on social interaction and in the context of cultural exchanges. While interacting in a community context and exchanging ideas through language, students consciously involve themselves in a learning experience. Furthermore, they try to discover their own interpretation, and use the advantage of social guidance and other people's protection to reconstruct their perception (5). Therefore, education does not simply entail the transmission of information. Instead, a problem is presented with the aim of provoking the students to engage in solving it through cooperation and participation and establishing a new equilibrium. For instance, Vygotsky (5) provoked a student during his or her approximate range of growth.

Bruner (6) calls this process exploratory, and considers it an active process. Instead of transferring a set of facts or information by stating the problem, it engages a person in a continuous process of thinking in synchronicity with discovery, selection, representation and categorization. He this process calls conceptualization. (7). In addition Bruner, like Vigotsky, sees this process as the result of the learner's actual action in the context of social interaction in which the learner is supported by the teacher, peers, and other persons through the mediating role of language(8).

Based on this constructivism, learning is the creation of the active knowledge of the learner's experiences, the knowledge the person creates in the process of constructing meaning, and the interpretation of experiences.

According to this approach, knowledge is based on the individual experiences and personal interpretations of each individual. Therefore, it is never fully transmitted to another person; and the teacher is not the distributor of knowledge but a "Pro-active facilitator". In this approach the teacher's task is to create an opportunity for all students to act effectively. Proactive teachers do not avoid problems in learning or problems with behaviour. These teachers accept responsibility for their students' successes and failures (9). Such teachers take pride in their ability to stand by all the students in their class, not merely those who succeed. Proactive teachers understand that each student has their own strengths and weaknesses. Their challenge is to bring out the best in all students. When students present problems, proactive teachers accept responsibility for finding solutions. They recognize that schools are awash with explanations for students' difficulties, but they do not use these explanations as excuses. In this light, a classroom-based on constructivist teaching

provides opportunities for students to hone their knowledge via first-hand experiences. In these classes, students are in real-life situations, and these diverse opportunities allow different people to participate and choose the ways they participate (10).

Constructivism is based on its explanation of knowledge creation, especially the active role of the person involved in this process. In addition, it facilitates new principles and concepts, and it has created various types of research questions and experiences within the philosophy of education (11-15). By examining their possible expectations of methods, researchers have focused on identifying their disadvantages from the viewpoint of educational agents and clarifying the necessary conditions for creating active learning environments. Other groups have gone beyond the planning stage, and have presented and tested a specific pattern of instruction based on a constructivist approach. Subsequently, they studied the effectiveness of these methods in the classroom (16-19). These researchers have diverse opinions based on their areas of expertise. They commonly compare the effectiveness of this method with traditional and teacher-oriented approaches. In other words, these studies have tested their constructive-based methods and compared them to the outcomes of traditional education (20-23). Some studies have also addressed student action in the constructivist approach (24-27). However, no one has ever conducted research about presenting the criterions and useful indicators of proactive teaching in the classroom.

In fact, despite providing the theoretical principles and explanatory bases, researchers have not found that structuralism provides accurate indicators of active teaching in classroom. Furthermore, it does not have the necessary criteria to diagnose active engagement in the classroom. In other words, active educators do not use structures, criteria, and diagnostic indicators based on actual classroom activities and interactions between teachers and students despite practical, defensible explanatory bases and the particular measurement of this kind of training. Furthermore, in the absence of this kind of scale, constructivist teaching (especially at higher levels) is limited to general recommendations. And if some of the professors utilize their creativity based on their areas of expertise, rather than trial and error, they will more actively provide students with information.

This study aimed at developing and validating a scale to evaluate the proactive teaching (based on Constructivism) in higher education.

## Methods

The present research is an exploratory mixed-methodology study. The first step of the research involves a qualitative paradigm by the phenomenological method. The purpose of this step was to identify concepts and indicators for teaching based on Constructivism. Then, based on these concepts, the scale questions bank was designed.

The second step of the research involves the validation of scale, which is performed within the framework of the quantitative research method. And the questions of this step are extracted from the findings of the qualitative section. This step was extracted from the psychometric properties of the questions using exploratory and confirmatory analyses.

**Data collection tool:** The research tool in the first step was a semi-structured interview. In this method, we asked all the participants the same questions. However, they were free to respond in any way they choose (28). The planning of interview questions was based on a review of previous research concepts and indicators of proactive teaching in universities. Researchers corrected questions in four steps. During each step, they asked focal groups these questions and conducted a bilateral interview with students at the University of Tehran. In the second step, after coding and analysing the interviews based on the extracted components, a quantitative part of the research was developed into a

questionnaire, which was adapted to Iranian culture. They identified the proactive teaching markers in the University. This 80-item questionnaire was conceptualized in six contexts (self-organization, context, cognitive involvement, participation and cooperation, teacher facilitator, and constructivist evaluation) for planning and evaluating the active education scale. Questions were scored on a 5-point Likert scale.

**Sampling:** The present study was conducted in two steps. The first step was purposeful sampling. In this step, the researcher's intention was to select items with abundant information related to the purpose of the research and to provide this information (29) by simultaneously analysing the data in this step and interviewing 100 people. The statistical population of the present study included all students of psychology, education, social sciences, medicine, and management of University of Tehran during the 2015-2016 academic years. Descriptive data were about students: mean age (21.92,). 49.6% of them were female, and 50.4% were male. Most of them were single (94.2%) and born in Tehran (95.7%). In the second step (i.e., standardization), 500 students at the University of Tehran who were majoring in psychology, education, social sciences, and management were randomly selected in a class. This sample group consisted of male and female students with a mean age of 23.88 and a standard deviation of 8.55. 44.2% of them were female, and 58.8% were male. All of the students were undergraduates. The admission quota was 57.7%, and the regional quota was 79.9%. About 82% of these students were taking a daily course in college. Two hundred and fifty of these students were selected for exploratory exploration, and 250 went through confirmatory analysis.

## Results

First, the findings of the qualitative step were coded and subcategories and categories were developed. Then Delphi method was used to confirm the construct validity. In this section, about 80 items were produced. Based on similarities, these six categories were obtained:

**Cognitive involvement:** Structuralism considers meaningful learning as the active involvement of students in developing personal knowledge. Students are actively engaged in learning through tools, methods, questions, and educational challenges. Through their perceptions, they examine their hypotheses and interpretations.

**Self-Organization:** According to the underlying principles of the constructivism approach, learners are active in their educational processes. Thus, students must be able to organize their cognitive activity. Through active learning, the learner is allowed to decide on ways to engage in educational activities, suggest appropriate strategies, and participate in the selection of resources, teaching methods, and evaluations.

**Contextualization:** Based on theories rooted in the constructivist approach, meaningful learning occurs in real-life situations. In other words, realistic situations make it possible for the desired knowledge (e.g., content, skills, and methods) to be related to real objectives and situations.

**Participation and cooperation:** According to social constructivism, knowledge is created via the collaboration between individuals and a social context. Communication and collaboration protect people by creating their knowledge, which enables students to interact in groups, especially through language that facilitates knowledge.

**Teacher as facilitator:** A constructivist teacher does not describe knowledge. Rather, he or she is a guide, partner, and facilitator encouraging students to create their own knowledge. A facilitator does not control or induce. Instead, they support and facilitate student learning by helping them question, challenge, and formulate their own hypotheses, thoughts, and achievements.

**Constructivist evaluation:** As mentioned earlier, the second step of the research was performed using two exploratory and confirmatory analyses. Researchers conducted an exploratory factor analysis on the matrix

of correlation coefficients obtained from the data of the sampling group. They used various rotations and limitations on the number of factors, and the loading rate of the variables on the factors of the sign. They concluded that the method of factorizing the principal components (via a varimax rotation and the minimum amount of loading on each item in the factors of 30) resulted in the extraction of 6 factors. These factors equal the results of the qualitative section, and the results of this analysis are displayed in Table 1. The value of the Kisser-Meier-AlkinSufficiency Suitability Index was 0.94, and the Bartlett Spread Test Index was 10207.11. This outcome is significant; it has a level of 0.0005 and a degree of freedom of 2080. According to this finding, the assumption of performing factor analysis is on the events of the grouping process. The results of factor analysis showed that the structure of six factors had a high value of 1, which explains 53.48% of the total scale variance. This outcome is the most appropriate and simple structure for this data. It should also be noted that this pattern was obtained after twenty rotations (Figure 1).

The results of the analysis showed the following: Among items in factor analysis, 12 items (in the first and second components) and 10 items (in the third through sixth components) were appropriately loaded. In order to finalize the number of factors and form a simple structure, researchers must consider the theoretical basis and the content of the items.

Meanwhile, due to the fact that the qualitative section is built on an active learning scale, each person is assignedthe six previously mentioned components (self-organization, constructivism, cognitive

**Table 1:** The Constructs and specific values of proactive teaching scale

| Component | Eigenvalue | percent of variance Adjusted variance | percent of congestion variance |
|---|---|---|---|
| Self –Organized | 25.07 | 38.58 | 38.58 |
| Contextualization | 2.68 | 4.11 | 42.70 |
| Cognitive involvement | 2.35 | 3.61 | 46.31 |
| Participation and cooperation | 1.78 | 2.74 | 49.05 |
| Teacher as facilitator | 1.50 | 2.30 | 51.35 |
| Constructivist evaluation | 1.39 | 2.13 | 53.48 |

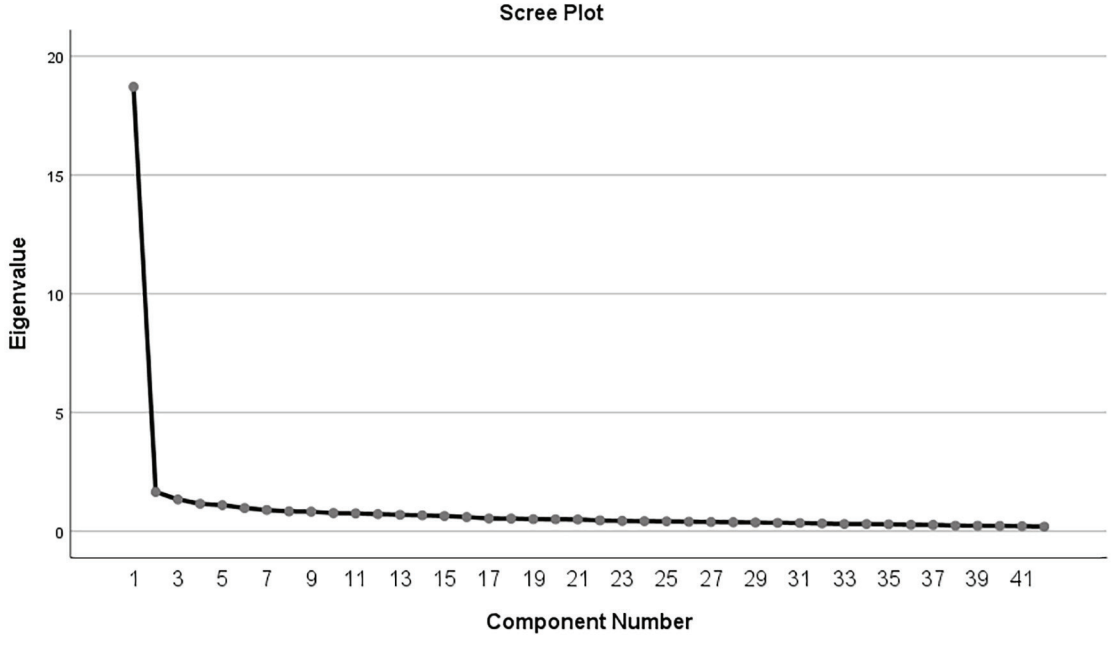


**Figure 1:** Scree plot

**Table 2:** Constructs and items in scale

| Self-Organization | Contextualization | Cognitive Involvement | Participation and Cooperation | Teacher as Facilitator | Constructivist Evaluation |
|---|---|---|---|---|---|
| Students are involved in determining the appropriate method of class activities. | A part of classroom training is applied. | Classroom discussions be prioritized over engaging the students' intellectual interests. | During the educational process, the professor provides a suitable field for group activities with the same class. | The professor helps students resolve ambiguities by pointing to the unobvious aspects of the subject. | Scoring is based on students ' use of theoretical concepts while solving practical issues. |
| Students offer their participation status in their classwork. | The professor tries to relate new topics to the previous knowledge of students. | Class discussions eventually lead to the subjective pluralization of students. | Classes try to replace competition with partnerships. | The instructor will maintain the power to provide and transmit accurate information. | More professors place attention on gaining an understanding and analysis of maintaining the content. |
| Evaluation methods are the results of teachers' consultations with students. | The professor consistently associates education with tangible examples. | At the end of the course, the professor directs new questions to the plan of the students, in order to study and search more. | Students are assigned to group activities, in order to help each other. | The professor provides a favorable environment and conditions for discovering the knowledge of the students. | Receiving feedback during evaluation improves training in subsequent courses. |
| The professor helps students become perceived via earlier knowledge with more depth. | The professor expresses the relevant examples with through their life experiences and responds to their questions. | A discussion of every new topic begins with challenging questions and discussions. | After a group activity, the professorencourages students to evaluate and critique the activities of the group. | Direct response is not given to questions, and only provides necessary guides for finding the answer. | Students participate in class discussions as evaluation criteria. |
| The class' current processes provides an adequate opportunity for the participation of all persons. | The professor tries to show users how to use cases in real life. | The professor encourages the criticism and evaluation of theories as an educational activity. | The professor monitors the group's activity and supervises the group. | While studying theories and methods, students are asked to provide their own inference and criticism, instead of imposing the institution's worldview. | The professor helps the class effectively achieve the best final score possible. |
| Professors can choose the way students contribute to classes. | Students are encouraged to apply their everyday experiences to the subject matter. | Students criticize theories, topics, and teaching methods as part of class activities. | The final score includes the tests results and class participation. | The professor introduces more resources to deepen learning. | Based on the feedback from the midterm exam, students are encouraged to amend learning methods. |
| Based on the professor's feedback, students can take action and choose other class activities. | One part of classroom education is finding solutions to social problems. | Students discuss and assess each other's strengths and weaknesses. | Students defend their viewpoints, which impacts their scores. | Students study the strengths and weaknesses of theories and methods with the professor and each other. | The professor guides the students towards other dimensions of the subject matter. |

involvement, participation and cooperation, teacher as facilitator, and constructivist evaluation). They review the content of the items placed in each component, and show that the extracted factors from the exploratory factor analysis were consistent with these six components.

However, since the researchers initially tried to create a relatively short research tool to evaluate this structure, seven items were selected from each of the components provided that they had appropriate psychometric properties. Therefore, the final scale comprises 42 items (Table 2).

The validity of items, subscales, and the total scale in the evaluation group showed that all subscales had internal homogeneity coefficients. Their range was between 0.82 (component self-knowledge and constructivist evaluation), and 86.8% (cognitive involvement). The correlation coefficients between items and subscales also show that these coefficients are between 0.48 (items 30, 44, and 61) and 0/69 (item 39).

However, the maximum alpha elimination coefficient belongs to items 15, 26, and 62. Its minimum belongs to items 18, 19, 20, and 45.Next, composite reliability (CR) was used as measure of internal consistency of the factors, where values greater than 0.70areindicative of good reliability. Discriminate validity is achieved when average variance extracted (AVE) is greater than maximum shared squared variance (MSV) or average shared squared variance (ASV). For convergent validity, AVE should be equal or greater than 0.50 and lower than CR. Put differently, variance explained by the construct should be greater than measurement error and greater than cross-loadings (30). For the analyses, IBM SPSS 20 was used. CR indices indicate a good reliability for all factors (all above 0.70). In addition, indices of convergent validity indicated no validity concerns; all factors AVE were less than CR and greater than 0.50. More importantly, indices of discriminate validity indicate good validity for all factors (all AVE markedly higher than MSV and ASV).

After doing an exploratory factor analysis in the sample group (for validation of the component structure), it is necessary to perform a confirmatory factor analysis of the data. Of course, it should be noted that this process involves two structures evaluated as competitive models.

These two structures were 1) the final structure of the exploratory factor analysis and 2) the one-factor structure as the basic model for assessing the diagnostic validity of the embedded components to scale.

As presented in Table 3, the first model has a total of more suitable features than the other model. Therefore, it can be concluded that the confirmatory factor structure has six components, compared to the one-component factor structure which has a more suitable fit for this data). The descriptive features of the items and their psychometric properties are presented in Table 4.

The validity of items, subscales, and the total scale of the final model showed that all subscales have suitable homogeneity coefficients (in the range of 0.58 to 0.77). Correlation coefficients of the score of the items with the total score of the subscale indicate that these coefficients vary between 0.28 (item 11) and 0.86 (item 8) (Table 4). Therefore, we can definitively say that the items, subscales, and whole scale have an intrinsic homogeneity of coefficients. To investigate the reliability we utilised R software and reported Ordinal Theta Coefficient in Table 4. Ordinal Theta Coefficient (0.86-0.92) for all factors, indicating good internal validity.

## Discussion

Our research was based on the theoretical principles of constructivism, and an exploratory mixed method was presented in two steps. Therefore, a constructive teaching scale was developed and validated. According to this approach teaching is proactive; teaching that provides opportunities for students' active learning and the teacher plays a guiding role. (4, 17, 18). In these classes, students are in real-life situations, and these

**Table 3:** Goodness of fit measures

| MODEL | $X^2$ | DF | NC | CFI | NNFI | RMSEA | RMSEA (CI 90) | SRMSR |
|---|---|---|---|---|---|---|---|---|
| (1) | 2048.10 | 804 | 2048.10 | 0.97 | 0.96 | 0.09 | 0.09 , 0.10 | 0.06 |
| (2) | 2446.86 | 779 | 2446.86 | 0.93 | 0.94 | 0.10 | 0.09 , 0.10 | 0.07 |

**Table 4:** Descriptive Statistics: Correlation coefficients, Means and Standard deviations, Ordinal Theta coefficient

| Component | Item | Mean | S. deviation | Ordinal Theta Coefficient | Correlation between the item and subscale | Standardized path Coefficient |
|---|---|---|---|---|---|---|
| Self–Organization | 1 | 2.21 | 1.15 | 0.89 | 0.55 | 1 |
| | 13 | 2.02 | 1.20 | | 0.67 | 0.86 |
| | 19 | 1.95 | 1.28 | | 0.65 | 0.77 |
| | 38 | 2.57 | 1.14 | | 0.62 | 0.93 |
| | 44 | 2.54 | 1.13 | | 0.58 | 0.89 |
| | 50 | 2.14 | 1.27 | | 0.66 | 0.76 |
| | 56 | 2.52 | 1.19 | | 0.69 | 0.74 |
| Contextualization | 8 | 2.48 | 1.51 | 0.91 | 0.53 | 0.94 |
| | 20 | 2.60 | 1.07 | | 0.64 | 0.78 |
| | 25 | 2.87 | 1.16 | | 0.65 | 0.63 |
| | 30 | 2.50 | 1.20 | | 0.62 | 0.78 |
| | 39 | 2.63 | 1.13 | | 0.72 | 0.94 |
| | 45 | 2.37 | 1.10 | | 0.69 | 0.75 |
| | 51 | 2.20 | 1.32 | | 0.60 | 0.96 |
| Cognitive involvement | 9 | 2.54 | 1.06 | 0.90 | 0.62 | 0.82 |
| | 15 | 2.46 | 1.13 | | 0.63 | 0.67 |
| | 26 | 2.38 | 1.24 | | 0.61 | 0.60 |
| | 40 | 2.48 | 1.24 | | 0.64 | 0.71 |
| | 46 | 2.46 | 1.20 | | 0.66 | 0.61 |
| | 52 | 2.38 | 1.21 | | 0.70 | 0.71 |
| | 62 | 2.44 | 1.19 | | 0.71 | 0.92 |
| Participation and cooperation | 4 | 2.36 | 1.10 | 0.87 | 0.55 | 0.79 |
| | 16 | 2.42 | 1.28 | | 0.60 | 0.72 |
| | 27 | 2.38 | 1.14 | | 0.65 | 0.68 |
| | 35 | 2.16 | 1.18 | | 0.65 | 0.83 |
| | 53 | 2.39 | 1.31 | | 0.63 | 0.92 |
| | 59 | 3.28 | 1.21 | | 0.44 | 0.93 |
| | 63 | 2.22 | 1.29 | | 0.47 | 0.85 |
| Teacher as facilitator | 17 | 2.65 | 1.10 | 0.86 | 0.60 | 0.67 |
| | 28 | 2.91 | 1.21 | | 0.56 | 0.63 |
| | 36 | 2.34 | 1.20 | | 0.65 | 0.90 |
| | 48 | 2.46 | 1.09 | | 0.50 | 0.65 |
| | 60 | 2.42 | 1.15 | | 0.65 | 0.66 |
| | 62 | 2.44 | 1.09 | | 0.69 | 0.86 |
| | 64 | 3.41 | 1.12 | | 0.49 | 0.75 |
| Constructivist evaluation | 12 | 2.15 | 1.13 | 0.92 | 0.67 | 0.69 |
| | 18 | 2.62 | 1.22 | | 0.60 | 0.64 |
| | 24 | 2.29 | 1.29 | | 0.54 | 0.97 |
| | 29 | 2.78 | 1.18 | | 0.46 | 0.67 |
| | 33 | 2.45 | 1.19 | | 0.61 | 0.96 |
| | 37 | 2.07 | 1.17 | | 0.63 | 0.94 |
| | 61 | 2.70 | 1.11 | | 0.61 | 0.87 |

diverse opportunities make it possible for different people to participate and choose the ways they participate (10).

The first phase of the research involved developing a tool within a framework of the qualitative research method and the phenomenology. The result was the conceptualization of the six dimensions: self-organization, Contextualization, cognitive involvement, participation and cooperation, teacher as facilitator, and constructivist evaluation.

The validation of the concepts and the standardization of the tool were obtained during the second phase. The final version of the scale was confirmed by two methods of exploratory and confirmatory analysis.

The results of exploratory factor analysis on the matrix of correlation coefficients (by two methods of causing main components, and variation of varimax) confirmed Saturation for six factors, which are most consistent with the theoretical structure to develop a scale. These six factors with value of one and more, explain 53.48% of the total variance of the scale.

The most consistent theoretical structure was considered while making the scale, and these six factors (with a high specific value of 1 in total) explained up to 53% of the total variance of the scale. The results showed that the six factors in this phase were equal to the results of the qualitative section. Since the purpose of the researchers was to construct a relatively short research tool to evaluate this structure (among the items in each of the components), seven items with the most appropriate psychometric properties and the most significant factor load were selected. Therefore, the final scale had 42 items. The validity of items, the subscales, and the total scale in the evaluation group showed that all of the subscales had intrinsic homogeneity coefficients.

Furthermore, their range was between 0.82 (self-organization component and constructivist evaluation) and 0.86 (cognitive conflict). The correlation coefficients between items and subscales also showed that these coefficients ranged between 0.48 and 0.69. However, all factors with a Cronbach alpha coefficient above 0.8 showed good reliability of factors. Another sample was selected from the population to accomplish a confirmatory factor analysis using the data available from the reliability finding group.

During this process, two-factor structures were evaluated as competing models. The first model was the best factor structure for exploratory factor analysis. The second model was the one-factor structure, which is the basic model for assessing the diagnostic validity of the embedded component. In total, the first model was fitted with more suitable features than the second model, and the confirmatory factor structure had six components, compared to a more complex fitting model for this data. The validity of the items indicated that all subscales had suitable homogeneity coefficients (in the range of 0.58 to 0.77).

In summation, it can be said that the items, the subscales, and the total scale internal homogeneity. For making and validating the constructivist teaching scale, it can be stated that constructivist teaching provides opportunities for students to become actively engaged in gaining an understanding via a firsthand experience. In these classes, students will have real-world experiences (24-27). Also, the learners will have several opportunities to participate and to choose the method of participation (9, 17). The findings of this study equalled the findings of other research (18, 21-23). These researchers have designed, planned, and tested a method or model based on a structured approach, and compared its educational outcomes to traditional education.

Finally, the scale of proactive teaching is made necessary by the need to change the teaching process and can be effective in improving instruction and interaction in the classroom. Professors are proactive facilitators (9). They provide educational opportunities and active role for everyone, and offer a variety of methods, tools and models that enable everyone to learn.

This instruction is based on the

constructivism and emphasizes active student learning (12). Proactive teaching provides opportunities for students to actively learn through the primary experience of engaging in the knowledge construction (10).

The findings of this study are consistent with the findings (24) that proposed an instrument to measure active student learning (22, 23, 27, 28, 31, 32) that introduced an instructional design framework for active learning in higher education.

## Limitations

The limitations of this research included the large number of questionnaires, the potential bias in respondents' answers, and the accuracy and clarity of the responses that may have affected validity and reliability of the questionnaires. There are also limitations regarding generalizability, and therefore, the scale should be re-evaluated in other contexts and countries in addition to larger cohorts.

## Ethical Declarations

In this study, the following ethical issues were considered:

Obtaining permission from the University officials, providing explanations to students and ensuring the confidentiality of their information

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## Authors' contributions

M.H.H 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. S.H.SH and E.N collected data, ran the study intervention, participated in the study concept, performed the analyses and revised the manuscript. Z.N contributed to the design and analysis of the study data.

## Conflict of interests

The author declares that they have no conflict of interests.

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Original Article

# Validity Evidence for a Persian Version of the Online Self-Regulated Learning Questionnaire

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## ABSTRACT

**Background:** Due to the importance of self-regulated learning in distance education (especially online learning environments), researchers are constantly looking for a suitable instrument to evaluate it more accurately. The purpose of this study was to investigate validity and reliability of the Barnard's et al (2009) Online Self-Regulated Learning Questionnaire in Iranian context.

**Methods:** The study was a descriptive survey that implemented a correlational research design. The population of this study were all postgraduate students enrolled in the online courses at universities located in Tehran in the academic year 2017-2018. A sample of 450 students were selected by Cluster random sampling and responded to the Barnard et al (2009) Online Self-Regulated Learning Questionnaire, of which, 418 questionnaires could be analyzed.

**Results:** The findings showed that the questionnaire had acceptable formal and content validities. The results of exploratory factor analysis by the principal components method, confirmed six factors named goal setting, environment structuring, task strategies, time management, help seeking and self-evaluation. These six factors account for 56.78 % of the overall variance. To determine the factor validity, a confirmatory factor analysis was used, and the results showed that the model appropriately fit to data. All of the tests confirmed the model. (X2/df=1.930<3, RMSEA=0.064, GFI=0.94, NFI=0.92, CFI=0.94). The results of this study showed that Cronbach's alpha coefficient ranged from 0.84 to 0.94 and Intraclass correlation coefficient and Pearson correlation coefficient of test-retest were 0.77 and 0.78, respectively.

**Conclusion:** The instrument appears to be appropriate for assessing self-regulated online learning among Iranian students for research or intervention purposes.

**Keywords:** Online learning environments, Self-regulated learning, Validity, Reliability

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## Introduction

Today we are witnessing the rise of numerous online courses that are offered by educational institutions around the world (1). Unlike face-to-face settings, the online learning environment exceeds standard synchronous education where students learn at the same time and place, and provides for asynchronous learning in which space and time are not barriers (2). Despite these advantages, success in an online learning environment excessively relies on a student's ability to autonomously and actively engage in the learning process (3). Online students are required to be more independent, as the very nature of online settings promotes self-directed learning (4). Therefore one of the required skills for success in such learning environments is self-regulated learning ability (5) defined as learners' systematic effort to manage their learning process to achieve personal goals (6). Research has shown that self-regulated learning is critical in determining students' successful learning experiences in an online learning environment (7). Self-regulated learners are known to set goals, plan ahead, and consistently monitor and reflect on their learning process. They effectively manage their time and learning resources (8) and persist in a challenging learning context; therefore, student self-regulation is important in determining successful learning experiences in an online course. (6). Nevertheless, examining the role of self-regulation skills in the online learning environments has not received as much attention as in traditional face-to-face environments (9). Due to the importance of self-regulation in learning, researchers are constantly looking for a suitable instrument to evaluate this feature in online learning environments (10). While existing instruments such as Motivated Strategies for Learning Questionnaire (11), the Metacognitive Awareness Inventory (12), and the Learning Strategies questionnaire (13) provide valid data in traditional learning environments, their validity in online learning environments has not been established. A recent study has shown that the MSLQ could not be validated in an asynchronous online learning environment (14). Additionally, the validity of the MAI and the LS in online settings has not yet been tested. The online Self-Regulated Learning Questionnaire proposed by Barnard et al. (15) is a response to the need to provide a valid instrument for online learning environments. The instrument was originally designed to study self-regulated learning behaviors in online learning environment in The United States. Although, according to Winne and Jamieson-Noel (16), self-reporting scales of self-regulated learning have unrealistic estimates of self-regulated behaviors, Barnard reports that the results obtained from this instrument showed satisfactory psychometric properties over time (17). In a study on 628 students (204 completed questionnaire) enrolled in the online courses at a large, public university in the Southwestern United States, Barnard et al. (15) assessed the validity and reliability of the OSLQ using confirmatory factor analysis. The results showed that 6 factors model had the best fit to data and the reliability of the factors ranged from 0.87 to 0.96. This instrument was also investigated by other researchers. Korkmaz & Kaya (18) studied the validity and reliability of this scale using confirmatory factor analysis on Turkish students (N=222) and showed that 6 factors model had the best fit to data and the reliability of the factors ranged from 0.63 to 0.95. Chumbley, Haynes, Hainline & Sorensen (19) also examined the validity and reliability of this scale using confirmatory factor analysis on American students (N=146) and showed that 6 factors model had the best fit to data and the reliability of the factors ranged from 0.87 to 0.94. Fung, Yuen & Yuen (20) also examined the validity and reliability of this scale using confirmatory factor analysis on Hong Kong students (N=412) and showed that 6 factors model had the best fit to data and the reliability of the factors ranged from 0.75 to 0.86.

Considering the studies whose results show the important role of the concept of Self-Regulated Learning for learners'

success in online learning environments (21–25) and since no Persian instrument was found in the review of the literature for measuring Self-Regulated Learning in online learning environments, investigating the psychometric properties of this scale in an Iranian sample provides the opportunity for Iranian researchers to have a valid and reliable instrument for research or intervention purposes. The purpose of this study was to report validity and reliability of the Online Self-Regulated Learning Questionnaire in Iranian context. To this end, the most important questions that this research seeks to address are:

1- To what extent is the Online Self-Regulated Learning Questionnaire (QSRL) valid in Iranian context?

2- To what extent is the Online Self-Regulated Learning Questionnaire (QSRL) reliable in Iranian context?

## Methods

### *Participants*

The study was a descriptive survey that implemented a correlational research design. The population of this study were all postgraduate students enrolled in the online courses at universities located in Tehran in the academic year 2017-2018. 450 students (requiring at least 200 samples for each of exploratory and confirmatory factor analysis and considering probable sample loss) were selected through Cluster random sampling. Among the universities offering e-learning courses in Tehran, 4 universities were selected randomly (a few classes at each university) and questionnaires were presented in face-to-face sessions and 418 questionnaires could be analyzed. Participants were fully informed as to the voluntary and confidential nature of the study. Participants ranged in age from 22 to 53 years old. 56% (234) of them were male and 44% (184) were female. Their GPA was 16.76.

### *Instrument*

Online Self-Regulated Learning Questionnaire was used to collect research data. This questionnaire was designed by Barnard et al. (15) to measure self-regulated learning in online learning environments and included 24 questions on a 5 point Likert scale. Six subscales: Goal setting (Questions 1,2,3,4,5), environment structuring (Questions 6,7,8,9), task strategies (Questions 10,11,12,13) time management (Questions 14,15, 16) help seeking (questions) and self-evaluation (21, 22, 23, 24) were examined. Barnard et al. (15) reported the reliability of these subscales as 0.95, 0.92, 0.93, 0.87, 0.96, and 0.94, respectively, and total reliability as 0.90. Also, its construct validity was confirmed by confirmatory factor analysis.

### *Procedure*

The procedure was to evaluate the content validity of the questionnaires in both source and target languages, using the standard Backward-Forward Translation method as a guide for cross-cultural matching of the questionnaire (26). This procedure involves the following steps: translation, reverse translation, expert review and pilot study. At first, the original text of the questionnaire was translated into English by an English language expert and an educational technology expert and after a discussion between the translators the translations were combined and the final version of translation was prepared. In the second step, the questionnaire was translated back into English by two other (freelance) translators and then to make sure that both English translations are equivalent and have the same semantic load, two other English language experts were asked to match the Back Translation version with the original one. Finally, after discussions among translators, the necessary corrections were made to the Persian version and the final translation was prepared (see Appendix). The effect of each question item was calculated to quantify the formal validity. Initially, a 5-point Likert scale was used for each of the 24 items: Strongly Agree (Score 5), Agree (Score 4), Undecided (Score 3), Disagree (Score 2), Strongly Disagree (Score 1). The questionnaire was then administered to 46

students to determine its validity. After the questionnaires were completed by the target group, the formal validity was calculated using the item impact formulas, i.e. (significance * frequency (in percentage)=impact score). In order to qualitatively evaluate the content validity of the questionnaire, 12 experts in educational sciences, psychology and educational technology were asked to present their corrective views in written form after careful study of the instrument. It was also emphasized that in evaluating the content validity the following factors should be taken into consideration: grammatical accuracy, suitable vocabulary, the importance of the questions and proper placement and completion time. To quantitatively evaluate the validity of the content and to ensure that the most important and correct content (question requirement) is selected, and to make sure that the instrument questions are designed to measure the content, content validity ratio and content validity index were utilized respectively. For this, 12 educational specialists including 5 PhD in educational technology, 3 PhD in educational sciences and 4 PhD in educational psychology were asked to determine the degree of appropriateness of each question to the context of Iranian culture on a scale of: a) essential, b) useful but unnecessary, and c) unnecessary. After obtaining expert opinions, using formulas:

and Lawshe's table, questions with content validity ratios above 0.56 were retained in the questionnaire and the rest were deleted. After calculating content validity ratio, content validity index was calculated based on Waltz and Basel content validity index.

$$CVR = \frac{Ne - N / 2}{N / 2}$$

To this end, the questionnaires were again handed to the experts to calculate the content validity index. They were asked to comment on each of the 24 questions according to three following criterions on a 4-point Likert scale: irrelevant (1), partially relevant (2), related (3), fully related (4): Relevance, simplicity and clarity. Accordingly, the score for the content validity index was calculated based on the following formula: total score for each question that scores 3 and 4 (highest score) divided by the total number of voters. Questions with content validity index higher than 0.79 are accepted.

To investigate the construct validity of the questionnaire, exploratory factor analysis was performed to determine the number of factors using Varimax rotation. Finally, 6 factors were identified and then confirmatory factor analysis was performed to check the fit of the questionnaire with 6 factors.

To assess the reliability of the questionnaire, the test-retest and intraclass correlation coefficient were used; the validated version of the questionnaire was given to 52 students and then they were asked one week later to fill the questionnaire again. Cronbach's alpha method was also used to examine the internal consistency of the questionnaire. Data were analyzed using spss21 and Lisrel 8.80 software.

## Results

The M ranged from 2.68 for Question 24 to 4.12 for Question 8, and SD from 0.76 for Question 7 to 1.13 for Question 21. Also The M and SD were respectively 3.84 and 0.92 for goal setting, 3.18 and 1.11 for environment structuring, 3.32 and 1.09 for task strategies, 3.27 and 1.05 for time management, 3.03 and 1.18 for help seeking, and 3.21 and 1.06 self-evaluation.

**Formal Validity**: The results of the item impact method indicated that all questions had a score greater than or equal to 1.5. Therefore, they were included in the questionnaire and the instrument's formal validity was confirmed.

**Content Validity**: The results of content validity ratio indicated that all questions were equal to or greater than the Lawshe's table index (0.56) within a range of 1- 0.77. Accordingly, all items were accepted and none were deleted. Content validity index results indicated that all the questions except 5, 15 and 17 (after adjusting CVI reached to 0.79) had higher scores than 0.79. Also the

final number of content validity index was 0.85 and thus the content validity of the scale is confirmed.

**Construct Validity**: To increase reliability and reduce the risk of error, exploratory and confirmatory factor analysis was performed on two separate samples. Thus 418 samples were divided into two parts. For exploratory factor analysis, the factor analysis capability was first investigated through Kaiser-Meyer-Olkin and Sphericity Bartlett indexes. The Kaiser-Meyer-Olkin index value (0.921) indicated the adequacy of the data for factor analysis and the Bartlett Sphericity Index (2924. 878, P<0.001) also showed that the data correlation matrix is not zero and therefore the factorization is justified. Varimax orthogonal method was used to determine the factors. To determine whether online self-regulated learning scale is saturated with several factors, Eigenvalue (equal to one), explained variance and the scree plot were examined. Table 1 and Figure 1 show the E values of the principal components analysis and the scree plot, respectively. According to Figure (1), the number of factors for the questionnaire is confirmed because the diagram falls on factor 6 and therefore 6 factors were extracted. The factor loadings obtained for the 24 items confirm the validity of the factors. These 6 factors account for 56.778% of the total variance. 18.889% of the total variance is related to the number one factor namely Environment structuring.

In Table 2, factor loadings of the 24 items are visible after rotating on factors. Accordingly, items 4, 3, 2, 1 on factor 1 (Environment structuring), items 5, 6, 7, 8, 9 on factor 2 (Goal setting), items 10, 11, 12, 13 on factor 3 (Task strategies), items 14, 15, 16 on factor 4 (time management), items 17, 18, 19, 20 on factor 5 (Help seeking) and items 21, 22, 23, 24 on factor 6 (Self-evaluation) have been loaded. Also alpha value was not higher than 0.94, and accordingly no questions were removed.

**Table 1:** Statistical indexes of 6 online self-regulated learning questionnaire factors after a Varimax rotation by principal component analysis

| Indexes / Factors | Eigenvalue | Percentages of explained variance | Cumulative Percentages of variance |
|---|---|---|---|
| 1 | 4.534 | 18.891 | 18.891 |
| 2 | 2.706 | 11.274 | 30.165 |
| 3 | 2.197 | 9.152 | 39.318 |
| 4 | 1.662 | 6.923 | 46.241 |
| 5 | 1.416 | 5.899 | 52.140 |
| 6 | 1.115 | 4.645 | 56.785 |

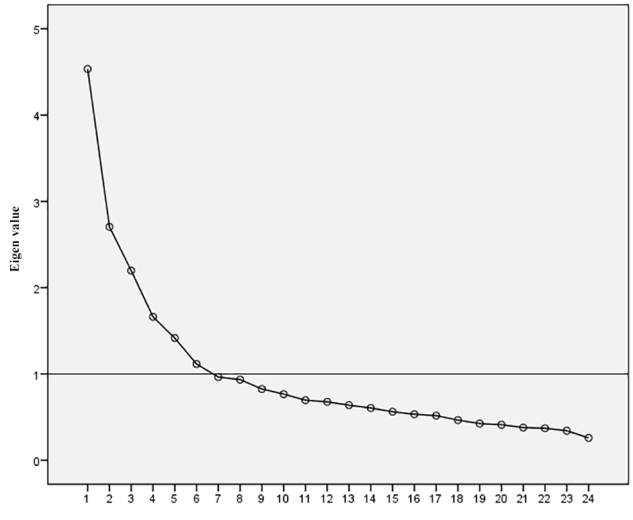


**Figure 1:** The scree plot

**Table 2:** Factor loads on subscales

| Items / Subscales | Environment structuring | Goal setting | Task strategies | Time management | Help seeking | Self evaluation | Cronbach"s alpha if item deleted |
|---|---|---|---|---|---|---|---|
| 1. I choose the location where I study to avoid too much distraction. | 0.771 | | | | | | 0.947 |
| 2. I find a comfortable place to study. | 0.721 | | | | | | 0.944 |
| 3. I know where I can study most efficiently for online courses. | 0.692 | | | | | | 0.946 |
| 4. I choose a time with few distractions for studying for my online courses. | 0.638 | | | | | | 0.948 |
| 5. I set standards for my assignments in online courses. | | 0.542 | | | | | 0.949 |
| 6. I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the semester). | | 0.668 | | | | | 0.947 |
| 7. I keep a high standard for my learning in my online courses. | | 0.692 | | | | | 0.946 |
| 8. I set goals to help me manage studying time for my online courses. | | 0.731 | | | | | 0.945 |
| 9. I don't compromise the quality of my work because it is online. | | 0.649 | | | | | 0.947 |
| 10. I try to take more thorough notes for my online courses because notes are even more important for learning online than in a regular classroom. | | | 0.527 | | | | 0.949 |
| 11. I read aloud instructional materials posted online to fight against distractions. | | | 0.551 | | | | 0.948 |
| 12. I prepare my questions before joining in the chat room and discussion. | | | 0.584 | | | | 0.946 |
| 13. I work extra problems in my online courses in addition to the assigned ones to master the course content. | | | 0.492 | | | | 0.947 |
| 14. I allocate extra studying time for my online courses because I know it is time-demanding | | | | 0.531 | | | 0.949 |
| 15. I try to schedule the same time every day or every week to study for my online courses, and I observe the schedule. | | | | 0.631 | | | 0.948 |
| 16. Although we don't have to attend daily classes, I still try to distribute my studying time evenly across days. | | | | 0.547 | | | 0.947 |

| | | | |
|---|---|---|---|
| 17. I find someone who is knowledgeable in course content so that I can consult with him or her when I need help. | 0.732 | | 0.949 |
| 18. I share my problems with my classmates online so we know what we are struggling with and how to solve our problems. | 0.711 | | 0.948 |
| 19. If needed, I try to meet my classmates face-to-face. | 0.682 | | 0.945 |
| 20. I am persistent in getting help from the instructor through e-mail. | 0.622 | | 0.946 |
| 21. I summarize my learning in online courses to examine my understanding of what I have learned. | | 0.514 | 0.948 |
| 22. I ask myself a lot of questions about the course material when studying for an online course. | | 0.679 | 0.947 |
| 23. I communicate with my classmates to find out how I am doing in my online classes. | | 0.642 | 0.945 |
| 24. I communicate with my classmates to find out what I am learning that is different from what they are learning. | | 0.612 | 0.946 |

In order to confirm the questionnaire's factors structure, after deleting outliers (24, 28, 33, 39, 128, 201, 221) through univariate (box plot) and multivariate (Mahalanobis index), confirmatory factor analysis model was used using LISREL. The basic assumption of the researcher is that each factor is related to a particular subset of variables and the researcher has a certain assumption about the number of model factors before doing the research. The results are reported in Table 3. It is noteworthy that the assumptions required to perform confirmatory factor analysis were examined and the results indicate that these assumptions are respected.

Table 3 shows that the research model is a valid model. The RMSEA value is 0.064. Therefore, this value is less than 0.09 indicating that the root mean square error of approximation is satisfactory and the model is acceptable. Also, the ratio of $\Sigma^2$ to the degree of freedom is less than 3 and the values of GFI, CFI and NFI are 0.9 and RMR is less than 0.09, indicating that the data are well-fitted.

According to Figure 2, the parameters for measuring the subscales are appropriately identified. All path coefficients of the six-factor pattern were statistically meaningful ($P<0.01$).

### *Reliability*

To test the stability of the structures, the test-retest method was used. The results of calculating the reliability coefficient in Table 4 show that the Pearson correlation coefficient as well as the ICC for all subscales are greater than 0.6, indicating high level of agreement. Also paired t-test ($P>0.05$) indicating mean score of subscales was not meaningful at each round of measurement. Also the values obtained from Cronbach's alpha indicate that each of subscales has a good internal consistency, so its reliability is accepted.

## Discussion

Given the studies indicating the essential role of self-regulated learning as predictor

**Table 3:** The Fit indexes of online self-regulated learning questionnaire

| Fit indexes | Value | Acceptable range | Result |
|---|---|---|---|
| χ2/df | 1.930 | 3< | Approved |
| RMR | 0.087 | <0.09 | Approved |
| GFI | 0.94 | <0.9 | Approved |
| NFI | 0.92 | >0.9 | Approved |
| CFI | 0.94 | >0.9 | Approved |
| RMSEA | 0.064 | <0.09 | Approved |

**Table 4:** Evaluating stability and internal consistency of online self-regulated learning questionnaire subscales

| Subscales | The number of items | Pearson correlation coefficient | Intraclass correlation coefficient | (P Value) paired t-test | Cronbach's alpha coefficients |
|---|---|---|---|---|---|
| Goal setting | 5 | 0.78 | 0.76 | 0.35 | 0.93 |
| Environment structuring | 4 | 0.83 | 0.82 | 0.41 | 0.91 |
| Task strategies | 3 | 0.76 | 0.77 | 0.37 | 0.84 |
| Time Management | 4 | 0.80 | 0.79 | 0.40 | 0.88 |
| Help seeking | 4 | 0.81 | 0.79 | 0.39 | 0.90 |
| Self-evaluation | 4 | 0.80 | 0.78 | 0.38 | 0.92 |
| Total scale | 24 | 0.78 | 0.77 | 0.33 | 0.94 |

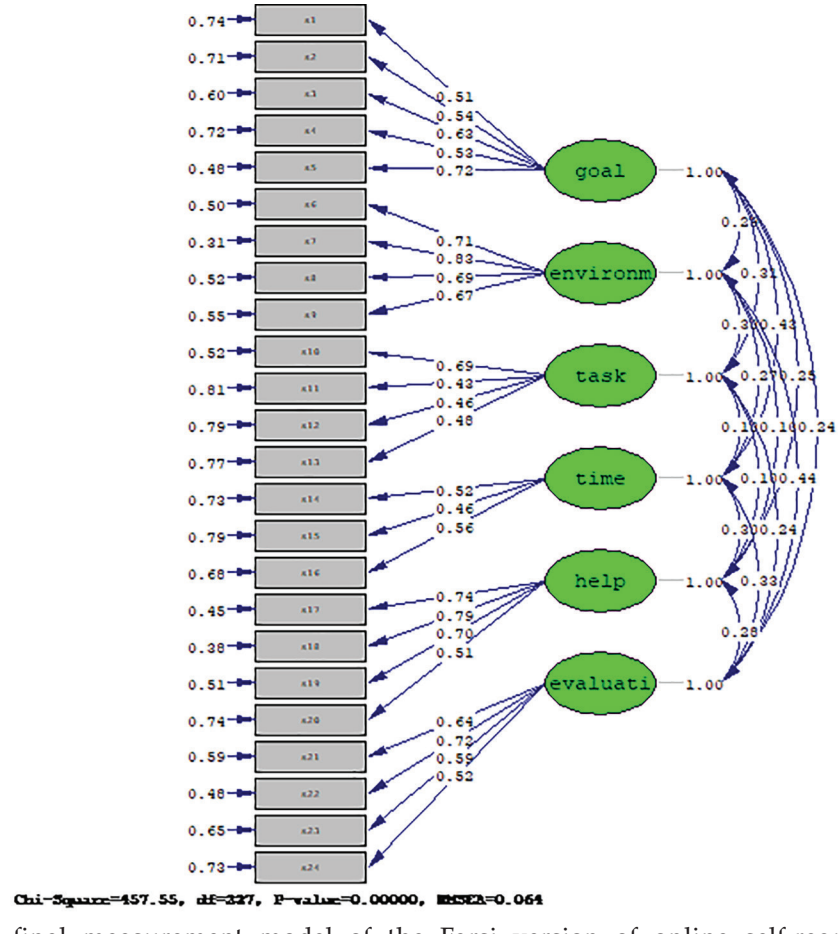


**Figure 2:** The final measurement model of the Farsi version of online self-regulated learning questionnaire and fully standardized estimates

of academic performance and satisfaction in online learning environments (21–25) and since no research-approved Persian instrument was found for measuring Self-Regulated Learning in online learning environments, this study was aimed to validate Persian version of the OSLQ.

This scale was selected because it has been widely used in various contexts and many studies have emphasized its high performance as a valid instrument for measuring self-regulated learning in online learning environments.

Conducting an exploratory factor analysis, 6 factors were identified that predict 56.78% of the total variance. These findings are consistent with the results of Barnard et al. (15) on the six-factor scale. Also, confirmatory factor analysis results confirmed the model, in consistence with the findings from previous studies (17–20). ($\chi 2/df=1.930 <3$, CFI=0.94, RMR=0.08, NFI=0.92, GFI=0.94 & RMSEA=0.064). In addition, reliability coefficients for the whole questionnaire and the six subscales ranged from 0.86 to 0.94, signifying adequate internal consistency. The test-retest method to investigate the stability of structures showed that Pearson correlation coefficient as well as ICC was higher than 0.6 for all subscales, indicating high level of agreement. In summary, based on data gathered from Iranian students, scores from the Persian translation of the OLSQ were found to be valid and reliable. The instrument appears to be appropriate for assessing self-regulated online learning among Iranian students for research or intervention purposes.

## Limitations

There are some limitations in this study. First, this study has been done on postgraduate students in Tehran. Then, caution should be considered in case of generalization. Second, since the responses were based on self-reporting, as Winne and Jamison-Noel (16) point out, it is more likely that learners overestimate their abilities (their self-regulation skills). Finally, because the original English language version of the questionnaire was developed a few years ago, some items regarding technology might need to be updated; for example, increased use of mobile technology for online learning might need to be taken into consideration in future versions.

## Authors' Contribution

A.T designed the study, supervised data collection and analysis, participated in the coordination of the study, and critically revised the manuscript. E.A and R.M also contributed in all the mentioned steps.

## Ethical Considerations

This research was conducted under the supervision of Tarbiat Modarres University in Tehran, Iran. No ethical issues were found. Participants have attended in this study willingly and data was presented anonymously. Participants were assured that their information will remain confidential.

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## Conflict of interests

The author declares that they have no conflict of interests.

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## Appendix

| ردیف | عبارات | کاملا موافقم | موافقم | نظری ندارم | مخالفم | کاملا مخالفم |
|---|---|---|---|---|---|---|
| ۱ | من مکانی را برای حضور در کلاس آنلاین انتخاب می کنم که حواس پرتی ام به حداقل برسد. | | | | | |
| ۲ | مکان راحتی را برای درس خواندن پیدا می کنم. | | | | | |
| ۳ | می دانم کجا می توانم به طور اثربخش تری برای مطالب درسی دوره آنلاین مطالعه کنم. | | | | | |
| ۴ | من زمان هایی را برای مطالعه مطالب درسی دوره آنلاین انتخاب می کنم که حواس پرتی ام به حداقل برسد. | | | | | |
| ۵ | من استانداردهایی را برای انجام تکالیفم در دوره های آنلاین تعیین می کنم. | | | | | |
| ۶ | من اهداف کوتاه مدت (روزانه یا هفتگی) و همچنین بلند مدتی (ماهانه یا ترمی) را طی دوره آنلاین تعیین می کنم. | | | | | |
| ۷ | من به استاندارد سطح بالایی برای یادگیری در دوره های آنلاین پای بندم. | | | | | |
| ۸ | طبق برنامه ریزی قبلی، زمان مطالعه مطالب درسی دوره آنلاین را مدیریت می کنم. | | | | | |
| ۹ | من کیفیت کارم را به خاطر اینکه دوره بصورت آنلاین است ، زیر سوال نمی برم. | | | | | |
| ۱۰ | من سعی میکنم یادداشتهای مفصل تری را طی حضور در دوره های آنلاین بردارم، زیرا یادداشت برداری برای یادگیری آنلاین بسیار مهمتر از کلاسهای حضوری است. | | | | | |
| ۱۱ | برای حفظ تمرکزم، مطالب درسی ارائه شده به صورت آنلاین را با صدای بلند میخواندم. | | | | | |
| ۱۲ | من سوالاتم را قبل از ورود به اتاق چت و گفتگو آماده می کنم. | | | | | |
| ۱۳ | در طی دوره آنلاین ، بمنظور تسلط بر محتوا، مسائل اضافه تری را علاوه بر مسائل تعیین شده، حل میکنم. | | | | | |
| ۱۴ | زمان مطالعه بیشتری را برای مطالب درسی دوره های آنلاین اختصاص میدهم، زیرا می دانم که وقت گیر تر است. | | | | | |
| ۱۵ | من سعی می کنم روزانه یا هفتگی در یک زمان مشخص مطالعه کرده و به برنامه ام پایبند باشم. | | | | | |
| ۱۶ | اگرچه هر روز در کلاس حضور نداریم، اما سعی می کنم روزانه به یک اندازه مطالعه کنم. | | | | | |
| ۱۷ | در صورت نیاز جهت مشورت، به فردی مطلع به محتوای درسی، مراجعه می کنم. | | | | | |
| ۱۸ | من مشکلات خود را با همکلاسی هایم مطرح می کنم، بطوری که ما می دانیم با چه مشکلاتی مواجه هستیم و چگونه آنها را حل کنیم. | | | | | |
| ۱۹ | من سعی می کنم در صورت لزوم، با همکلاسی هایم به طور رو در رو ملاقات کنم. | | | | | |
| ۲۰ | در صورت لزوم، از طریق ارسال ایمیل، از مدرس کمک می گیرم. | | | | | |
| ۲۱ | برای ارزیابی فهم خود، مطالب آموخته شده را برای خودم خلاصه میکنم. | | | | | |
| ۲۲ | هنگام حضور در دوره آنلاین، سوالات زیادی را از خود در مورد مطالب درسی ارائه شده، می پرسم. | | | | | |
| ۲۳ | نظر همکلاسی هایم را در خصوص نحوه عملکردم در دوره های آنلاین، جویا می شوم. | | | | | |
| ۲۴ | از طریق ارتباط با همکلاسی هایم بررسی می کنم که آیا بین آنچه دارم یاد می گیرم با آنچه آنها در حال یادگیری هستند، تفاوت وجود دارد. | | | | | |

Interdisciplinary Journal of Virtual Learning in Medical Sciences

Original Article

# Quality Assessment of Persian Educational Websites for Pregnant Mothers: A Descriptive Study

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## ABSTRACT

**Background:** Raising awareness among pregnant mothers and their participation in self-care can reduce the complications and risks of pregnancy. One of the ways to acquire information for pregnant women is through the Internet and websites**.** The purpose of this study was to determine the quality of Persian educational websites for pregnant mothers.

**Methods:** This was a descriptive survey study. The study population consisted of Persian educational websites for pregnant mothers. Sampling method was Available websites. The first 5 pages of two common search Engines, Google & yahoo, were searched using the keywords "pregnancy" & "education website". A total of 20 out of 86 websites matched the criteria and were included in the study. The data collection tool was the standard Checklist WebMedQual assessment tool created by Provost in 2006. The validity and reliability of this tool was verified in its original version and then in the localized version based on the frameworks of the template websites in previous studies. The websites were directly observed and evaluated by 9 trained experts in January 2017. The agreement coefficient between the two checklists was completed in groups based on Kappa 0.78 coefficient. The websites were evaluated based on information content indexes, resource validity, design, availability, usability, links, user support and information confidentiality, with the scores ranging from 0 to 85, and the ideal score was considered 60. SPSS 16 was used for data analysis and using one-sample t-test the results were presented as mean score and optimal score.

**Results:** The findings showed a significant difference between the average availability and utilization index of the websites under study (P<0.001), and the mean score (6.2±0.61) was higher than the average score (4.5). Persian websites were less favored in the criteria of content, validity, design, links and support, and their ratings were lower than the average rating of the study. Also, none of the reviewed websites received the total score.

**Conclusion:** Persian websites for pregnancy education are not high in quality. Therefore, pregnant mothers need to seek guidance from specialist doctors and midwives. Website administrators are also advised to consider website evaluation criteria and improve their websites.

**Keywords:** Pregnancy education, Website, WebMedQual Scale

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## Introduction

People around the world are using the Internet to obtain their required information. As a result, acquiring medical and health information on this global network is on the rise. Gaining access to up-to-date information in the shortest possible time is considered the most prominent feature of the cyberspace. The Internet has been able to change the of information seeking behavior of users and their attitudes towards information needs, especially in the healthcare field (1).

Websites are the most accessible sources of information, and today, the availability of mobile and internet enables people to surf the Web in search of vast amounts of data in different areas. The ease of access to websites allows the users to obtain their required information. Of all the information available on websites, health related information is very critical. One of the health areas in which many people are looking for information is pregnancy field (2).

In recent years, the Internet has become a very popular health information source for pregnant women(3, 4). There is evidence that pregnant women may be seeking information in specific cases during pregnancy and in response to specific situations (5). Pregnant mothers' awareness and participation in self-care can reduce complications and risks during pregnancy, reduce maternal and newborn mortality, and ultimately improve maternal and neonatal health. As a result, many pregnant women use the Internet as a source of information and tools to help them clear their doubts and guide pregnancy decisions (4, 5). Seeking health-related information before meeting with health professionals is commonplace after consultation (6).

Pregnant women on the Internet search various topics related to pregnancy including childbirth, fetal development, and nutrition during pregnancy. Prime-Gravid pregnant women, employees and educated women are more likely to search online for pregnancy information. Most women find content on the Internet useful and reliable, and few pregnant mothers discuss the information they receive with health professionals (7). Pregnant mothers' awareness and participation in self-care can reduce complications and risks during pregnancy, reduce maternal and newborn mortality, and ultimately improve maternal and neonatal health (8).

A high percentage of pregnant women search for pregnancy information on the Internet (3, 9). A systematic review and meta-analysis in 2014 studied the use of the terms pregnancy and Internet over a ten-year period (in English) and found that most women do not discuss information provided on the Internet with health care providers. Therefore, health providers may not be aware of potentially incorrect information or misconceptions about pregnancy reported on the Internet (10). Although Internet search is widely used, one problem with this media is its inability to judge the quality and accuracy of information obtained, and many people searching online for health advice or information, may believe what they find (11). Careful review of the website contents requires standards and reliable methods of evaluation. Given the importance of evaluating the quality of online learning for patients, several studies have been conducted to assess the quality of health-related websites with different tools and models (12-14).

In recent years, many studies have been conducted on the evaluation of different websites based on different indicators and different approaches. Studies towards the use of quality measures with greater ease of use are warranted. One of the major weaknesses of existing tools and indicators for assessing the quality of health websites is the incompatibility of effective elements for quality assessment or the incompetence of a particular group of people, such as physicians and medical professionals. One of the tools for the quality assessment of websites is the WebMedQual health scale (15). This scale is suitable for various user groups, including specialized Internet users, web designers, patients, webmasters and experts. Since no research has so far been carried out to evaluate the Persian websites

for the education of pregnant women, this study aimed to evaluate these websites using WebMedQual tool in order to be referenced & help pregnant women retrieve information in these media. Furthermore it helps web designers and website administrators to update websites with useful, credible, and effective information, and instill confidence in users.

## Methods

The present study was a descriptive survey. The study population was 86 Persian-language websites in the area of pregnancy education. The sampling method was Available. Websites that were specialized in providing educational materials related to pregnancy were considered. It was a direct observation study. Keywords were entered into search engines and all the relevant websites in the first five pages were included for assessment. 20 websites were registered based on the following inclusion criteria: health education websites, academic websites, official websites of midwifery consultants and gynecologists, Persian language education and advertising sites that cover educational topics related to pregnancy and pregnancy websites with [.com], and [.ir] domain names.

Exclusion criteria included: blogs, Wikipedia, websites that were inactive for more than 6 months, and websites with no educational content. The process of identifying websites according to the research criteria is shown in Figure 1.

Using NCSS Software (PASS) a total of 64 samples were selected. The study was conducted in January 2017, and the Google& Yahoo search engines were used to search for the keywords "pregnancy", "delivery" and "educational website" in their first 5 pages. According to the primary keyword evaluation,

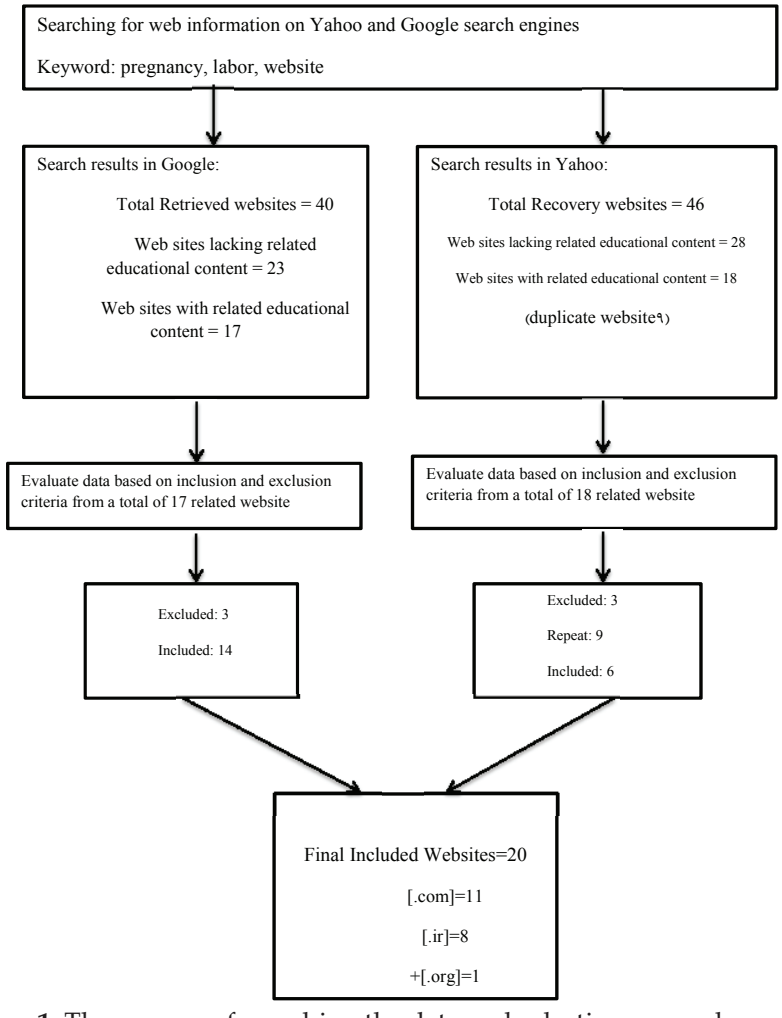


**Figure 1:** The process of searching the data and selecting research samples

**Table 1:** List of Pregnancy Educational Websites evaluated using WebMedQual scale

| Type | Search engine | Adress | Title | ROW |
|---|---|---|---|---|
| Non-governmental | Google | https://madarsho.com | Pregnancy and Childbirth Guide | 1 |
| Individual | Google | www.iranbirth.com | Maternal Health Center | 2 |
| Individual | Google | https://www.ninisite.com | Pregnancy and Childhood Guidelines | 3 |
| Non-governmental | Google | www.himama.ir | Pregnancy Guide Training Children | 4 |
| Non-governmental | Google | www.ninikadeh.ir | Pregnancy and Childbirth Guide | 5 |
| Individual | Google | drshirinheshmat.com | Dr. Shirin Heshmat's site | 6 |
| Non-governmental | Google | barooneh.com | Maternity and Pregnancy | 7 |
| Non-governmental | Google | www.araameshcenter.com | Midwifery Counseling Center | 8 |
| Non-governmental | Google | www.atiehhospital.ir | Atieh Hospital | 9 |
| Non-governmental | Google | https://mamasite.ir | Midwifery Call Center Mother | 10 |
| Non-governmental | Google | niniban.com | pregnancy and child help | 11 |
| Individual | Google | mom.ir | fertility center and infertility treatment | 12 |
| Non-governmental | Google | https://ninitime.com | NINI time site | 13 |
| Non-governmental | Google | www.ooma.org | Encyclopedia of Women's Health | 14 |
| Non-governmental | Yahoo | onlinesalamat.com | Maternity and Midwifery Women | 15 |
| Individual | Yahoo | www.drs-azari.ir | Dr. Sedigheh Azari – Gynecologist | 16 |
| Individual | Yahoo | www.rezaeemed.com | Dr Fariba Rezaei 's Gynecologist | 17 |
| Non-governmental | Yahoo | www.pezeshkonline.ir | Online Physician Network | 18 |
| Non-governmental | Yahoo | www.naigo.ir | Iranian Association of Gynecologists and Midwives | 19 |
| Non-governmental | Yahoo | www.nabzema.com | nabzema | 20 |

most of the related Persian websites were found. The content of the websites in the 6th & 7th pages of both search engines were irrelevant or repetitive, and in view of data saturation and duplicate content, the search was stopped. Therefore, duplicate sites that did not meet the entry criteria were removed and ultimately 20 websites were reviewed (Table 1).

A total of 86 websites (with sample crash counts) were identified, 40 of which were listed in Google search engine and 46 in Yahoo search engine retrieval and matching (Table 2).

The data collection tool was localized version of the standard WebMedQual scale (12). The checklist questions were based on a two point scale (Yes/No). The scale has 8 components including: The data content with 4 components (including quality, accuracy, domain and depth of information) And 19 questions with a maximum of 19 points, credit resources with two components (solicits and authorities) and 17 questions with a maximum

**Table 2:** List of websites found using pregnancy keywords

| Non Related | Related | Engine Search | Site address | Row | Non Re-lated | Re-lated | Engine Search | Site address | Row |
|---|---|---|---|---|---|---|---|---|---|
| | | Yahoo | onlinesalamat.com | 44 | | | Google | https://madarsho.com | 1 |
| | | Yahoo | www.drem-dadi.com | 45 | Adver | | Google | sitezanan.com | 2 |
| Repet | | Yahoo | www.ara-ameshcenter.com | 46 | | | Google | www.iran-birth.com | 3 |
| | | Yahoo | www.drs-azari.ir | 47 | | | Google | https://www.ninisite.com | 4 |
| | | Yahoo | www.rezaeemed.com | 48 | | | Google | onliner.ir | 5 |
| | | Yahoo | drshahnaza-mini.com | 49 | | | Google | www.nikan-hospital.com | 6 |
| Repet | | Yahoo | www.ara-ameshcenter.com | 50 | | | Google | treata.com | 7 |
| | Repet | Yahoo | www.nikan-hospital | 51 | | | Google | www.hi-mama.ir | 8 |
| | | Yahoo | baby.3eke.ir | 52 | | | Google | https://www.webyad.com | 9 |
| | | Yahoo | rmci.blogfa.com | 53 | | | Google | www.ninika-deh.ir | 10 |
| | | Yahoo | bita110.mihan-blog.com | 54 | | | Google | bardary.blogfa.com | 11 |
| | | Yahoo | www.pezesh-konline.ir | 55 | | | Google | www.khatamhos-pital.org/ | 12 |
| | | Yahoo | www.parse-gard.com | 56 | | | Google | drshirinhesh-mat.com | 13 |
| | | Yahoo | www.naigo.ir | 87 | | | Google | bahonar.ab-zums.ac.ir | 14 |
| | | Yahoo | azitasaffarza-deh.com | 58 | | | Google | www.bmi-hospital.com | 15 |
| | | Yahoo | doctorzanan.blogfa.com | 59 | | | Google | https://www.aparat.com | 16 |
| | | Yahoo | doctorzanan.blogfa.com | 60 | | | Google | http://royan-mama.com | 17 |
| | | Yahoo | magifa.com | 61 | | | Google | zmhospital.ir/ | 18 |
| | | Yahoo | taheripanah.com | 62 | | | Google | health.beh-dasht.gov.ir | 19 |
| | | Yahoo | doctorsaberi.ir | 63 | | | Google | barooneh.com | 20 |
| | | Yahoo | www.bebinak.com | 64 | | | Google | www.ara-ameshcenter.com | 21 |
| | | Yahoo | www.drebra-himy.com | 65 | | | Google | www.atiehhospital.ir | 22 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Rep | Yahoo | www.bebinak.com | 66 | | Google | hoskosar.qums.ac.ir/ | 23 |
| | Rep | Yahoo | baby.3eke.ir | 67 | | Google | askariehospital.com | 24 |
| | | Yahoo | www.royan-mama.com | 68 | | Google | www.migesplus.com | 25 |
| | Rep | Yahoo | www.atiehhospital.ir | 69 | | Google | bomi.mui.ac.ir | 26 |
| Rep | | Yahoo | www.ninisite.com | 70 | | Google | www.pars-naz.com | 27 |
| | | Yahoo | med.mui.ac.ir | 71 | | Google | https://mama-site.ir | 28 |
| | | Yahoo | www.beytoote.com | 72 | | Google | www.kowsarhospital.com | 29 |
| | Rep | Yahoo | taheripanah.com | 73 | | Google | bent-hospital.com | 30 |
| | | Yahoo | iranianacademy.com | 74 | | Google | niniban.com | 31 |
| | Rep | Yahoo | www.nikan-hospital.com | 75 | | Google | www.tamin.ir | 32 |
| Rep | | Yahoo | iraniannurse.com | 76 | | Google | www.madari.ir | 33 |
| | | Yahoo | www.royaninstitute.org | 77 | | Google | mom.ir | 34 |
| | | Yahoo | www.tanzime-khanevadeh.com | 78 | | Google | www.iranair.com | 35 |
| | | Yahoo | www.sinahosp.ir | 79 | | Google | barnamerizi.net | 36 |
| | | Yahoo | www.payam-sara.com | 80 | | Google | darman.yums.ac.ir | 37 |
| | | Yahoo | perinatalrc.sums.ac.ir | 81 | | Google | iraniannurse.com | 38 |
| | | Yahoo | www.iau-mahabad.ac.ir | 82 | | Google | jech.umsha.ac.ir | 39 |
| | | Yahoo | javanrood.kums.ac.ir | 83 | | Google | https://ninitime.com | 40 |
| | | Yahoo | www.madar-hospital.com | 84 | | Yahoo | drjahromizadeh.com | 41 |
| | | Yahoo | khc.kums.ac.ir | 85 | Rep | Yahoo | www.ninikadeh.ir | 42 |
| | | Yahoo | qommidwifery.com | 86 | | Yahoo | bestparsian.ir | 43 |

of 17 points, design (high-resolution features of the page, website appearance and ease of use) one component and 19 questions including 19 points, Availability and usability (regular and continuous availability of content and ease of operation) with one component and 9 questions with a maximum of 9 points, links (quality of internal and external links to obtain more information for users) with one component and 4 questions with a maximum of 4 points, User support (technical support for the site and support for users i.e. answering the questions, providing services and links to products) with 2 components and 11 questions with maximum of 11 points, confidentiality (security and information related to user identity) with one component and 6 questions with maximum of 6 points.

The validity and reliability of this tool was verified for its original version and then for the localized version, based on the frameworks of the template websites in previous studies. The validity and reliability of this tool was confirmed by Quadrant-Richardson method (0.89) applied in previous studies (12). For each of the applications considered, the number of sites is localized and varied according to the location of the websites in previous studies. The total number of questions on the scale according to the localized version for the present study was 85 and the maximum score for the websites was 85. In this study e-commerce questions were removed from the original version due to the nature of most health education sites and previous studies. Also, the checklist rating scale is dichotomous (yes or no). The criteria in this study were evaluated in 7 domains: content, credibility, design, accessibility and availability, user interface, and confidentiality. Then, 2 checklists were prepared to perform a careful evaluation of the websites and determine their ratings. Each checklist was assigned to a team of midwifery, librarians and computer experts, and each team conducted a review on a site-by-site basis. The agreement coefficient between the two checklists was completed by groups based on Kappa 0.78 coefficient. Upon completing two checklists and calculating the total score of a website, the average score of the two checklists was used for analysis. Statistical analysis was performed using SPSS 16 software and the data were analyzed by one-sample t-test. Website owners' consent was obtained by email & the results will be kept confidential upon the owners' request.

## Results

In this study, 20 websites in the field of pregnancy education were evaluated. The results of the comparison of the research variables in the reviewed websites are shown in Table 3. As can be seen in the table, there was a significant difference between the mean score of the information content index of Persian pregnancy websites based on Qualitative Web Models Score. The mean score of website content (7.35) was significantly lower than average. The expected p-value was 0.019, and therefore the reviewed websites were weak and less than average in terms of content. Also, the mean score of the validity index of Persian websites for pregnancy education was lower than average (8.5), but not statistically significant (P=0.07). The mean score of website design index (9.95) was higher than average (9.5) but not statistically significant (P=0.604).

In addition, the results showed a significant difference between the average availability and utilization index of the websites under study (P<0.001), and the mean score (6.2) was higher than the average score (4.5). Accordingly, the availability index of the websites reviewed was desirable. The average index of links on the sites under review by WebMedQual Scale (2.1) was slightly higher than the average score (2) but did not show a significant level (P=0.629). The results showed that there was a significant difference between the scores of this index based on the average score (P<0.001). The findings

**Table 3:** Total Score and Intermediate T-Test Quality Indicators for Pregnancy Education Websites Based on WebMedQual Scale

| Significance level | Degrees of freedom | Value t | Average obtained in the study | Average points earned | Perfect score | Index name |
|---|---|---|---|---|---|---|
| 0.019 | 19 | 2.558 | 7.35 | 9.5 | 19 | Content |
| 0.071 | 19 | 1.916 | 7.25 | 8.5 | 17 | Credibility |
| 0.604 | 19 | 0.527 | 9.95 | 9.5 | 19 | Designing |
| <0.001 | 19 | 12.35 | 6.2 | 4.5 | 9 | Access ability |
| 0.629 | 19 | 0.49 | 2.1 | 2 | 4 | Links |
| <0.001 | 19 | 8.189 | 2.5 | 5.5 | 11 | Support |
| <0.001 | 19 | 11.105 | 0.95 | 3 | 6 | Confidentiality |

**Table 4:** Rankings of Pregnancy Educational Websites on the WebMedQual Scale

| Total score (58) | Confidentiality(6) | Support (11) | Links (4) | Access ability(9) | Designing(91) | Credibility(71) | Content (91) | Criteria/ row |
|---|---|---|---|---|---|---|---|---|
| madarsho(45) | ninisite(4) | dr heshmat(5) | niago(4) | iranbirth (7) | madarsho (71) | Mom(31) | oma(61) | 1 |
| oma(35) | himama* (1) | ninisite(5) | madarsho(3) | baroone (7) | Mom (51) | oma(21) | madarsho(41) | 2 |
| mamasite (94) | ninikade (1) | madarsho (4) | iranbirth (3) | Mom (7) | mamasite (41) | niniban (11) | Mom (31) | 3 |
| mom(74) | dr heshmat(1) | iranbirth (4) | dr heshmat(3) | onlinesalamat (7) | ninisite (31) | madarsho (01) | mamasite(11) | 4 |
| ninisite (64) | baroone (1) | atie(4) | baroone (3) | dr azari(7) | dr heshmat(31) | onlinesalamat (9) | niniban (11) | 5 |
| dr heshmat(24) | aramesh (1) | mamasite (4) | atie(3) | pezeshkonline(7) | oma(21) | pezeshkonline(9) | ninisite (9) | 6 |
| atie(04) | atie(1) | oma(4) | pezeshkonline (3) | oma(6) | himama (21) | ninisite (8) | dr heshmat(7) | 7 |
| niniban (73) | mamasite (1) | mom(3) | oma(2) | aramesh (6) | atie (21) | atie (8) | nabzema (7) | 8 |
| iranbirth (63) | niniban(1) | onlinesalamat(3) | mom(2) | atie(6) | dr azari (21) | dr heshmat (7) | baroone (6) | 9 |
| dr azari (63) | oma(1) | pezeshkonline(3) | aramesh (2) | ninisite(6) | ninitime (11) | aramesh (7) | aramesh (6) | 01 |
| onlinesalamat (53) | ninitime (1) | himama (2) | niniban (2) | himama* (6) | iranbirth (11) | dr azari(7) | atie (6) | 11 |
| pezeshkonline (33) | onlinesalamat(1) | niniban(2) | onlinesalamat (2) | ninikade (6) | baroone (8) | dr rezaee (7) | himama (6) | 21 |
| nabzema (23) | dr azari(1) | ninitime (2) | dr azari (2) | dr heshmat(6) | aramesh (8) | nabzema (7) | ninitime (6) | 31 |
| ***mom* (13) | pezeshkonline(1) | niago(2) | nabzema (2) | nabzema (6) | nabzema (8) | mom (7) | dr azari (6) | 41 |
| aramesh (13) | nabzema (1) | dr azari(1) | ninisite (1) | niago(6) | onlinesalamat (8) | iranbirth (6) | onlinesalamat (5) | 51 |
| ninitime (13) | iranbirth (1) | nabzema (1) | himama* (1) | ninitime (6) | dr rezaee (7) | ninitime (4) | pezeshkonline (4) | 61 |
| baroone (82) | mom(0) | aramesh (1) | ninikade (1) | niniban(6) | pezeshkonline (6) | niago (4) | niago(4) | 71 |
| dr rezaee (32) | niago(0) | dr rezaee (0) | mamasite(1) | madarsho (6) | ninikade (5) | himama* (3) | iranbirth (4) | 81 |
| niago(32) | dr rezaee (0) | ninikade (0) | ninitime (1) | mom(5) | niniban (4) | ninikade (3) | ninikade (3) | 91 |
| ninikade (91) | madarsho (0) | baroone (0) | dr rezaee (1) | dr rezaee (5) | niago (3) | baroone (3) | dr rezaee (3) | 02 |

also indicate that there is a significant difference between the average privacy index of Persian pregnancy websites based on WebMedQual Scale (0.95) and the average score was found to be 3 (P<0.001). Of the six indicators of information content, resource validity, accessibility, links, user support, and confidentiality, the only indicators with an adequate score was "accessibility". The results also indicated that, based on the website rankings according to the WebMedQual Scale (Table 4), the websites of "Madarsho" and "Oma" scored the highest (54 & 53 respectively), and the "Ninikade" scored the lowest "19" out of ideal score of 85. However, since the acceptable score was 60 or higher (or 70% of the total score), none of the websites surveyed in this study achieved an acceptable score. The rankings of the websites reviewed in this study are presented in Table 4.

## Discussion

The average ratings of Persian websites on pregnancy education were measured by the six indexes of information content, validity, design, links, support and privacy. As the findings of this study show, based on the WebMedQual scale, the ratings were lower than average, and only accessibility index was higher than average. Previous research, conducted in various fields and with various evaluation tools of websites, has acknowledged the weaknesses of Persian language websites in many cases. Although the tools and therefore the evaluation criteria of these studies are different from the present research, it would be useful to consider their results and compare them with the results of this study. Pinedo et al. (2) searched for the keyword "Pregnancy" and identified 125 relevant Spanish websites and then, using a LIDA questionnaire, they showed that a small percentage of websites (30%) were trustworthy, which was consistent with the research validity index. This was in line with the results of the evaluation of the accessibility index of the present study. A study by Shahrzadi et al. (12) used WebMedQual tool in the field of depression and anxiety. Given that a number of websites under study were private, it was only in terms of optimal design that the results of the present study were inconsistent. They had not paid much attention to the visual attractions and ease of use of the website, but the other features studied had shown inadequate quality, content, links, support and privacy that were not consistent with the results of the present study. It was in line with the criteria for reviewing the information content of the present study.

Xiaowocheng's study (2017) examined the quality of health information content of Chinese and English websites, indicating that the quality of the information content was poor (16).

In Narwani's Study (17) readability and quality of education materials on 54 websites were reviewed. The study met the criteria for evaluating the information content in the present study, and the content of the study was assessed by its evaluation tool, which was not included in the evaluation tool of the current research. Kuchdurmuz's review (18) reported that information quality was inadequate and unreliable. He pointed out that the information was not based on the date of publication of the methodology, which was consistent with the criterion of resource validity.

Also Haghshenas et al. (19) carried out a web site survey using the WQET Evaluation Toolkit. They included content, links, and moderately good content criteria that did not match the results of our research, which might reflect the specificity and type of activity of the websites. Unfortunately, according to the survey, government and university websites are growing less concerned about the content and effectiveness of websites and other criteria for evaluating websites on the topic of pregnancy education. Although the Nasajpour's study (20) compares Type 1 and Type 3 medical sciences universities based on the evaluation model, the study by Aminpour (21) on the websites of Type 1 medical universities of Iran has a weak international presence at the university level.

As also indicated, the lack of inclusion criteria in the study of medical education websites in the field of pregnancy can also be confirmed in this study. Samadbeik's (22) study with "Bomba quality scores in the availability and usability guidelines for Persian health website" showed that, based on his evaluation tools, the quality of Persian websites was also better in terms of accessibility and usability, which was consistent with the results of our study.

Overall, based on the current research findings and reviews of the quality of information provided by medical websites and affiliate websites, it can be concluded that, to date, web designers and production managers have ignored various quality factors. Poor credit ratings or publishing of content that is not accurate and quality-controlled, leads to poor information and ill-informed users. This is why the quality of website content is challenging in many ways and users cannot rely on the online information to fulfil their needs, especially in the area of health information.

## Conclusion

Considering the wide range of information related to different areas of health sciences and more specific topics such as weight loss pregnancy, and the growing public desire to use this information, it is necessary to evaluate the information in this area. Specialists in the area of information assessment, especially medical information librarians, are the major authorities in this field. They are responsible for evaluating information in different shapes and forms, and the ranking of websites in different domains. In particular, health officials need to validate the quality of healthcare information before it is provided to non-specialist groups. The aim of this study was to evaluate the Persian websites on pregnancy (based on WebMedQual Scale). It was found that the average scores of Persian pregnancy websites were, according to all indexes, poor and below average. Therefore, when using the Internet, users should not trust the contents of the website without regard to the quality indicators of the website. They should adhere to the basic principles of quality, especially with respect to content validity. They must check the authors' names, expertise, contact information and source citations, and pay particular attention to the main content. Therefore, health professionals, midwives and antenatal care providers should be aware of this issue and provide more evidence-based information to pregnant women at the time they require it. Careful attention should be paid to the information quality indicators of websites, especially updating of the content, accurate and detailed introduction of authors, making a distinction between scientific and commercial content, and the possibility of reciprocal interoperability between specialists. Finally, it is suggested that Persian designers and mothers in the field of maternal health in general and pregnant women in particular meet the quality criteria of healthcare websites, and focus on the importance of information and validity, especially with regard to author's name and specialty. Timely content updates, careful consideration of advertisements and links to other websites and observing the principles of confidentiality are especially important and thus improve the quality of websites. In addition, researchers in various health sciences can use the WebMedQual tool to evaluate websites and provide them with an opportunity to improve.

## Study Limitations

The study was conducted on Iranian Persian websites; the number of educational websites devoted exclusively to prenatal education was very low, with many websites addressing this issue along with advertising information on other medical issues. There were also a few websites that met all of the criteria for web evaluation in this study. There were no studies on pregnancy websites outside the country at the time of the study, and there was no exclusive study on this subject in the country. Some websites did not take responsibility for their content and there was no possibility of correspondence with them through email. Other related sites that

were launched after the study period were not included in the study. The survey was conducted in January 2016, and since then some websites might have gone out of service or might have already improved the quality of their material.

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## Ethical Declarations

Ethics approval and consent to participate

In this study, the following ethical issues were considered: After obtaining permission from the college officials, the training program began in January 2017 At the beginning of the training program after the researchers had introduced themselves, they explained the objectives of the study and the need to implement them to the observation of website to this study and the written consent was obtained from email participating in the study. The participants were also assured that all information collected will remain confidential.

This study was approved by the Ethics Committee of IR.SUMS.REC.1397.592.

## Availability of data and materials

The data that support the findings of this study are available from the corresponding author on request.

## Authors' Contributions

M.B M.M and Z.K Devised the study concept and designed the study. M.M and Z.K Supervised the intervention. M.B Data collection and analysis. M.M Supervised the intervention. M.B and M.M Drafted the manuscript. M.M, M.B and Z.K Critically revised the manuscript.

## Conflict of interests

The author declares that they have no conflict of interests.

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Original Article

# The Effect of Online Interpretations via Interactive White Boards on Vocabulary Learning

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## ABSTRACT

**Background:** English, as a foreign language, has become an essential part of educational curriculum in Iranian educational contexts. However, there has not been enough research in the domain of using technology in English classes in Iran to make learning easier and more accessible. The present study aims at investigating the effect of online interpretation of English lessons through Interactive White board on learning new vocabularies in an Iranian international school in the academic year 2017-2018.

**Methods:** To achieve the goal, 60 female students were randomly selected as homogeneous learners after a placement test (Oxford Placement Test). Following a pre-test of vocabulary, all 60 participants were randomly assigned to 3 groups of 20 to be exposed to the experiment. The participants of all three groups received English vocabulary lessons on IWB screen while simultaneously receiving the online interpretation of each lesson through auditory, video, and pictorial annotations attached to the new words. In this process, the participants read the vocabularies and their usage in the texts. In the meantime, they were able to consult the data attached to them through IWB to find their definitions through auditory definition, pictures, or movies by touching the board. In order to measure the influence of whiteboard on their learning ability, the subjects of all three groups were given an immediate post-test after the lessons.

**Results:** The data was analyzed through ANOVA and the results indicated that the group who received video interpretation (m=5.27) outperformed the auditory (m=4.42) and pictorial annotation groups (m=4.20), and auditory group displayed a significantly better performance than pictorial group.

**Conclusion:** The results provide significant implications for teaching English vocabulary in international schools. They highlight the role of English language syllabus designers and international school educators and instructors in providing electronic programs that can substantially improve the learning process.

**Keywords:** Annotation, Interactive white board, Auditory definition, Pictorial materials, Video interpretation

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## Introduction

English, as an international language, has become an essential component of educational curriculums in Iranian educational contexts in 20th and 21th centuries, especially in international schools. Most of the international schools in Iran include nursery schools and primary and secondary (high) schools. Some of these schools follow either American or British curriculums, and the programs should be delivered in English in almost all schools. The philosophy of establishing these schools is to provide education for people like the executives of multinational corporations and their children, foreign diplomats' family members living in Iran, employees of non-governmental organizations (NGO), and local people who would like to study abroad later. In fact, the main body of students is from other countries and most of them are not from English language countries including Arab countries, Europeans, or countries form Far East, where their first language is not English. These schools offer high educational standards with small class sizes, first-rate and up-to-date facilities as well as extra-curricular programs. Using smart technological devices enables teachers to impart sufficient knowledge to students in line with international standards. One of these up-to-date facilities are Interactive White Boards.

Schools and universities will continue to offer their courses in physical classrooms, and the introduction of online technology will not reduce the physical presence of learners. Instead, the use of online technologies in face-to-face teaching and distance education systems in higher education institutions will be highlighted (1). Face-to-face learning environment is prevalent in educational systems in all countries and educational experts believe that human interactions are considered an essential part of learning. In addition, e-learning environment provides greater time and opportunity for thinking and creates equal opportunities for learners to share their thoughts. In recent years, new innovations in the higher-education curricula around the world have provided enormous educational opportunities for learners. They can now benefit from face-to-face classrooms along with online instructions and application of educational tools such as blogging, virtual classes, discussion boards, and talking forums. This form of learning is known as blended learning.

Being a modern version of the traditional whiteboards, an interactive white board is an interactive large screen that is connected to a PC and a projector to show the computer's desktop information onto the board. Users can control the computer via special pens, their hands, or other devices that are used to touch the screen of this smart board. Teachers, managers or students can drag, click, copy and also handwrite notes to transform data into text or save them.

This tool allows learners to boost interactive and collaborate learning. It also enables the integration of media content into teaching materials or lectures to support collaborative learning, and hence provides a wide range of learning opportunities. Interactive whiteboards are considered, therefore, a cost saver because a single computer is utilized to provide learning stimuli for a whole classroom. One may not have to equip an entire classroom with many computers or rent a computer lab for class activities, or give every student a laptop. Although this device was originally used in business to show concepts in meetings and record them, nowadays it is widely used in educational environments from primary schools to university level. While there are some mobile interactive whiteboards, they are normally fixed on the walls in the classes to make it easy for everybody to see and use them (2).

As a pedagogical tool, interactive whiteboard helps promote creative teaching allowing the lecturers to provide different learning styles, including:

Audio learners participate in class discussion,

Visual learners enjoy a clear view of the class contents,

Tactile learners move things around the board, make notes and highlight elements.

### *Related Studies*

Not much research has been conducted on the effectiveness of multimedia annotations on learning English vocabulary. However, as indicated in this section, more studies can be found about reading comprehension. According to Paivio's Dual-coding Theory (3), there is an interconnectedness between two distinct cognitive visual and verbal systems. The verbal system is those word-like codes that include visual, articulatory, auditory, and other verbal codes, while the nonverbal system includes special modality images for sounds, actions, shapes, skeletal sensations which are related to emotion and other nonlinguistic events and objects. Mayer and Sims [quoted in Shams & Dabaghi (1)] emphasized that according to the Dual-coding Theory, although the two systems of visual and verbal systems are independent, the referential connection between them is crucial for conceptualization. They stated that if these two systems are applied simultaneously, it may assist the formation of referential connection. In view of this reality, most related studies have focused on investigating the effect of integration of these two modes of multimedia representation on vocabulary retention and reading comprehension among foreign language learners (4-7).

Al-Seghayer (8) also conducted a similar study on 30 ESL students and found that the integration of printed text definition and video clips resulted in greater achievements in vocabulary retention, as compared to integrating printed text definitions and pictures. On the other hand, Chun and Plass (9) have done a research on comparing the effect of two types of presentation. Their findings revealed that the group who received vocabulary definitions through texts along with pictures performed better than the ones who received an integration of pictures and video clips of vocabulary definitions.

Al-Mansour and Al-Shorman (10) also conducted a study on the effect of computerized instruction on ESL courses. They revealed the positive effect of visual aspect of technology usage in teaching English.

Shams and Dabaghi (1), following Dual-coding Theory (3), have done a study on Iranian students to find out the effect of using IWB on the English reading comprehension. In their experimental design research, they found that pictorial annotation group outperformed the auditory annotation group, and video annotation group showed better performance than the other two groups in reading comprehension.

An overall look at the related studies shows the usefulness of using technological tools in educational contexts, especially smart boards such as IWB in schools. However, there is room for more experiments and studies on the usefulness of such tools as well as the better ways of using them to make them more useful and cost effective in schools. The present study aims to review and explore the effectiveness of annotations in learning English vocabulary in international schools focusing on comparing three modes of combining pictorial, auditory, and video presentation along with online annotation through IWB. The study follows the theoretical framework of Dual-coding Theory of Paivio (3). By comparing the functions of auditory, textual, and video explanation through IWB, the author decided to find out which one is more effective for learning and retaining vocabulary, which is the basis for all other lessons in international schools. In a way, this study duplicates a similar study by Shams and Dabaghi (1), except that it is conducted in a different setting in Iran, i.e. an international school where there has not been any study to make teaching and learning more effective and up-to-date and in line with other foreign and international schools all around the world. Therefore, the research question is:

Is there any significant difference between audio, video, and pictorial online annotations via Interactive White Board in terms of their effect on learning vocabulary among international students?

The hypothesis of the study then is:

There is no significant difference between auditory, video, and pictorial online annotations via Interactive White Board in learning vocabulary among international students

## Methods

The research population consisted of all female students in an international school in Tehran in the academic year 2017-2018. However, in order to choose homogeneous students in accordance with the aim of the study, the researcher selected 60 participants from a total of 109 female students after conducting a placement test based on Oxford Placement Test (OPT) (11). This placement test was used because it is known as a standard test used in most institutions to determine the levels of students and place them in appropriate levels. The total score of this test was 100 and for the purpose of this study, those who obtained 96 to 100 were ranked as excellent (A+), 80 to 95 as very good (A), 65 to 79 as partially good (B), 50 to 64 as not good enough (C), and below 50 as weak students. However, the majority of students (89) were placed in the group A, so among them 60 were selected randomly. The age of the selected subjects ranged from 12 to 14 years. Then, they were randomly assigned in three groups each of which consisted of 20 students. The criteria for entering the study included enrollment at the beginning of the academic year. Those who had more than four absences were excluded from the study according to the school's educational rules. All individuals in the sample were present until the end of the study. The ethics committee of research approved the study and ethics code was allocated accordingly. In addition, written informed consent was obtained from all participants.

The experimental groups (all three groups) were given the academic achievement test (pre-test) before the experiment. The instruction lasted for 13 weeks and involved teaching each group the same topics, but adopting different techniques. At the end of the 13th week, the post-test was implemented. The reliability coefficient of pre-test and post-test was calculated using Kuder-Richardson formula (KR-21). Pre-test in the model helps to know the degree of group similarity in the pre-experimental process and adjust the results of post-test accordingly (Karasar, 2010). This study did not have any control group as the aim was comparing experimental groups only. During the academic year, each group was exposed to online annotations (auditory, video, and pictorial) through IWB in separate classrooms.

For each group, the first session was dedicated to explaining the learning procedure and introducing the parts of teaching including the role of IWB, annotations, online texts and modes of definitions through the board for that group. Throughout the online presentation of the lesson, students or teachers could consult the annotations for each new vocabulary by touching the hyperlinked boldface words on the screen. The link provided access to the auditory definitions of the annotated words (for auditory group), or pictures of the words (for pictorial group), or videos and animations related to the meaning of the hyperlinked words (for video group).

The next step was the implementation process (examination), which included collective presentations, students' description of the content delivered by the instrument, learning assessment based on the procedure, evaluating previous lessons by providing oral and written feedback, and teaching new topics.

Therefore, the intervention in three classes was carried out in three steps. In the first phase (introduction of content), the annotation method was introduced to the students and the lesson plan was explained to them. In the second step (student contributions in using whiteboard and annotations), the content of the course was recorded in lectures and recorded sessions were made available to the students on the Web. Thereby the students had the opportunity to study course content at home. There were also resources available to these students to solve the problems. In the third step (examination), the teacher held

a virtual web-based session each week for questioning and answering the students. Then the teacher reviewed the contents of previous sessions 15 minutes after attending the classroom. Then the other students had 60 minutes to solve the classroom exercises in groups using the assigned annotation types provided by the whiteboard. During class sessions, the students continually observed other students' activities and provided feedback to each other. In third phase and at the end of each session, students underwent 15 minutes of progress assessment by answering the questions about the lessons delivered. It should be noted that two to three people were invited to observe the classes in all stages. All three classes were handled by the trained teachers according to the aim of study with identical teaching methods and all were observed by the researcher to ensure the accuracy of the procedure.

After the instruction (13 weeks), the final examination (as post-test) was administered. The achievement post-test was designed in parallel (equivalent) with the pre-test exam with the help of three English teachers and the reliability and validity of the exam items were ensured by the researcher. All three groups took the achievement test both as the post-test and the final exam. Finally, the data were analyzed using SPSS 21 software and presented in descriptive and inferential statistics (t-test and paired t-test).

### *Data Analysis*

For data analysis, descriptive statistics and one-way analysis of variance (ANOVA) were used to calculate the mean and standard deviation of scores for each group and to investigate whether there was any difference in the scores of the experimental groups. The Post hoc Scheffe test was also applied to evaluate the differences between the three groups, if there were any at all.

## Results

The aim of this study was to compare international female students who were divided into three auditory, video, and pictorial online annotation groups using whiteboard. To do this, the researcher applied ANOVA formula to compare their performance. At first, descriptive statistics of pre-test of experimental group was calculated.

The demographic information of the participants is shown in Table 1.

Table 2 demonstrates the result of descriptive analysis of three experimental groups' pre-test scores of the study.

As the table shows, the results of each group demonstrate no significant difference among the groups before the experiment. Therefore, the researcher applied one-way ANOVA to find out if there was any significant difference between the performances of experiment groups before instructions. ANOVA results could display the amount of variance between and within the groups, if there was any difference. Table 3 shows the results of one-way ANOVA of pre-tests.

The results in the Table 3 show that the significance level (0.857) was greater

**Table 1:** Demographic information of participants in three experimental groups

| Group | Age (Mean) | Gender | Mean of OPT sore | Mean of Listening test |
|---|---|---|---|---|
| | | Girl | | |
| Vid. | 13 | 20 | 89 | 82 |
| Pic. | 13 | 20 | 89 | 82 |
| Aud. | 13 | 20 | 89 | 82 |

**Table 2:** Descriptive statistics of the Pre-test of experimental groups

| Group | N | Min. | Max. | Mean | St. Deviation |
|---|---|---|---|---|---|
| Video | 20 | 2.25 | 5.95 | 3.70 | 1.03 |
| Pictorial | 20 | 2.00 | 5.55 | 3.82 | 1.02 |
| Auditory | 20 | 2.45 | 5.00 | 3.66 | 0.71 |
| Total | 60 | 2 | 6.00 | 3.74 | 0.92 |

**Table 3:** One-way ANOVA results of pre-test scores

| Groups | Sum of squares | Df | Mean squares | F | Sig. |
|---|---|---|---|---|---|
| Within groups | 50.21 | 57 | 0.88 | | |
| Between groups | 0.27 | 2 | 0.13 | 0.15 | .857 |
| Total | 50.48 | 59 | | | |

**Table 4:** Descriptive statistics of the Post-test of three groups

| Group | N | Min. | Max. | Mean | St. Deviation |
|---|---|---|---|---|---|
| Video | 20 | 4.50 | 7.50 | 5.27 | 0.83 |
| Pictorial | 20 | 3.00 | 6.50 | 4.42 | 0.93 |
| Auditory | 20 | 3.00 | 6.00 | 4.20 | 0.80 |
| Total | 60 | 3.00 | 7.50 | 4.63 | 0.95 |

than alpha level (P>0.05, F=0.15), which indicates no significant difference between the performances of all group's before experiment. In addition, the observed *f* value was lower than critical *f* value, which also shows no significant difference between the groups. All the results indicated that all three groups were at the same level of English proficiency before receiving instruction through three different modes of auditory, pictorial, and video annotations.

### *Results of Analysis of Three Groups' Post-Tests*

Descriptive statistical results of post-test scores of all three study groups are listed in Table 4. In this table, the scores of the students are compared as well.

As observed in Table 4, the mean score of video annotation group (m=5.27) is significantly higher than the other two groups (Mpictorial=4.42 and Mauditory=4.20) and also the mean score of pictorial group is a little higher than auditory group. So the results demonstrate the difference among the mean post-test scores of all three groups after the experiment. To calculate the degree of variance among the groups, a one-way ANOVA was employed again (Table 5).

The results in the Table shows that the significance level (0.000) is lower than the alpha level (P<0.05) which shows significant difference between all three groups. It means that the post-test scores of the groups differ significantly due to different online annotations through IWB (auditory, pictorial, and video annotations), which has significantly affected the participants' vocabulary retention. However, in order to find out which group outperformed the other groups, the Post-hoc Scheffe test was employed to compare their mean scores. The results are demonstrated in Table 6.

The results in Table 6 demonstrate that

**Table 5:** Intra-group and inter-group effects test results using One-way ANOVA results

| Groups | Sum of squares | df | Mean squares | F | Sig. |
|---|---|---|---|---|---|
| Within groups | 41.07 | 57 | 0.72 | | |
| Between groups | 12.85 | 2 | 6.42 | 8.92 | 0.000 |
| Total | 53.93 | 59 | | | |

**Table 6:** Post-hoc Scheffe results of the post-test scores

| (I) Group 1 | (J) Group 1 | Mean difference (I-J) | Std. Error | Sig. | 95% confidence interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower bound | Upper bound |
| Audio | Picture | -0.22 | 0.268 | 0.705 | -0.899 | 0.449 |
| | video | -1.07* | 268 | 0.001 | -1.749 | -0.400 |
| Pictorial | Audio | 0.22 | 268 | 0.705 | -0.449 | 0.899 |
| | video | -0.85* | 268 | 0.010 | -1.524 | -0.175 |
| Video | Audio | 1.07* | 268 | 0.001 | 0.400 | 1.749 |
| | picture | 0.85* | 268 | 0.010 | 0.175 | 1.524 |

video group outperformed the other two groups significantly, which reveals that integrating video annotation with online instruction through IWB had the greatest effect on the performance of participants in comparison with the other two groups. In addition, the auditory annotation group displayed better performance than pictorial group, which again shows that auditory annotations through IWB affect learning performance more than pictorial annotations through IWB.

## Discussion

The purpose of the study was to evaluate the effectiveness of different online annotations through Interactive White Board on learning English vocabulary in an international female school in Tehran, Iran. The results revealed that there was a significant difference among the three video, audio, and picture annotation groups in that the video group outperformed the other groups significantly and auditory group put up a better performance than pictorial group in post-test. The results of this study are in line with the results of the study conducted by Glover and Hardaker (12) who examined the effectiveness of using different modes of annotation on reading comprehension and vocabulary learning. Their study was on the basis of generative theory of multimedia learning (13) and demonstrated that the participants performed better on the post-tests where visual and textual information were presented in learning English, especially when they could choose their own preferred gloss mode of presentation.

The findings also support the previous findings of similar studies that have demonstrated that the inclusion of annotations, whether multimedia or traditional, significantly affects students' reading comprehension (14). The results of this study is partly in line with the results of Shams and Dabaghi (1) who found that video annotation group performed better in using IWB than pictorial and auditory annotation groups. In the present study, the auditory annotations aided learning L2 vocabularies more than pictorial annotations and the video-annotation group significantly outperformed the audio-only and image-only annotation groups. It shows that in the video-annotation group, students receive a combination of sound and pictures that explain the lesson through smart board. Presenting sound and moving pictures on smart screens in the classroom (via multimedia) appeared to have a cognitive influence on learning while presenting picture-only and sound-only contents does not produce such effect.

The findings are also consistent with the results of Ishtaiwa's study (15), which found that using different multimedia modes through IWB could facilitate teaching process and improve EFL reading comprehension. In his study, Ishtaiwa concluded that EFL students nowadays would prefer receiving authentic and concrete information in their classes. The findings of this study and students' willingness to receive concrete materials indicate that better understanding of online vocabulary through IWB occurs when both visual and verbal channels are employed. This finding and also Shams and Dabaghi's (1) results confirm Dual-coding Theory of Paivio (3).

In addition, the finding of this study is also consistent with the results of Al-Saleem (7), Yohon, and Zimmerman, (16), Javidi Jelyani, Janfada, & Soori (17), and Marzban (18). They found that using smart boards such as IWB facilitates and expedites learning process with high efficacy, since it provides authentic and real material and activates dual channels of understanding (visual and audial). Furthermore, the results of this study confirm a study by Winzenried (19), which established that IWBs can be applied as a helpful aid in language teaching and students can benefit from them significantly.

## Conclusion

This study aimed at investigating the effectiveness of video, pictorial, and auditory annotations through IWB on English vocabulary learning among international

students at intermediate level in an Iranian international school. The results were in conformity with dual-coding theory, and indicated that IWB in general, and video presentation in particular, affect learning English vocabulary considerably. As discussed earlier, exposure of English learners to online video annotations via IWB can have a positive impact on second language learning due to providing real materials and activating different intelligence and absorbing channels (audio, visual, verbal, and productive). Interactive White Board is regarded as a part of "main technology" which is able to provide available online annotations to support specific components of learning materials.

One of the limitations of this study is that all participants were female because it was a female international school and it is recommended to conduct another research comparing male and female schools. In addition, as it was noted earlier, due to the importance of the subject in Iranian education, it duplicates another study on the Iranian educational system but in a different context, i.e. an international school where teaching English is an essential part of the curriculum. The results were relatively different due to the different contexts and ages, necessitating more research in this area in Iran in different contexts, ages, and genders to achieve more general results.

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## Conflict of interests

The author declares that they have no conflict of interests.

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Original Article

# A Comparison Between the Effectiveness of E-learning and Blended Learning in Industrial Training

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## ABSTRACT

**Background:** Blended learning has recently become a widespread practice in industrial training. Accordingly, comparing the effectiveness of e-learning and blended learning in industrial environments is of utmost necessity. The purpose of this research was to compare the effectiveness of e-learning and blended learning in industrial training based on learning outcomes and course satisfaction.

**Methods:** This study was conducted at Hepco Company in 2018, and a quasi-experimental design with a control group was used. The sample size included 90 employees randomized in three groups by means of random sampling method. 60 participants were assigned to the experimental groups (30 learners in e-learning group and 30 in blended learning group) and 30 of them went to the control group. Satisfaction questionnaire (Kirkpatrick, 2007) with 23 questions and 3 components was used for data collection. Components of this scale included the content component (8 questions), lecture component (9 questions) and organization-possibilities (6 questions). The reliability of the questionnaire was 0.92 based on the Cronbach's alpha. To evaluate the learning outcomes a researcher made test with 30 questions was administered, and the CVR of the test for validity was 0.96.

**Results:** In terms of learning outcomes, the mean results in the blended learning group (M=22.96, SD=2.66) were higher than in the e-learning (M=19.48, SD=3.25) and face-to-face (M=18.13, SD=4.62) groups. There was a significant difference between of learning scores in the experimental group and control group (P<0.001). Also the results showed that the mean course satisfaction in blended learning group (M=71.19, SD=8.6) was higher than e-learning (M=43.88, SD=7.94) and face-to-face (M=59.65, SD=11.63) groups. The course satisfaction scores showed that the blended learning group expressed greater satisfaction than the e-learning and face-to-face groups (P<0.001).

**Conclusion:** The results indicate that blended learning can improve the effectiveness of training. It is therefore suggested that curriculum developers and HR managers in companies can improve industrial training by developing blended learning courses.

**Keywords:** E-learning, Workplace learning, Blended learning, Vocational education & training

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## Introduction

Today, more than ever, it is important to keep the employees updated on the developments in their professions. New information emerges on a daily basis, and they must have access to that information if they are expected to deliver their best performance. The extent to which an employee makes progress is a measure of a manager's effectiveness (1). In this regard, workplace learning has, in recent years, embraced technology to meet the demands of continuing professional development and general training of employees. Little research however has been undertaken to assess the effectiveness of the methods used and the learners' reception of these teaching-learning strategies (2). In fact, educational technologies have largely influenced the teaching approaches because of their major benefits. These benefits are well documented in both academic institutions and corporate training areas. Some of the E-learning benefits include accurate and consistent content delivery through visually-enhanced multimedia presentation and simulation, cost-effectiveness (3), self-paced and learner-controlled learning via dynamic content (4), learner engagement through interactive learning materials (4, 5), instant feedback (6), real-world-like practices enabled by virtual labs, simulation, and interactive exercises (6), promotion of lifelong learning accommodation for a variety of learning styles (5), high retention of content through personalized and active learning (3, 5), content delivery efficiency (7), anytime and anywhere learning (3, 5, 8), and meaningful assessment and testing (4). E-learning tools have the advantage of allowing your staff to learn either independently or in groups. With educational technology, they can each work at a pace or at a time that is convenient. Technology enables companies to provide training to their staff in different situations and ensure that they all receive identical information. It eliminates the costs of hiring instructors or sending staff out-of-town to training programs (1).

Despite the n noted vantages, e-learning is not an all-inclusive solution regardless of its effectiveness. Therefore, its limitations as a training method in corporate settings have led many to try a mixture of various delivery methods. Accordingly, there is a rapidly rising interest in blended learning which is a typical combination of face-to-face training and online learning (9). This is mainly due to the fact that more traditional forms of learning, such as face-to-face teaching, also have some advantages: The enthusiasm of the facilitator (instructor) for the content is contagious and encourages learning; People prefer to learn in a social situation; There is accountability in a classroom that is missing in e-learning, Learning occurs casually and indirectly when individuals interact; Instructor-led sessions remove people from their daily work responsibilities, so participants can focus on learning (There is no such protection when using e-learning methods); The questions and comments of class members help raise and address important issues and make it comfortable for others to talk; The pattern of learning in a group environment is established in almost everyone's school experience and connects us with our past; The facilitator speeds the process of knowledge acquisition; Classroom experiences provide opportunities for learners to practice and rehearse skills and receive feedback from others (10).

Therefore, corporate instructors need to provide a mixture of teaching methods to satisfy all their staff. In fact, some employees will quickly adapt to high-tech learning tools such as Web-based courses, training programs on CD-ROMs, or interactive computer-based training, whereas others are more comfortable with the more traditional in-class lecture and books (11). On the other hand, one should take account of the major drawbacks in educational programs where e-learning is relied upon as the only approach in teaching. Among the frequently cited downsides are physical isolation and lack of social support and interaction. As a result, high attrition rates are common with many online programs that use e-learning

as the sole instructional delivery (12 & 1). In a blended learning approach, we can draw on the strengths of both e-learning and traditional learning methods. Franks (13) asserts that educators who have tried both the traditional lecture format and an online education approach become aware that neither method by itself is sufficient for every learner, every instructor, and every course. This inadequacy leads to strong possibilities for the effective application of a third option: a blended learning approach, which attempts to integrate the best from both modes. The blended learning paradigm promotes student-to-instructor, instructor-to-student, and student-to-student social interaction which are all conducive to learning. Research on the effectiveness of blended learning in formal education environments shows that this teaching approach can significantly enhance student learning. researches such as Mosalanejad et al. (14), Motamedi et al. (15), Mohammadi et al. (8), Bailey & Morais (16), Chen and Jones (17), Pereira et al. (18), Akkoyunlu & Yilmaz-Soylu (19); Sahin (20), Shellton & Parlin (21) and Mwanza-Simwami (22) emphasize the effectiveness of blended learning.

In the literature the term is used to describe the integrated combination of traditional offline methods of learning with intranet web-based, extranet web-based or internet-based online approaches (23). Also, Blended learning has been described as a mode of teaching that eliminates time, place, and situational barriers, whilst enabling high quality interactions between teachers and students (24). To accentuate the fact that the concept is learner centered, blended learning can be described as a mix of delivery methods that have been selected and fashioned to accommodate the various learning needs of a diverse audience in a variety of subjects (25). Blended learning combines classroom-based learning with computer-mediated instruction (26), but it also describes learning that mixes various event-based activities, including face-to-face classrooms, live e-learning, and self-paced learning (27). However, as each approach in teaching has its own advantages and disadvantages, many learning experts try to combine different approaches because they believe that blended learning is a promising approach in solving these problems (28). Obviously, blended learning approach can leverage the benefits of both e-learning and traditional learning, and learners can study the training material at home or in the workplace. Some learners adapt to high-tech learning tools such as computer-based or mobile-based resources, while others are more comfortable with more traditional teaching tools such as classroom lectures and books (1). Therefore, it appears that corporate institutions should adopt this approach in training their staff. The purpose of this research was to compare the effectiveness of e-learning and blended learning based on learning outcomes and course satisfaction among the employees of Hepco Company.

## Materials and Methods

This research used a quasi-experimental design with a control group. The experiment was conducted at Hepco Company in 2018. The sample size were 90 employees of Hepco Company in three groups selected by random sampling by which 60 subjects belonged to the experimental groups (30 learners in e-learning group and 30 learners in blended learning group) and 30 were categorized in the control group. The sampling method in this study was simple random sampling. Out of 120 company experts, 90 were randomly selected on an equal chance. They were then randomly assigned to three groups. The criterion for inclusion in the research was being employed at Hepco Company and having a graduate degree. Also, the criterion of exclusion was ineligibility for the post-test and not completing the questionnaires. For data collection satisfaction questionnaire (Kirkpatrick, 2007) with 23 questions and 3 components was used. Components of this scale are content (8 questions), lecture (9 questions) and organization-possibilities (6 questions). Likert spectra were used to measure satisfaction. The reliability of the

questionnaire was calculated .92 based on the Cronnbach's alpha. Additionally, for measuring learning outcomes we had a researcher-made test comprising 30 questions with closed questions answered by the students. For validity of the test we used CVR index where the CVR of test was .96. The analysis of variance (ANOVA) was performed to test the differences in pre and post tests and for paired comparisons, using SPSS v21, Scheffe test was conducted to analyze the data.

Procedures: Before training, a pre-test was conducted in the three groups, and then they were all taught by the same trainer. The content of the course was Gagnie's Problem Solving learning model. In the Gagnie's Problem Solving model, there are 9 instructional events that presented in 9 steps. The course lasted eight weeks and four hours each week so the whole course took 32 hours of class time. The teaching method varied in the three groups. In the control group, training was conducted by the traditional approach of giving lectures. In other (experimental) groups, one group was conducted by asynchronous content and training was step by step. And in the other group, instruction was conducted via blended learning. Therefore, in this group we had the content presented by CD and E-texts and in other two groups we had instructors in class, so trainers gave feedback to learners. For the sake of ethical considerations, this study was conducted with the consent of the participants. Furthermore, all participants were fully aware of the nature and confidentiality of the research and were told that their information would be kept confidential. To test the effectiveness of the courses, the satisfaction of learners' satisfaction was measured. Learning outcomes was also measured by a post-test. The post-test took 50 minutes.

## Results

The demographic characteristics of the participants show that 95.6 percent of the participants were male and 4.4 percent of them were female. The majority of the participants (94.5 percent) were employees and workers and 5.5 percent were managers. The participants were 20–50 years old.

The first hypothesis is that blended learning has a positive effect on course satisfaction of learners: In order to answer the first hypothesis, means of ANOVA scores were used. The mean and the standard deviation of learner satisfaction scores in the face-to-face group were 59.65 and 11.63. Also in the e-learning group, the mean and standard deviation of learner satisfaction scores were 43.88 and 7.94. And finally the mean and standard deviation of learner satisfaction scores in the blended learning group were 71.19 and 8.60. For significance analysis of the scores, one-way ANOVA analysis in the control and experimental groups was used the results of which are tabulated in Table 1.

As indicated in Table 1, it can be said that learner satisfaction of learning in face-to-face, e- learning and blended learning at 0.001 level is different. This means that staff training in the above groups, and a combination of dependent variables (student satisfaction of learning approach) there is a significant difference. For paired comparison of the learner's scores in learning outcomes between face-to-face, e-learning and blended learning, Scheffe post-hoc test was used the results of which are given in Table 2.

As indicated in Table 2, it can be said that learner satisfaction of learning in face-to-face, e learning and blended learning settings at 0.001 level is different, and Scheffe post-hoc test show that learners in blended learning group were significantly more satisfied than face-to-face and e learning groups. Also learners in face-to-face learning group were significantly more satisfied than learners in the e learning group.

The second hypothesis is that blended learning has a positive effect on learning outcomes of learners: To answer this hypothesis we measured the pre-test and then compared it with post-test scores obtained from course content. These scores are presented in Table 3:

As shown in Table 3, the mean and standard

**Table 1:** One-way ANOVA analysis on learning satisfaction in the control and experimental groups

| Source | Sum of Squares | Df | Mean Squares | F | Sig |
|---|---|---|---|---|---|
| Between Groups | 9964.07 | 2 | 4982.03 | 54.85 | 0.001 |
| Within Groups | 66629.92 | 87 | 90.82 | | |
| Total | 16594 | 89 | | | |

**Table 2:** Scheffe post-hoc test analysis for means of control and experimental groups on the satisfaction of learning

| Group | | Mean difference | SD | Sig |
|---|---|---|---|---|
| Face-to- face | E-learning | 15.76* | 2.70 | 0.001 |
| | Blended learning | -11.54* | 2.72 | 0.001 |
| E-learning | Face-to-face | -15.76* | 2.70 | 0.001 |
| | Blended learning | -27.30* | 2.61 | 0.001 |
| Blended learning | Face-to-face | 11.54* | 2.72 | 0.001 |
| | E-learning | 27.30* | 2.61 | 0.001 |

**Table 3:** Comparisons of means for control and experimental groups on the learning outputs in per-test and post-test

| Stage | Group | Mean | SD |
|---|---|---|---|
| Pre test | Face-to-face | 16.26 | 3.49 |
| | E-learning | 17.23 | 2.82 |
| | Blended learning | 17.50 | 2.95 |
| Post test | Face-to-face | 18.13 | 4.62 |
| | E-learning | 19.48 | 3.25 |
| | Blended learning | 22.96 | 2.66 |

**Table 4:** Covariance analysis on the learners' post-test scales in the control and experimental groups (with controlling pre-test effect)

| Indicator Variable | Sum of Squares | Df | Mean Squares | F | Sig |
|---|---|---|---|---|---|
| Learning | 516.60 | 1 | 516/60 | 91.15 | 0.001 |

deviation of learning outcomes scores in the pre- test stage in face-to-face group were 16.26 and 3.49. Also in the e-learning group, the mean and standard deviation of learning outcomes scores were 17.23 and 2.82. And finally the mean and standard deviation of learning outcomes scores in the blended learning group were 17.50 and 2.95. In post-test stage, the mean and standard deviation of learning outcomes scores in face-to-face group were 18.13 and 4.62. Also in the e-learning group, the mean and standard deviation of learning outcomes scores were 17.23 and 2.82. And finally the mean and standard deviation of learning outcomes scores in the blended learning group were 22.96 and 2.66. For significance analysis of the scores, covariance analysis in the control and experimental groups was used the results of which are presented in Table 4

As indicated in Table 4, covariance analysis for determining of difference in learning between face-to-face, e-learning and blended learning groups at 0.001 level is meaningful. This means that in terms of staff training in above-mentioned groups, and a combination of dependent variable (student learning) there was a significant difference. For paired comparison of the learners' scores in learning outcomes between face-to-face, e-learning and blended learning, Scheffe post-hoc test was used as tabulated in Table 5.

**Table 5:** Scheffe post-hoc test analysis for means of control and experimental groups on the learning outcomes

| Group | | Mean difference | SD | Sig |
|---|---|---|---|---|
| Face-to-face | E-learning | 1.35 | 1.00 | 0.41 |
| | Blended learning | -4.83* | 1.00 | 0.001 |
| E-learning | Face-to-face | -1.35 | 1.00 | 0.41 |
| | Blended learning | -3.48* | 0.96 | 0.002 |
| Blended learning | Face-to-face | 4.83* | 1.00 | 0.001 |
| | E-learning | 3.48* | 0.96 | 0.002 |

As indicated in Table 5, it can be said that by comparing learners' learning scores in Scheffe post-hoc test in face-to-face, e-learning and blended learning it is revealed that learners in the blended learning group significantly learned more than learners in face-to-face and e-learning settings. However, there were no significant differences between learners' learning outcomes in face-to-face learning group and e-learning group.

## Discussion

The present study indicates that blended learning is the most appropriate approach in corporate training. The learner satisfaction scores revealed that the learners in the blended learning group displayed a significantly higher level of satisfaction than face-to-face and e-learning groups. The results are consistent with other studies such as Mosalanejad et al. (14), Motamedi et al. (15), Mohammadi et al. (8), Bailey & Morais (16), Chen, and Jones (17), Pereira et al. (18), Akkoyunlu & Yilmaz-Soylu (19), Sahin (20), Shellton & Parlin (21) and Mwanza-Simwami (22). In fact, several studies have shown that learner satisfaction in blended learning courses is higher than in the courses that apply only face-to-face or e-learning approaches. This is natural since in the blended approach learners' tastes are more closely addressed. In this approach, each person will learn in a particular way according to their learning style and interests. Also, the formal classroom learning environment is largely ignored and learners can access course content at any time and place via their computers. As a result, students are naturally more satisfied with this learning environment than other courses where learning occurs only in the classroom. It can be due to the trainer's feedback or learners' cooperation in the learning process, and additionally, the use of new technologies can be appealing to learners. Therefore, a combination of human trainers and educational technologies can be more attractive to learners than other approaches.

As indicated in the results, in terms of learning output, the scores of the blended learning group were significantly higher than the scores of face-to-face and e-learning groups. The effectiveness of this approach in student learning is due to the adoption of diverse learning resources such as online and computer-based resources as well as classroom and face-to-face interactions to attract learners with different needs. In this regard, Pratt (1) points out that the underlying philosophy in blended learning is that not everyone learns in the same way. Therefore, it seems necessary to use different methods for teaching. Accordingly, learners who take an interest in e-learning and electronic resources such as mobile software are more inclined towards the e-learning dimension of blended learning, and those who are interested in face-to-face learning may instead choose to attend physical classrooms. The diversity of learning methods leads to a marked improvement in the performance of learners in blended learning courses as compared to the other courses like face-to-face learning. Also it can be attributed to the active learning cooperation of learners in learning process, in this approach. They can negotiate, ask questions, and receive feedback from their teachers. On the other hand, they can make use of e-texts and other electronic

products to have a more real and durable experience. As a result, combining traditional training methods and new technologies can enhance the learning outcomes in blended learning instructions as compared to the other approaches. Based on the research findings, it is recommended that instead of using a one-dimensional approach in industrial training, such as face-to-face or e-learning approaches, the blended approach should be embraced.

Research limitations: In the present study, it was not possible to measure any changes in the participants' behavior and the subsequent outcomes. This can be a limitation of the study. Another limitation was the lack of control over the gender and age of the participants.

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## Authors' Contribution

In this study, S.M determined the research conceptual framework, as well as the process of writing the manuscript. Z.S implemented the technical aspects including course implementation and data collection, and M.GH conducted the statistical analysis

**Ethical Considerations:** This study was conducted with the consent of the participants. Also all participants were fully aware of the nature and confidentiality of the research and were told that the their information would be kept confidential

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Original Article

# Designing a Virtual-Social Learning Environment for Awareness about Diabetes and its Effectiveness on the Knowledge and Self-efficacy of Male Students' Mothers

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## ABSTRACT

**Background:** Diabetes is a type of metabolic diseases whose common characteristic is the increase in blood sugar. It is dangerous and very common in the world, especially in Iran. Research on people's awareness of this disease is scarce. The purpose of this study was to design a virtual-social educational environment for awareness of diabetes and its effectiveness on the knowledge and self-efficacy of male students' mothers.

**Methods:** Multi-stage cluster sampling was used and a total of 30 mothers were selected. These mothers were divided into experimental and control groups. (Each group involved 15 people). A pretest of knowledge about diabetes and self-efficacy was given to all mothers qualified for the study. All mothers in the experimental group were given diabetes training in 12 sessions, and the control group did not receive any training. For data analysis, descriptive statistics, mean, frequency and standard deviation were used at the end of the training sessions. Covariance analysis was used in inferential statistics using SPSS version 25.

**Results:** The results of the hypothesis review through covariance analysis indicate that the special virtual-social learning environment for diabetes awareness has an impact on the knowledge and Self-efficacy of Male Student's mothers and has increased it at a significance level of 1%.

**Conclusion:** It was concluded that that the virtual social-educational environment raises people's awareness of diabetes. Similar studies are recommended for other organizations like high schools, universities, public and private sectors. These studies can have a positive effect on psychological health of society.

**Keywords:** Virtual social-vocational educational environment, Knowledge about diabetes, Knowledge, Self-efficacy

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## Introduction

A healthy family is a family that manages the relations among its members, especially parents and children. In order to secure a healthy relationship, there are principles and practices that parents, especially mothers should follow. They need to have the necessary knowledge and skills to establish their educational roles based on these principles of spiritual and intellectual bonding. One of these skills is self-efficacy. Parental self-efficacy is an important cognitive structure in relation to parental performance. Parents need knowledge and information on effective childcare methods in order to feel self-efficacious and to reduce physical and mental ailments.

Effective education can play a significant role in reducing diseases and complications and, as a consequence, improving mothers' health because education is one of the key pillars of developing abilities, skills and competencies in different parts of society (1, 2). In this regard, the advancement of information technology has led to the emergence of new approaches in education such as e-learning. The use of e-learning in a flexible educational system provides a good opportunity for expanding scientific content and increasing the depth of learning; it can be one of the most important ways of responding to the growing educational requirements for handling diseases.

Education can be especially effective in dealing with some widespread diseases such as diabetes. The statistics in Iran indicate that we have always ignored the issue of information and prevention, and there has never been a serious, effective and continuous program to prevent many chronic diseases such as diabetes (3, 4). There are limited studies in Iran about the public awareness and self-efficacy in tackling diabetes. Also it is known that there is a high rate of diabetes in Yazd province.

All of these reasons encouraged us to design a virtual socio-educational environment to raise awareness of diabetes and its effectiveness on knowledge and self-efficacy of mothers in Yazd. The purpose of this study was to evaluate its effectiveness on knowledge and self-efficacy of male student's mothers in primary schools in district 1 of Yazd. We sought to determine the effectiveness of awareness about diabetes on the mothers' resistance to obstacles in confronting the disease.

## Methods

This study involved experimental and control groups, and was conducted using pretest and posttest. In this research, the experimental and control groups were evaluated twice, once before the start of training and once after completing the training. The diagram of the research is shown in Table 1.

### *Samples and Setting*

The statistical population included all mothers of male students in district 1 of Yazd in 2017-2018 educational year. The number of mothers was about 2,000.

Individuals were selected using multi-stage cluster sampling method. Among all male students in district 1, two elementary schools were randomly selected and from each school five classes and from each class three students were selected. Their mothers were contacted, and if any of them was not interested in the research, a replacement was selected. In total, 30 mothers were selected. These mothers were classified in two groups (each group involved 15 people).

### *Intervention*

In this research, a quasi-experimental

**Table 1:** Pretest and Posttest design with experimental and control group

| | Post test | Independent variable | Pre-exam | Random selection |
|---|---|---|---|---|
| Examination Group | T2 | X | T1 | R |
| Control group | T2 | | T1 | R |

T2: Posttest; R: random selection; T1: Pretest; X: Independent variable

method was applied. After receiving approval from the Vice Chancellor for Research and Ethics Committee of the University, the qualified participants were first selected. Then, after explaining the objectives of the study, written informed consent was obtained from the participants. Then they were individually randomized to one of two "parallel" groups; intervention group (training in a virtual-social educational environment) and control group (without intervention). To observe ethical guidelines, the groups were allowed to leave at any stage of the study if they did not wish to continue cooperation. All 30 subjects completed the study and the follow-up assessment.

At first a pretest of knowledge about diabetes and self-efficacy was given to all mothers who were qualified for the study. We trained all mothers of the experimental group during the 10 sessions of diabetes education, and the control group did not receive any interventions. In the experimental group, the mothers received training about diabetes in twelve 60-minute sessions. In these sessions we used the multimedia training tools and software such as Snagit and PowerPoint. The posttest was administered after the experimental group acquired sufficient knowledge about diabetes. The two groups were compared at the end of the posttest, and the data from pretest and posttest were analyzed in SPSS software. To analyze the data, descriptive statistics, mean, frequency and standard deviation were used. Covariance analysis was applied for inferential statistics using SPSS software version 25.

### *Data Collection Tools*

In order to collect research data, library studies and field method have been used. In this study, to evaluate the mothers' awareness we used the self-efficacy questionnaire developed by Sherer et al. (5), which is valid and reliable. To examine the mothers' knowledge about diabetes we used the Diabetes Information Questionnaire, which is available in diabetes treatment centers and general public. Standard questionnaires like the General Health Questionnaire (GHQ) and self-efficacy questionnaire were used, and their validity and reliability are already established (6-9).

### *Ethical Issues*

Prior to the start of the training program the researchers introduced themselves and explained the aims of the study. Written informed consent was obtained from all participants. They were also assured that all the collected information would remain confidential.

## Results

The descriptive findings of this study include statistical indicators such as mean and standard deviation of self-efficacy scores and their dimensions, which are indicated in Table 2.

### *Inferential Findings*

For statistical tests, following assumptions are considered:

- Dependent variable has interval scale
- Observations are independent
- Sampling method is random
- Variances are homogenous

It should be noted that the variables proposed in the study are spaced and their observations are completely independent. Sampling and replacement of samples were done in control and experiment groups in a completely randomized manner. In addition, in covariance analysis, synchronous variables should be specified. In this study, only the pretest effect is controlled as a synchronous variable (quartile) (11, 12).

### *Testing Hypotheses*

**The first main hypothesis:** A special virtual-social learning environment focusing on the awareness of mothers of male students would affect their awareness in this respect.

As Table 3 shows, after modifying Pretest scores, there was a significant difference between the two experimental and control groups in terms of the mean of knowledge. Therefore, the first hypothesis of the research

**Table 2:** Pretest and Posttest statistics of awareness and self-efficacy in experimental and control groups

| | | Groups | Level | Average | The standard deviation | Groups | Level | Average | The standard deviation |
|---|---|---|---|---|---|---|---|---|---|
| Awareness of diabetes | | The experiment | Pre-exam | 40 | 45.1 | Witness | Pre-exam | 39 | 07.1 |
| | | | Pre-exam | 70 | 24.2 | | Pre-exam | 42 | 14.1 |
| Efficacy | | The experiment | Pre-exam | 80.59 | 77.9 | Witness | Pre-exam | 40.62 | 06.10 |
| | | | Pre-exam | 53.71 | 08.18 | | Pre-exam | 33.61 | 81.10 |
| Dimensions | Willingness to reaction behavior | The experiment | Pre-exam | 56.13 | 84.2 | Witness | Pre-exam | 40.13 | 55.1 |
| | | | Pre-exam | 73.15 | 91.1 | | Pre-exam | 47.14 | 23.2 |
| | The desire to continue trying to complete the behavior | The experiment | Pre-exam | 07.11 | 31.2 | Witness | Pre-exam | 73.10 | 31.2 |
| | | | Pre-exam | 26.12 | 98.1 | | Pre-exam | 86.12 | 77.1 |
| | Resist obstacles to women's behavior | The experiment | Pre-exam | 08.12 | 54.3 | Witness | Pre-exam | 93.12 | 15.3 |
| | | | Pre-exam | 13.16 | 52.3 | | Pre-exam | 07.14 | 41.3 |

**Table 3:** Covariance analysis results of Pretest and Posttest's awareness scores. Knowledge of two groups with Pretest control

| Change source | Sum of squares | Degrees of freedom | Average squares | F | Significance level | Partial chute | Test power |
|---|---|---|---|---|---|---|---|
| Pre-exam | 257.961 | 1 | 257.961 | 139.772 | 0.001 | 0.436 | 0.997 |
| Groups | 58.246 | 1 | 58.241 | 31.560 | 0.001 | 0.833 | 1 |
| Error | 49.831 | 27 | 1.846 | | | | |
| Total | 7256.625 | 30 | | | | | |

is confirmed; in other words, the special virtual-social educational environment for raising awareness about diabetes has raised awareness in the experimental group. The effect or difference is equal to 0.833. In other words, 83.3% of the differences in the knowledge of the experimental group are related to the virtual-social educational environment for diabetes awareness. The statistical power of test 1 and the desirable level of significance ($P<0.05$) show the high accuracy of the test and the adequacy of the sample size. Considering that the results of the test showed that the scores of the experimental group were significantly increased in the posttest, compared with the control group, it can be claimed that in view of the constraints in experimental design, a special virtual-social learning environment for diabetes awareness improves the mothers' knowledge, and this hypothesis is confirmed.

**The second main hypothesis:** The special virtual-social learning environment has an impact on the self-efficacy of the male students' mothers.

Table 4 shows that there is a significant difference between the mean scores of self-efficacy of the two groups in the posttest stage

**Table 4:** Co-variance analysis of two groups in the posttest phase

| Change source | Sum of squares | Degrees of freedom | Average squares | Coefficient f | Significance level | Eta square | Test power |
|---|---|---|---|---|---|---|---|
| Pre-exam | 0.197 | 1 | 0.197 | 0.046 | 0.832 | 0.002 | 0.046 |
| Groups | 55.730 | 1 | 55.730 | 12.979 | 0.001 | 0.525 | 0.935 |
| Errors | 115.963 | 27 | 4.294 | | | | |
| Total | 1313.000 | 30 | | | | | |

**Table 5:** Analysis of covariance of willingness to reaction of two groups in the posttest phase

| Change source | Sum of squares | Degrees of freedom | Average squares | Coefficient f | Significance level | Eta square | Test power |
|---|---|---|---|---|---|---|---|
| Pre-exam | 1835.764 | 1 | 1835.764 | 187.923 | 0.000 | 0.79 | 1 |
| Post test | 523.948 | 1 | 523.948 | 29.198 | 0.001 | 0.52 | 0.999 |
| Errors | 484.503 | 27 | 17.945 | | | | |
| Total | 222687 | 30 | | | | | |

after the elimination of the Pretest (average adjusted) effect (P<0.01). The training effect size was 0.552. It means that almost 55% of the changes in the experimental group in the posttest were due to interventional training. The statistical significance of the test is 0.83 and the desirable level of significance (P<0.01) indicates the high accuracy of the test and the adequacy of the sample size. In the light of the fact that the scores of the experimental group in the posttest on self-efficacy were significantly increased compared to the control group, it can be claimed that in view of the constraints in experimental design, a special virtual-social learning environment for raising diabetes awareness increases student self-efficacy and this hypothesis is confirmed.

**First sub hypothesis:** The virtual-social-specific educational environment for awareness about diabetes affects the willingness to reaction the mothers of male students.

As shown in Table 5, after modifying the pretest scores, there was a significant difference between the two groups in the mean scores of willingness to reaction. The effect size of the training was 0.52, which means that 0.52 of the changes in the experimental group in the Posttest were due to the intervention. The statistical power of test 1 and the desirable level of significance (P<0.01), the accuracy of the test and the adequacy of the sample size are shown. The effect or difference was 0.52, which means that 0.52 of the changes in the experimental group in the Posttest were due to the intervention.

**Second sub-hypothesis:** A special virtual-social learning environment for diabetes awareness affects the desire to expand efforts among the mothers of male students.

Table 6 shows that there is a significant difference between the mean scores of the two groups in terms of their desire to expand their efforts in the posttest stage after eliminating the effect of the pretest (mean adjusted) (P<0.01). The training effect size was 0.87. This means that 87% of the changes in the experimental group in the posttest were due to the training intervention. The statistical power of the test is 0.96 and the significant level of satisfaction (P<0.01) indicates the high accuracy of the test and the adequacy of the sample size. Given that in the posttest the desire to expand the efforts in the experimental group was significantly increased compared to the control group, it can be argued that, in view of the constraints in experimental design, a special virtual-social learning environment for diabetes awareness increases the desire in mothers to expand their efforts and this hypothesis is confirmed.

**Third sub-hypothesis:** A special virtual-social learning environment for diabetes awareness has a significant effect on the mothers' resistance in the face of obstacles.

Table 7 shows a significant difference

**Table 6:** Analysis of covariance of desire to expand the efforts of the two groups in the Posttest phase

| Change source | Sum of squares | Degrees of freedom | Average squares | Coefficient f | Significance level | Eta square | Test power |
|---|---|---|---|---|---|---|---|
| Pre-exam | 0.649 | 1 | 0.649 | 1.029 | 0.308 | 0.36 | 0.16 |
| Post test | 6.533 | 1 | 6.533 | 5.867 | 0.004 | 0.87 | 0.96 |
| Errors | 17.618 | 27 | 0.653 | | | | |
| Total | 170.000 | 30 | | | | | |

**Table 7:** Resistance covariance analysis in confronting the obstacles facing the two groups in the Posttest phase

| Change source | Sum of squares | Degrees of freedom | Average squares | Coefficient f | Significance level | Eta square | Test power |
|---|---|---|---|---|---|---|---|
| Pre-exam | 1.050 | 1 | 1.050 | 3.266 | 0.05 | 0.108 | 0.414 |
| Post test | 6.681 | 1 | 6.681 | 20.774 | 0.000 | 0.435 | 0.992 |
| Errors | 8.683 | 27 | 0.322 | | | | |
| Total | 61.000 | 30 | | | | | |

between the mean scores of resistance in confronting the obstacles facing the two groups in the Posttest stage after eliminating the effect of Pretest (mean adjusted) ($P<0.001$). The training effect size was 0.453. This means that 43.5% of the changes in the experimental group in the Posttest were due to the training intervention. The statistical power of the test is 0.99 and the desirable level of significance ($P<0.01$) indicates the high accuracy of the test and the adequacy of the sample size; therefore, the hypothesis is confirmed.

## Discussion

Today virtual learning environment is a vital approach in any scope of education through the world and unfortunately sometimes it is not very noticeable in our researches. This approach is very effective in raising awareness of people in any filed. Diabetes is a very common and dangerous disease in the world especially Iran and Yazd. Strong research about the effect of virtual learning as an instrument for awareness of student's parent is completely ignored in previous researches and in this paper we designed this approach in Yazd for the first time.

In other words, in this study, a special virtual-social learning environment was designed and implemented for diabetes awareness. We have considered two main hypotheses and three sub-hypotheses. Statistical analysis demonstrated that special virtual-social learning environment affects awareness of diabetes. In addition, special virtual-social learning environment has an impact on the self-efficacy of male student's mothers. Also all the presented sub-hypotheses regarding the willingness to reaction, the desire to expand efforts and resistance in the face of obstacles were confirmed. All these developments were made possible by the virtual social-learning environment, and the mothers' awareness of the symptoms and complications of diabetes has substantially increased. Therefore, in view of the assessments in this study an educational program in a virtual environment can effectively increase the public awareness of a widespread disease like diabetes.

## Ethical Considerations

This study was approved by the Ethics Committee of the Meybod University. The following ethical issues were considered in this research:

This research was based on the data provided by library and field study.

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## Authors' Contributions

All authors have contributed substantially

to provide the research. All of them reviewed and developed the manuscript for submission and also read and approved the final version.

## Conflict of interests

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Interdisciplinary Journal of Virtual Learning in Medical Sciences

Letter to Editor

# The Role and Influence of "Clip Thinking" on the Educational Process in Medical Education

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## Dear Editor

Information technology has strengthened the role of information, leading to the fact that modern society has reached a new stage of development – information. A fundamentally new way of communication and information broadcasting called the "screen culture" is emerging. The information society influences the society of people, their training and management processes. This influence is transforming our thinking, and therefore such concepts as "human-screen", "clip thinking" and "clip consciousness" appear more often in the academic literature.

In connection with the informatization of education, there are risks of losing the creative culture-generating ability of entire generations. If the older generation still retains other forms of perceiving the information provided (comprehension, comparison, analysis, criticism, etc.), the younger generation, especially students, are rather inclined towards the dynamic and mosaic "clip", and receiving, processing and generating visual information, primarily educational.

"Clip thinking" as a phenomenon is a response to an increase in the amount of information. The media have developed a universal format for presenting information. Its essence is to submit a set of abstracts or clips without defining a context, since due to its relevance, the context for the thesis is objective reality. In other words, the universal format of the media makes audiences find some relevance in the events even if temporarily related, rather than factual. Society transforms into an "electronic society" or "global village" and defines a multidimensional perception of the world through electronic means of communication. The individual eliminates the need to remember information, take notes and comprehend it. He ceases to master the objects of knowledge, despite the fact that they are virtually accessible.

This specificity of memorizing an "electronic personality" entails parallel changes in thinking – the number of desired,

sought, significant and unknown objects is reduced. And the thought that has lost its problematic components ceases to generate thoughts, images, symbols, ideas.

The aim of the study is to analyze the role of "clip thinking" and its impact on the educational process in higher medical institutions.

First, we determine the positive and negative aspects of "clip thinking" and its impact on the learning process.

Positive aspects: 1) "clip" way of working with information adds dynamism to cognitive educational activity, and in dealing with a growing volume of educational material, it helps learners keep up with and complete the necessary tasks, at least formally; 2) "clip" behavior allows us to see the multidimensionality, multivariance and ambiguity of approaches to analysis, or to solve specific questions and tasks (such thinking helps audience to better understand the most diverse connections between phenomena and events); 3) "clip thinking" can be a protective mental reaction to information overload, enabling greater cognition and acceptance of a changing social reality.

Negative aspects: 1. The world around us turns into a mosaic of disparate, loosely connected facts, parts and pieces of information. Individuals become accustomed to the fact that they constantly replace each other, and are in constant need of new events (the need to listen to new music, chat, constantly "wander" the network, edit photos, watch movie clips, and play online with new participants). This significantly distracts them from the "core" occupation – learning. 2. The ability to analyze and build logical chains is lost, and the absorption of information resembles the consumption of fast food. 3. It is difficult for a clip-thinking individual to analyze the situation, since any information does not linger in his mind and is quickly replaced by new information. The success rate is falling and the level of knowledge assimilation declines. 4. For students "clip" is manifested more vividly. This is due, firstly, to the fact that they are in the "attention zone" of teachers who require them to read the sources and take notes, and when they do not, the search for interactive teaching methods and influence begins. Secondly, with the global informatization of society over the past ten years, the rate of information exchange has rapidly grown. This gives the student confidence by providing him with quick and easy solution to a difficult task: why go to the library to find a monograph on a topic, when it's enough to google it, and download from the network the very first information? (which almost never meets modern requirements), or openly tell the teacher: "Why prepare at home if you explain everything to us anyway?" This is clearly the manifestation of a consumer approach to learning.

Therefore, one needs to introduce alternative educational programs with new means of structuring and providing information. The program could include digitized textbooks with a multi-level structure, where the first level allows learners to spend twenty minutes reading a couple of dozen "paragraphs-clips" to become acquainted with the general idea, and each new question goes deeper, systematizing previously acquired knowledge. Books in this organized system will be studied up to the last level and will also undergo mandatory changes in quality.

This problem has become the reason for the development and implementation of a process of teaching methodological materials in higher education that would help fulfill this social request. For example, one can point to the methodological manual "Pedagogy of Higher Education: In Schemes and Tables" for the preparation of masters, which is compiled according to the curriculum with details of all topics and questions in them in the form of diagrams, figures, tables (1).

The same approach underlies the methodological support of the preparation of interns for qualifying exams (2).

We assume that the problematic situation of the modern educational space is that the teachers are mostly "book people" and the students (interns) are mostly "screen people"

and they need to learn to talk to each other and understand each other. In some countries the danger of "clip thinking" has come to notice, and special trainings are being developed where lecturers are advised to concentrate on one subject and maintain a state of concentration for a long time.

The most accessible method to minimize the negative impact of "clip thinking" is to read "non-clip" literature

Student (intern) interest in the learning process is a critical factor in the formation of "clip thinking". In a study titled "Prospects for optimizing the training of interns" (3), some interesting observations were made when comparing the results of questionnaires on thematic improvement. The questionnaires were completed by anonymous interns and cadets of cycles of specialization and internship. When they reported the training material in the cycles as "interesting" and "useful," the difference between the percentages was minimal 1.6±0.2%. For a doctor with practical experience, these two concepts are almost identical. For interns, this difference was 39.2±0.7%. This proves that a medical intern's perception of "interesting material" is fundamentally different from their definition of "useful material". In this case, the word "interesting" more closely matches the term "exciting". The definition of "useful" for them is inevitably necessary for something that is labor and time-intensive. In analyzing the questionnaires of interns, each year we noted a progressive decrease in the percentage difference between these definitions. In the academic year 2011-2012 was 7.2±0.2%, and in 2016-2017 it was already 6.1±0.3% (3).

It is advisable to make classes "outwardly attractive" by delivering courses in game forms, giving examples from own experiences, assigning engaging tasks with practical results, etc. A dialogue between the teacher and the interns should constantly take place. They should be given the opportunity to independently acquire (or consolidate) the necessary practical skills, master modern diagnostic research methods, as well as prepare theoretical material in the form of a presentation on a highly specialized topic and report to all interns with subsequent discussion.

The efforts of all participants in the educational process are directed towards self-development and realization of their own positive "I" concept. The educational process is designed to ensure the integrity of the formation of the professional and civic status of young assistants while maintaining the personality of each intern. This requirement is one of the important aspects of the formation of a socially mature personality of a professional in postgraduate educational system (4, 5).

Applying methods to enhance the interns' activities is the most important principle of training at the postgraduate level. The solution of diagnostic and medical tasks, problem situations and participation in educational games secures a highly professional training. The modern educational process actualizes the leadership qualities of young people, instilling in them a taste for progress and encouraging the study of the latest medical technologies.

One of the most important methods for improving the effectiveness of higher education is to optimize the interns' independent work (the planned work of interns is carried out during the instructions and with the methodological guidance of the teacher, but without his direct participation). This type of work is intended not only for mastering the discipline, but for acquiring the ability to take responsibility, independently solve a problem, find constructive solutions, and handle a crisis situation.

Therefore, "clip thinking" reinforces clinical thinking, supports the principles of medical deontology, and promotes the development of paramedic skills. This phenomenon requires detailed social, andragogic and medical research, and the creation of new educational technologies based on "live" communication. "Clip thinking" is not only the development of some cognitive skills at the expense of others, it is

now also a "child in the cradle", and the way it grows depends on ourselves.

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## Ethical Approval

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## Conflict of Interests

The authors declare that they have no conflict of interests.

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Letter to Editor

# The Role of Artificial Intelligence in the Future of Education

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## Dear Editor,

It is arguable that Artificial Intelligence (AI) is currently one of the hottest topics in technology. It is the subject of significant attention at technology conferences around the globe, and with the attention comes an increasing call to action for organisations across all industries to adopt a strategy towards AI implementation (1). Like any other new disruptive technology, there is a corporate race to lay groundwork, maintain market relevance, and keep up with the competition. The education sector is no exception to this, with current research predicting a 47.5% increase in the use of AI in education by between 2017 and 2021 (2).

There are many potential applications of AI in the education sector. AI can be used to automate or assist administrative work such as admissions and enrolment, and course-related tasks like grading and assessment. However, most experts agree that the impact AI will have on the future of education will likely extend beyond automation of existing teaching and learning processes, and will allow the development of intelligent learning systems that are able to adapt to best suit student requirements (3).

In 2020, we are likely to see a significant amount of AI and automation advance within the education sector. Applications of the technology include addressing accessibility and remote learning, developing more immersive and interactive learning approaches, customising and personalising education based on student requirements, and development of 'smart' schools through automation.

One of the basic human rights is the right to education. However, accessibility has always been a great challenge to this, given the limitations of remote learning programmes. With the increase in global online connectivity and the development of AI, quality education through remote learning is constantly improving (4). AI-based language translation also plays a major role in reaching indigenous groups in third-world countries and providing material in users' own language.

Interactive and immersive learning methods have been in development for several years now, with virtual and augmented reality applications being used to improve student engagement, and as a result enhance learner achievement (5).

One of the biggest challenges in education has always been catering to different learning styles and speeds. Advances in AI are presenting opportunities for personalised and customised teaching methods. China has taken significant steps in this direction through an organisation called. Squirrel (http://squirrelai.com), an AI tutoring system specialising in mathematics. In 2019, an estimated US$1 billion was invested in developing AI-based teaching and learning systems in China. As a result, the number of students using Squirrel's AI system is now in the millions.

The system assesses a student's existing level of knowledge, and through a series of tests can determine strengths and knowledge gaps, customising a curriculum specifically for the student. As the students progress through this curriculum, the system updates and adjusts material to suit their progress. It also recognises patterns and trends among multiple students, and can improve the way material is presented based on its success (6).

While most agree that the current developments in AI look promising, there are numerous challenges to overcome. The competition-fueled rush into AI could result in a trend of standardised learning. There also needs to be focus on developing AI strategy for education. There are also significant ethical concerns with the use of AI in this context, particularly around testing and development, and initial trials of more complex systems. Since AI systems are refined through mass data collection, the obvious ethics question is what type of student data is acceptable to be collected, and what measures need to be taken to protect student privacy (7). There is also the issue of algorithmic bias –unconscious bias at human level being 'coded' into AI systems – resulting in AI systems that are inherently biased.

In the near future, advances in AI will allow development of intelligent tutoring systems that could be available full-time, and could deal with thousands and even millions of students at the same time. The education publishing company Pearson has suggested a lifelong AI companion for students that will know strengths and weaknesses, and will be able to suggest study fields and career paths based on a student's academic ability or personality (8). Students needing assistance will no longer need to email a tutor, waiting sometimes days for a reply, instead they will be able to ask a virtual teaching assistant and receive instant replies. Facial and gesture recognition will be able to assess a student's level of attention, and understand when they need a break to make sure they are in the best position to retain knowledge. AI can be used to create smart content – digitizing guides for course textbooks, summarizing content for revision and developing revision exercises.

While there is still much work to be done on refining systems and approaches, the long-term future of education is exciting. It is hailed by many as exactly what our traditional education system needs, and will help provide every student of any skill level and ability with the best opportunity for success.

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## Conflict of Interests

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