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THE BLENDED EDUCATIONAL PROGRAM AS A MODIFIED EDUCATIONAL PROGRAM IN MEDICAL EDUCATION AND THE EFFECT ON STUDENTS' CRITICAL THINKING

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Introduction

One of the most important challenges of education in the twenty-first century is how to train students in having necessary readiness for confronting the changing society and complexities of the information explosion age. "In addition, the professional world asks the universities to provide formative opportunities that train students to fulfill their roles as working professionals," (Ugarte & Naval, 2008).

Today, teaching and learning are mostly supported by digital material and electronic communication. At present, Web-based learning (WBL), problem-based learning (PBL), and collaborative learning are the most powerful educational options in higher education. New teaching methods and especially electronic learning is on the top of the educational curriculums of all countries and mainly the advanced countries. (Henrich & Sieber, 2009; Taradi, Taradi, Radic, & Pokrajac, 2005).

New pedagogical paradigm is replacing the classical system with its unique characters (Gerreson & Anderson, 2003; Brower, DeJone, & Stout, 2004). Therefore, it gives priority to using some techniques which can develop maximum learning for the students and provide a deeper learning by using the benefits of both conventional and new methods.

In order to respond to these requirements, blended learning has become increasingly popular and is particularly suitable to the process of transitioning towards E-learning from classical forms of teaching. (Hoic, Mornar, & Boticki, 2009).

Abstract

Introduction: Blended learning is a mixture of various learning strategies and delivery methods to optimize the learning experience of the users.

Objectives: The objective of this study was to compare a designed blended educational method with classical face to face method in the cognitive effect of the program on the students' critical thinking.

Methods: A comparative study was conducted on 41 first year nursing students of Jahrom University of Medical Sciences who participated in the psychiatry course in 2008–2009. The students were randomly divided into two groups of conventional and blended educational methods. The Watson Glazer test was used for assessment of critical thinking.

Results: There was a significant increase in student's critical thinking skills in both groups after conducting of the course. Analysis of variance results showed that there was a significant relationship between students' final score, teaching method and critical thinking in conclusion skills. The mean of final scores of the students who participated in the blended educational group was significantly more than that of those who participated in the face to face teaching approach.

Conclusion: The use of blended educational method is recommended for teaching in Medical and Para-medical sciences.

Key words: Face to face education, Critical thinking, Educational Psychology, Active Learning, Computer Uses in Education, Academic achievement

Blended educational method has been widely studied and its mechanisms explained by different research (Valiathan, 2002; Harvey, 2003; Allison, Felicia, & Rebecca, 2008; Michael & Renate, 2003; Rossett, 2003). The available evidence demonstrated that blended learning is better than conventional methods and the E-learning technology and is not only able to transfer information more efficiently but it is also a more effective pedagogical method (Alvarez, 2008).

Much research has been accomplished on the effects of blended education learning on the various aspects of Students' learning, so that some research reflects a combination of both traditional learning (face to face) and electronic learning has influence on student's learning. For example, Reynold maintains that the advantage of using blended education learning especially electronic learning for training dentists is their deep understanding of subjects, so that most students preferred the blended education learning to the conventional learning and they consider the blended education learning as a successful experiment for themselves (Chamberlain & Reynolds, 2007).

Valiathan considers the blended education teaching as a very successful method for teaching anatomy and they think that it is more effective than the traditional teaching (Valiathan, 2002).

Some researchers remarked that the blended education learning derives its success from the acquaintance of students with electronic learning and participatory and collaborative learning in which both hardware and software topics are of great importance and pedagogical bases are ready for using it (Oh & Park, 2009). This method could decrease the gap between theoretical and practical subjects (Sung, Kwon, & Ryu, 2008). Others showed that electronic learning as a supporter of traditional learning could play a role in bolstering the learning of students (Kay, 2006).

Others demonstrated the achievements of the electronic learning of the students in instructing medical sciences. They found that some considered this kind of learning as effective, and others thought that it was not effective because of its maladjustment with their learning methods (Watson & Glaser, 1998).

One research on instructing on medicines for knowledge advancement, one's self-efficiency and its practical use in the clinical skills showed that information and knowledge of nurses increased remarkably, but this issue didn't have any significant effects on self-efficiency and practical use in the clinical skills (Magnusen, 2000).

Key, 2006 applied it to the students taking the unit of physiology. Their research showed that there were not any significant differences between the final scores of students in both traditional and blended education groups; the blended education learning could help students deepen their perceptions of subjects and increase their understanding of practical units in the laboratory. This issue was found by evaluating the relationship between students' practical scores and degree of their learning through blended education learning (Kay, 2006).

Owing to the rapid evolution of science and knowledge in different fields, it is possible to present effective teaching through new methods providing deep and fast learning.

Considering medical courses are an integration of theoretical and practical parts and psychomotor domain it is of great importance because working in the clinical environment, it is necessary to have regard for electronic learning through novel and different methods. Also concerning the positive aspects underlined in different research and lack of studies about its cognitive effects between research accomplished inside and outside of the country, we evaluate these

effects and use the aforementioned pedagogical methods to make a teaching culture and deepen learning of students and introduce unknown effects and aspects of this kind of teaching and plan the path of future research in other fields.

We hope this research can provide a dynamic ground for studying the pedagogical research in the field of medical sciences and also the results of this research can be used by our researchers for attaining a better education.

Methods

A comparative study was conducted among 41 nursing students of Jahrom Medical Sciences medical school who participated in the course of psychiatry in the academic year 2008 -2009.

Blended learning is a novel method, based on the conventional and electronic methods of teaching. We considered the organization of the class to encourage critical thinking to attain a balance between the content and the process of education, between lecture and interaction, create discussion in the class and use a student center in learning via assignments and educational projects.

In the conventional method, we used the common methods of lecture and face to face education during the term. In the blended group we used the standard educational designed models and the educational process was started using lectures and face to face education; this procedure was maintained by the aid of active teaching and learning while venturing to e-learning, electronic self - learning and Asynchronous virtual learning as personal or collaborative projects.

To design this research, the students were randomly divided into two 20 and 21 member groups according to their students' numbers and orienting the empirical groups to reduce resistance to involvement in active education, we used face to face education to present the basic

Face-to-face tutorials based on active learning	12 x 2 hours
Researching, reading, planning, designing ideas	Over 10 weeks
Online reflective journal entries	1 per week x 12 weeks
Asynchronous discussions	3 per week x 12 weeks
Evaluation	12 week

Table 1: Activities in the blended model

principles and it was maintained by active educational techniques such as PBL, scenario, writing simulation, group discussion and role playing (12 two hour weeks). Then it was maintained by asynchronized electronic education such as self=electronic learning via digital libraries and scientific sources, presenting abstracts of scientific essays from the latest relevant sources by the student (12 two hour weeks, the last 15 each of session). Students contacted with the teacher by email (during the term and before each session), and using educational films and CDs.

In the other group we used other usual teacher-centered methods and for preventing the impression of selection and abiding to the ethics of education, we gave an extract of the material presented by the empirical group to the students who received traditional education after the final exam.

We also explained to respective groups at this time how to use the electronic sources. Students in both groups were randomly distributed and the midterm and final exams were taught identically. In educational designing of the research we considered the standard educational design and the following steps for designing and practicing blended education. These steps consisted of assuring the learner preparation (justification of education type), presenting the material (using active educational strategies mixed with online education), displaying the working mechanism (searching sources and digital libraries' systems supporting the student's learning), practice (giving feedback), evaluation, (comparative, summative, individual and group conferences and presenting scientific essays),

providing support (access to online system and professional service for digital sources), and supervising the student learning and sustaining communication with emails and cooperation in learning (Kay, 2006).

The test used in this research was a normalized version of Watson Glazer Critical Thinking Test, which contains eighty general questions in five parts: comprehension skill, recognition of pre-assumptions, conclusion skill, interpretation, and evaluation skill (Magnusen, 2000; Watson & Glaser, 1998). This test was normalized in Iranian society (Islami, Shekarabi, Behbahani, & Jamshidi, 2004). The students were examined pre and post test, and their academic achievements were measured by comparing the scores of the two groups.

The difference between the score of critical thinking in pretest and posttest was studied by a quantitative evaluation so that the scores below 54, the scores between 55- 60 , and the scores between 61 - 80 were considered as weak, average, and strong respectively (Magnusen, 2000).

A qualitative analysis was performed to investigate the degree of students' satisfaction by open questionnaire. As a normal distribution of variable , we used Paired t-test to compare mean scores in the pretest and posttest result; student t-test was used to compare the differences of mean scores in the two groups of traditional and blended teaching and chi-square and analysis of variance to assess interaction between variables.

Results

Through the qualitative study by open questionnaire, we evaluated students' satisfaction in the two groups. Students who were in the blended educational group 20 (93.8%) were satisfied with this kind of teaching. They believed that this kind of teaching approach could provide in-depth learning, improve their knowledge (n=19), facilitate access to the essential sources (n=13), and provide more self-learning (n=16). They also mentioned that it was a user-friendly method (n= 8). Also (83.7%) of the conventional group were satisfied with teaching, but there were no significant differences between them.

Table 1 illustrates that the mean scores of critical thinking skills changed in both groups. However the mean of scores of the evaluation factor decreased in both groups, with more decrease in the conventional group.

The result of Paired t-test in blended groups shows that there is a significant difference between perception skills (P = 0.005).

Conventional group pre test and post test showed a significant relationship between means of data in recognition of pre-assumptions, conclusion and interpretation. Mean of evaluation score decreased significantly in the posttest. (10.68 ± 1.70 in pretest vs. 80.06 ± 1.43 in post-test) (p = 0.001).(Table 2 - top pf next page)

Moreover, the student t-test didn't show any significant differences between the mean of critical thinking skills in both educational groups. It clarified that both kinds of teaching played the same role in the

Critical thinking	Blended group				Traditional group			
	Before	After	T	P	Before	After	T	P
Perception	3.44±1.58	5.61±2.19	3.19	0.005	5.31±2.21	5.06±1.98	3.41	0.73
Recognition of Pre-assumption	9.57±2.34	10.21±1.35	1.10	0.28	8.31±2.28	10.06±2.07	2.50	0.02
Conclusion	10.11±3.08	10.27±1.52	1.83	0.85	9.18±2.42	10.93±1.48	2.28	0.003
Interpretation	9.36±2.19	9.84±1.16	0.67	0.50	7.43±2.22	10±1.75	401	0.001
Evaluation	9.78±2.04	9.05±3.32	0.64	0.46	10.68±1.70	8.06±1.43	4.11	0.001

Table 2: The Mean Score Of Critical Thinking Skills before and after Education in the Two Groups

improvement of students' critical thinking. Mean of perception, recognition of assumption and evaluation in the blended group was higher than the other group. Table 3.

Critical thinking skills	Conventional	Blended	T	P
Perception	5.31±2.21	5.61±2.19	0.39	0.69
Recognition of assumption	10.06±2.01	10.21±7.32	0.258	0.79
Conclusion	10.93±1.48	10.26±1.48	0.16	1.34
Interpretation	10±1.75	9.86±1.16	0.318	0.75
Evaluation	8.06±1.43	9.05±3.32	1.10	0.25

Table 3 : Differences Between Mean Of Critical Thinking skills In the Two Groups

As a scoring of test we consider the scores below 54, the scores between 55- 60, and the scores between 61 - 80 were considered as weak, average and strong respectively. (22)

The difference between score of critical thinking in the pretest and posttest showed that the difference of means was significant in the blended education group (4).

Educational group	Before	After	T	P
Blended group	41.51 ± 6.10	44.96 ± 5.61	2.45	.002
Classical group	42.29 ± 5.69	45.52 ± 5.88	1.53	154

Table 4 : Differences Total Critical Thinking in the two Groups Before And After Teaching

Analysis of variance results showed that there was a significant relationship between students' final score , teaching method and critical thinking in conclusion skill. (Table 5).

Dependent variable	Critical thinking skills	Source	Mean	DF	Sum of square	F	P
Student final score	Perception	Group	5.79	16	5.79	1.18	0.19
		Group & skill	4.84		29.09	0.53	0.22
	Interpretation	Group	10.1	1	10.7	2.22	0.14
		Group & skill	2.12	4	4.49	0.24	0.90
	Conclusion	Group	20.49	1	20.49	4.8	0.03
		Group & skill	0.51	5	2.58	0.12	0.04
	Recognition of pre-assumption	Group	15.76	1	15.76	4.01	0.057
		Group & skill	6.33	4	25.34	1.61	0.20
	Evaluation	Group	8.91	1	8.91	2.87	0.10
		Group & skill	8.19	5	40.94	2.64	0.58

Table 5 : The Effect Of Education On Student Critical Thinking By Analysis of variance

We used chi square test to compare the strength of critical thinking in educational groups after teaching. These results revealed that there was significant differences between the evaluation skills in the two educational groups. ($\chi^2=0.04$, $p=0.03$). As a result students who received blended learning 'were significantly stronger' than those in the conventional group in evaluation skills.

There was a significant difference in the final score of students' in the conventional and blended groups; blended teaching had more effects on the improvement of students' final scores.(Table 6)

Student's final score	Mean	T	P
Blended group	15.67(1.65)	3.06	0.004
Classical group	13.88(2.06)		

Table 6 : Difference of Final Score in Educational Groups

Discussion

The result finding of this study showed that 93.8% of blended group and 83.7% of conventional group were satisfied with the teaching method. Some research states that most teachers have a positive attitude towards blended instruction as they believed it played a role in improving the quality of their instruction (Kay, 2006 ; So & Brush, 2008). Others stated that most of students have a positive perception and satisfaction toward blended learning so that this method effects student self regulation, student perceptions of collaborative learning, social presence and critical factors (So & Brush, 2008; Kim, Bonk, & Teng, 2009). However some research revealed that the perceived communication, collaboration, and satisfaction levels of students in blended learning varies according to their levels of computer and Internet literacy(Rossignol, 1997).

The results of investigations confirm the present research and affirms the impact of blended learning on the students' attitudes and satisfaction.

Conventional teaching also had a positive effect on students' satisfaction and improved critical thinking skills of students in the present research. Much evidence revealed that lecturing and teacher centered method is more effective in presenting the background and introduction to a topic or

issue.(Owens & Walden, 2001) The impact of conventional method on students' critical thinking may be related to students' tendency toward teacher-centered learning and provision of reliable information by teachers that leads to the promotion of critical thinking skills.

This study revealed that blended educational method has an effect on improving critical thinking skills; a similar finding was reported from other studies (Marinick, 2006; Tiwari & Lai, 2006; Gokhale, 2006; Staib, 2003; Badawi, 2009; Campbell, Gibson, & Hall, 2008). Others reported the positive effect of blended learning in developing prospective pedagogical knowledge and performance (Mongust, Fabregas, & Delgado, 2000).

This study did not find any significant difference in students' critical thinking in blended method and conventional method. This finding was in agreement with a similar finding (Rossignol, 1997).

Furthermore, the results showed that the blended teaching had more effects on student learning. This may be due to the identified relation between web-centered teaching based on problem solving skills, self directed learning and improvement in students' attitudes about learning (Taradi et al., 2005; Campbell et al., 2008; (Delialioglu & Yidirim, 2009). This result agrees with the present result, and confirms educational

effects of blended learning on cognitive aspects of students.

This research also showed that we can profit by the integration of conventional and electronic methods as a synergic effect to increase students' satisfaction and provide deepened learning, self directed learning and self monitoring. This integration in turn effects students' learning, critical thinking and academic achievement in a positive way.

As a limitation to the present research we can point to the lack of electronic infrastructures and unfamiliarity of teachers with new strategies especially for electronic learning; we need more information about effectiveness of this method by further research. We need also greater responsibility and commitment on the part of higher education managers in order to provide electronic infrastructures to assess the application of this novel method in our country.

Conclusion

The study showed the positive effect of blended learning method on learning, critical thinking and satisfaction from teaching- learning strategies. Therefore the use of blended educational method is recommended for teaching in Medical and Para-medical sciences.

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