

Original Article

The Role of Interactive E-Learning in Problem-Solving Skill and Independent Learning of Medical Students in Psychology Courses

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Abstract

Introduction: Today, due to the speed and amount of science production in the world, knowledge processing and learning is changing. In this regard, independent learning using new instructional methods interactively with a specific goal in order to dominate the content and assignments with self-regulation strategies is of great importance. This study is aimed to evaluate interactive e-learning role on medical students' learning in psychology courses.

Methods: This study is a experimental research project, in which 68 medical students were selected through available sampling method as the statistical sample. Heppner questionnaire was used to evaluate problem-solving skills, and a teacher-made test was used to evaluate independent learning. After intervention, data analysis was conducted using SPSS software and independent t-test and covariance.

Results: In general, there was no significant statistical difference between the groups' pre-test scores ($P=0.40$). However, covariance analysis on the groups' pre-test and post-test evaluations showed a significant difference regarding the superiority of the experimental group compared to the control group in problem-solving. In addition, students' mean scores in the teacher-made test in the control group was higher than that of the experimental group, and there was a significant statistical difference between the two groups ($P=0.003$).

Conclusion: Using interactive e-learning method for theoretical instruction of some medical courses provides more opportunities for teachers and students to learn the lessons at patients' bedside, and learning this skill by students enables them to benefit from scientific subjects. Hence, more appropriate infrastructure allows utilization of this method in some topics of medical field.

Keywords: Interactive e-learning, Independent learning, Problem-solving skill

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Introduction

According to the most recent meanings of the word "instruction" from educational psychologists' viewpoints, learners must construct knowledge in

their mind, and the teacher makes the information meaningful and understandable to learners. In fact, the teacher provides some opportunities for them to discover

and apply their ideas. In addition, the teacher through teaching this subject to learners of selecting their used strategies in learning consciously, facilitates the knowledge construction process for them. Today, e-learning is a new paradigm in modern education, and refers to a series of educational activities which are conducted using electronic devices and considered as a form of active and smart learning to change the teaching-learning process (1). Accordingly, computer-based learning environment helps people to achieve educational goals and provides the highest degree of control for learner (2).

In order to develop electronic learning environment (e-learning environment), three factors are considered: learners, educational structure and interaction between learner and teacher. In this regard, e-learning provides an opportunity for learners to play an active role and determine their educational needs to meet them. Therefore, students enjoy autonomy in learning and engage in complex tasks and problem-solving (3).

The main purpose of e-learning is scientific dominance over contents, since this type of learning is based on collaborative learning and students' comprehension and perception and leads to increase motivation, interest and understanding-based learning together with creating high academic motivation among students (4). Learners' main task in this type of learning is management, knowledge production and problem-solving (5).

The results of a study on nursing students showed that web-based learning is desirable for nursing freshmen, and students demanded courses in this way as this type of instruction improves their learning and allows learning with their desired speed (6).

In addition, interactive e-learning allows learning experiences quality improvement from content transmission to knowledge construction using a kind of cooperation that benefiting from this opportunity in designing e-learning is possible with transition from text transfer approaches, being an interactive approach with cooperation to construct knowledge (7). In independent learning, learning is done by the individual, and another person or institution's help and guidance is minimized. The individuals' role in instruction from learning "in any case" leads to learning "at any time", and this point is considered in informal education (8). In addition, learning prospect in knowledge-based society in 2020 is considered as access to appropriate knowledge and constructing appropriate knowledge by learning and technology science researchers (9).

Based on the current situation, instruction is faced with new tools and communicational environments today. Furthermore, recent advances in computer and information industry, together with the arrival of local, regional and international information networks especially internet, multi-media, and communication technologies provide new tools and methods for educational programs designers, planners and managers. Influence of new information technologies to educational centers (schools and universities), and even homes has changed simple relations between teachers and students in general, and users are faced with an extensive volume of information and knowledge (4).

Therefore, according to rapid growth of scientific productions, each educational institution is committed to transfer new scientific contents to its learners continuously. This will be achieved through coherent relationship between new scientific and research resources and target groups in instruction to change attitude and increase knowledge. Meanwhile, knowledge transmission and dissemination method and learning stability depend on appropriate selected technologies for learning (6). Therefore, in higher education in the country, e-learning development is necessary to achieve the Fourth Development Plan (knowledge-based development) (10).

Thus, e-learning utilization not only enhances students' learning motivation but also provides a deep understanding of scientific skills and strategies for them (11). Hence, according to information expansion in this era and greater access to different sciences, it seems that optimal use of interactive e-learning system is effective on students' academic achievement; in addition, this ability helps people to use the latest information in scientific fields, a topic of great importance regarding medical knowledge. Thus, in this study, the role of interactive e-learning on problem-solving skill and independent learning is investigated in order to provide more opportunities for teachers and students in clinical and therapeutic settings, and according to the key role of such instructions, the main problem of this study is to evaluate efficiency of new methods in education, especially in the field of medical education.

Methods

This is an applied study to be implemented through a experimental method. The statistical population consisted of students in Kermanshah University of Medical Sciences studying in the 2014-2015 academic year comprising of 68 students in the second semester selected using the available sampling method. The subjects were then appointed to experimental and control groups equally

through simple random sampling. Therefore, the two resulting groups were similar, and measurement of the dependent variable was conducted at the same time and under similar conditions. Heppner questionnaire was used to assess problem-solving skills. This questionnaire measures understanding of problem-solving, and its objective is to evaluate individuals' imaginations regarding problem-solving ability rather than their actual skills. This questionnaire consists of three components: Problem-Solving Confidence (PSC), Approach Avoidance Style (AAS), and Personal Control (PC), which are obtained based on factor analysis. PSC is defined as self-confidence in problem-solving, and a low score in this component indicates that the individual believes in his/her problem-solving capabilities. The AAS is defined as general attitude toward the distance from problem-solving activities, and PC component indicates the extent to which a person believes that he/she is under his/her emotions and behaviors control in problem-solving (12).

The applied questionnaire includes 35 items (confidence component with 11 items, approach avoidance style with 16 items, personal control with 5 items, and 3 items were considered for research objectives) which are scored on a 6-option Likert scale: fully agree, agree to some extent, agree, disagree, disagree to some extent, and fully disagree (13).

The validity and reliability of the Heppner questionnaire is reported between 0.83 to 0.89 based on two implementations in two weeks. Moreover, according to obtained alpha coefficient (confidence in problem-solving 0.85, approach or avoidance problem-solving activities 0.84, emotions and behaviors control in problem-solving 0.72), factors enjoy a desirable and acceptable internal consistency with the validity being approved using factor analysis statistics methods (14).

The teacher-made questionnaire was used to assess independent learning of the lessons presented in this study for both groups. In order to execute the plan in the first session, people were randomly allocated to the experimental and control groups, and the first measurement with Heppner questionnaire acted as the pre-test to determine students' problem-solving skills. In addition, the lesson plan, which was related to a topic of general psychology, was arranged using the comments of experts and professors in Department of Clinical Psychology in Kermanshah University of Medical Sciences. Then, a classroom session was held according to the previous practice with the teacher for the control group, and in order to avoid bias, in the computer center, contents were made available in the site for the experimental group. Students in the experimental group

received lessons using e-learning system of university, so both groups enjoyed the same curriculum and similar purposes. After intervention in the third session, the second measurement of problem-solving skill was conducted as the post-test, and independent learning measurement was conducted using the teacher-made questionnaire. Collected data from the experimental and control groups in the form of the pre-test and post-test of Heppner questionnaire were entered to the SPSS software version 17 to assess the problem-solving skill. The scores from the teacher-made questionnaire were also entered to the same software to measure and compare independent learning. Data were analyzed using qualitative analysis of covariance and t-test.

Results

The number of male and female students in both groups was equal with an age range of 21-29 years with a mean of 21.10 ± 2.20 . According to Table 1, the results of covariance analysis test after pre-test effect adjustment show that interactive e-learning approach has a positive effect on self-confidence in problem-solving, and the significant effect of this teaching method was confirmed ($F=3.913$, $P=0.043$). Considering Eta coefficient, this method explains 4 percent of post-test score variance after prior knowledge effect adjustment. The results of covariance analysis test after pre-test adjustment also show that the interactive e-learning method has a positive effect on approach-avoidance problem-solving activities in psychology courses, and the significant effect of this teaching method ($F=5.449$, $P=0.023$) was confirmed. Considering Eta coefficient, after prior knowledge effect adjustment this method explains 7 percent of post-test score variance in approach-avoidance problem-solving activities. In addition, These results show that interactive e-learning method has a positive effect on control personality during problem-solving, and the significant effect of the teaching method was confirmed ($F=9.122$, $P=0.04$). Considering Eta coefficient, after prior knowledge effect adjustment this method explains 12 percent of post-test score variance in control personality during problem-solving activities.

In Table 2, the mean score of students' perception of problem-solving skill is shown in general and according to self-confidence in problem-solving, approach-avoidance style and control personality in the studied groups for the pre-test and post-test. Accordingly, the range of scores of the confidence component in problem-solving was 11-66, while it was 16-96 for the approach-avoidance style component and 5-30 in the personality control component. The total problem-solving skill ranged between 35 and 210.

Table 1. Interactive e-learning effect on different problem-solving components in studied groups

Component	Change resource	SS	MS	F	P	Eta
Self-confidence	Pre-test	1526.086	1526.086	57.463	0	0.473
	Group	77.371	77.371	3.913	0.043	0.044
	Interactive effect	2.777	2.777	0.105	0.747	0.002
Approach-avoidance	Pre-test	4189.126	4189.126	91.968	0	0.590
	Group	24.222	24.222	5.4449	0.023	0.078
	Interactive effect	6.236	6.236	0.137	0.713	0.002
Control personality	Pre-test	445.653	445.653	62.330	0	0.493
	Group	65.220	65.220	9.122	0.04	0.125
	Interactive effect	19.543	19.543	2.732	0.103	0.041

Table 2. Mean and standard deviation of medical students' scores regarding their problem-solving skill in the studied groups

Group Component	Test	Experimental group	Control group
Self-confidence	Pre-test	26.82±6.51	29.44±7.41
	Post-test	50.32±7.30	44.79±6.77
Approach-avoidance	Pre-test	45.85±12.00	46.65±10.13
	Post-test	75.59±10.48	61.91±10.38
Control personality	Pre-test	14.30±4.02	14.82±3.54
	Post-test	25.18±2.90	21.79±4.33
Total	Pre-test	95.79±22.44	100.18±20.40
	Post-test	169.97±20.85	147.35±19.79

The results of covariance analysis test after pre-test effect adjustment show that interactive e-learning method has a positive effect on problem-solving skill, and the significant effect of the teaching method was confirmed ($F=3.945$, $P=0.033$). Considering Eta coefficient, after prior knowledge effect adjustment this method explains 1 percent of problem-solving activities score variance (Table 3).

Mean scores of the students participating in the teacher-made test was $17.23±1.77$, and this mean in the experimental group was $16.60±1.46$, which was less than the students' mean scores in the control group ($17.87±1.85$). The difference was statistically significant ($P=0.003$) (Table 4).

Table 3. Effect of interactive e-learning on problem-solving skill in the studied groups

Change source	SS	MS	F	P	Eta
Pre-test	2246.622	2246.622	5.752	0.019	0.082
Group	368.909	368.909	3.945	0.033	0.015
Interactive effect	1.918	1.918	0.005	0.944	0

Table 4. Mean score and standard deviation of medical students' scores in the teacher-made test for the studied groups

Group	Mean	Standard deviation	Test result
Experimental group	16.60	1.46	P=0.003
Control group	17.87	1.85	
Total score of teacher-made test	17.23	1.77	

Discussion

The present study revealed that using interactive e-learning method has a positive effect on problem-solving, and the significant effect of this teaching method was confirmed. In addition, it was indicated that using interactive e-learning has a positive effect on approach-avoidance problem-solving activities, confirming the significant effect of this teaching method. It was also determined that using interactive e-learning has a positive effect on control personality during problem-solving emphasizing the significant effect of the teaching method. These results were consistent with Lazakidou & Retalis and Serin et al. results (14, 15).

Comparison of the results of the pre-test and post-test of the studied groups showed that there is a score superiority in each group regarding post-test scores compared to the pre-test. This superiority was obtained in the experimental group compared to the control group, but there was no similar study to compare the results.

The results showed that using interactive e-learning method has a positive effect on problem-solving skill, confirming the significant effect of the teaching method. These results were consistent with Lazakidou & Retalis, Serin et al. and Yaghoubi et al. results regarding increased components of problem-solving skills, approving the significant statistical effect (14, 15, 16).

This research indicated that using interactive e-learning has no positive effect on students' independent learning, and the significant effect of the teaching method was not confirmed. These results were consistent with Yu and Park & Choi results and indicated students' academic failure in e-learning (17, 18).

In addition, findings of Farahani study were not consistent with the results of this study, since in his study increased learning was reported based on the web. One of the academic failure reasons is that this kind of education is new, and it was expected to reduce this failure over time. However, with development of network infrastructures, internet access is significantly provided to learners and teachers (19).

Conclusion

Given the importance of developing better thinking skills in web-based learning and appropriate learning environment to conduct dynamic and challenging activities, in order for learners to gain significant knowledge and use their cognitive abilities, the use of this technology in the teaching and learning process is emphasized in all sciences today. Since instructions based on new

technologies have eliminated many inefficiencies in traditional educational systems and have led to fundamental changes compared to the traditional instruction, replacing virtual education concept with the traditional instruction is now one of the most promising and most growing development achievements. Since technology can support problem-solving issues and creative thinking by applying troubleshooting strategies, and since scientific developments in the field of medicine like other scientific fields is progressing rapidly, coordination of the university system with new educational methods and using these method opportunities is of great importance and can be effective in education and students' advancement.

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