



Critical thinking skills of preservice teachers in the blended learning environment*

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Abstract

The purpose of this study is to examine the effects of blended learning environment which supports the course management system on the critical thinking skills of students. The model of the study is pretest, posttest single group model. There are 44 Preservice Teachers who attending the course of Design And Use Of Instructional Material in the Department of Computer and Instructional Technology Education of Faculty of Educational Sciences at Ankara University in third grade who constitute the study group. In this study, Watson-Glaser Critical Thinking Appraisal Test, which consists of 100 items, was used to collect data. The test was developed in 1964 by Watson and Glaser. The test was translated into Turkish by Demirtaşlı-Çikrikçi in 1996. Analysis results indicated that the ranges of internal consistency of the subscales are interval from .20 to .47 and the total correlation coefficient is .63. The course consists of 5 weeks. At the beginning of the semester, preservice teachers' WGCTA scores were obtained. In the environment of blended learning, the course is supported to chat rooms and forums. After 5 weeks, preservice teachers were asked to do the test again and the critical skills of the students were examined. The data was analyzed through paired sample t-test to compare the results of pretest posttest scores, as well as descriptive statistics. There was no significant difference between pretets and posttest results.

Keywords: Critical thinking skills, blending learning.

* This article was presented at the World Conference on Education Sciences, February 04-07, 2009, North Cyprus.

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Harmanlanmış öğrenme ortamının öğrencilerin eleştirel düşünme becerilerine etkisi*

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Özet

Eğitim teknolojisindeki gelişmeler ışığında değişen eğitim sistemi, öğrencilerin öğretim sürecine etkin katılımının yanı sıra problem çözme, eleştirel düşünme gibi becerilere sahip bireyler olarak yetişmelerini amaçlamaktadır. Eleştirel düşünme; akıl yürütme, analiz ve değerlendirmeye gibi zihinsel süreçlerden oluşan bir düşünme biçimidir. Bu bağlamda araştırmanın amacı, ders yönetim sistemi ile desteklenmiş harmanlanmış (blended) öğrenme ortamının öğrencilerin eleştirel düşünme becerilerine etkisini belirlemektir. Araştırmanın deseni ön test-son test tek gruplu desendir. Çalışma grubu, Ankara Üniversitesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Anabilim Dalı'nda üçüncü yarıyılıda Eğitimde Materyal Tasarımı ve Kullanımı dersini alan 48 öğrenciden oluşmaktadır. Araştırmada veri toplama aracı olarak, ön test ve son test olmak üzere iki aşamada 100 sorudan oluşan Watson-Glaser Eleştirel Akıl Yürütme Ölçeği kullanılması kararlaştırılmıştır. Ölçek, analitik ve mantıksal olarak öğrencinin ne kadar iyi düşünülebildiğini ortaya çıkarmayı amaçlayan; Çıkarsama, Varsayımların Farkına Varma, Tümdengelim, Yorumlama, Karşı Görüşlerin Değerlendirilmesi olmak üzere 5 çeşit testi içermektedir. Ölçek 1980 yılında Watson ve Glaser tarafından geliştirilmiştir. Bu ölçeğin Türkçeye uyarlanması Demirtaşlı-Çıraklı (1996) tarafından yapılmış. Yapılan çalışmada, ölçeğin alt testlerinin iç tutarlılığında 0.20 ile 0.47 arasında değişen korelasyon katsayıları elde edilmiş, testin bütününe ilişkin korelasyon katsayısı ise 0.63 bulunmuştur. 11 haftadan oluşan dönemin başında öğrencilerin ders yönetim sisteminde yer alan ölçüye cevaplamları istenmiştir. Harmanlanmış öğretim ortamında dersin işleniği ders yönetim sisteminde yer alan forumlarla, canlı sohbetlerle desteklenmektedir. Dönem sonunda öğrencilerden ölçüye tekrar cevaplamları istenecek ve eleştirel düşünme becerilerinin gelişip gelişmediği belirlenecektir. Verilerin analizinde betimsel istatistik tekniklerinin yanı sıra ön test ve son test arasındaki farkın anlamlılığını sınmak için t-testi kullanılacaktır. Elde edilen bulgulara dayalı olarak varılan sonuçlar belirtilecek ve sonuçlara dayalı öneriler geliştirilecektir.

Anahtar Kelimeler: Eleştirel düşünme becerileri, harmanlanmış öğrenme.

* Bu makale Uluslararası Eğitim Bilimleri konferansında bildiri olarak sunulmuştur. 4-9 Şubat 2009, Kuzey Kıbrıs.

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Introduction

The aim of educational system which changes according to the enhancements in educational technology is to make students more active in the learning process, as well as make them as people who have skills such as critical thinking, problem solving etc. Critical thinking is a thinking skill which consists of mental processes of discernment, analysis and evaluation. Blended Learning is learning which combines online and face-to-face approaches. By means of online discussion forms, teachers can monitor the class discussions. These discussions help teachers identify topics that need clarification or that have captured the interest of students, and they can use the insights gained by them to structure class time. Also, if teacher use the Web discussion area to address some of the more straightforward student questions, they can make better use of class time.

What is Blended Learning?

While many education courses traditionally delivered within a classroom environment consisted of brick and mortar, online learning have grown up recently. As well as information age have been developed, to use so many techonological innovations for educational system become widespread. Online learning has become the norm rather than the exception for many of today's students.

Online technologies could offer us the opportunity to do more than simply teach our content matter, but can also be used as a means to develop students' thinking practices. When student progress and teacher ability are being questioned, it is important that colleges of education look for new ways to improve the performance of teachers in future classrooms (Anderton, 2006).

Nowadays, researchers suggest that rather than delivered instruction just online, it should be forced with traditional learning. So, blended learning developed as an alternative learning environment. Blended learning has been referred to as the "third generation" of distance education systems. The first generation was correspondence education which utilized a one-way instructional delivery method, including mail, radio, and television. The second generation was distance education with single technology, such as computer-based or web-based learning. The third generation is blended learning, characterized as maximizing the best advantages of face-to-face learning and multiple technologies to deliver learning

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(Phipps and Merisotis, 1999; as cited in So and Brush, 2008). In general, blended learning means any combination of learning delivery methods, mostly including face-to-face instruction with asynchronous and/or synchronous computer technologies. Hybrid learning is another term which has been used synonymously with blended learning (So and Brush, 2008).

Owston, Sinclair and Wideman (2006) examined two one-year Professional Development Programs for 133 middle school mathematics or science/technology teachers that employed the blended model (TeL—Teacher eLearning Project). The implementation model of the program employed 2–3 modules. Each module had a specific theme and consisted of face-to-face sessions followed by online sessions. Special expert teachers were hired to facilitate the online discussions. The results indicate that the program positively affected teachers' attitudes, content knowledge and motivation to transform practice. Nevertheless, while there was a general feeling that the face-to-face component was extremely valuable, there was a mixed reaction towards the online sessions, with a weak participation rate in reflective biweekly task.

What is Critical Thinking?

In the information age with the changing life conditions, in all aspects of life especially in the business world, critical thinking skills have gained great significance. Critical thinking is not a luxury but a requirement that should not be neglected. One of the greatest experiences for students in higher education is to have the opportunity to think freely and challenge other students' ideas with their own. Aim of the higher education is to teach and develop student's critical thinking skills. Gough (1991) indicated the significance of teaching thinking skills as (as cited in Cotton, 2001), "perhaps most importantly in today's information age, thinking skills are viewed as crucial for educated persons to cope with a rapidly changing world. Many educators believe that specific knowledge will not be as important to tomorrow's workers and citizens as the ability to learn and make sense of new information". On the other hand, most scholars can agree that one aspect of critical thinking is the ability to analyze, understand, and evaluate an argument. First hypothesis is that students actually are improving their abilities on online discussions, chat, and face to face discussions. Critical thinking may be difficult but it certainly is not impossible (Gelder, 2005).

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Watson and Glaser (1980) defined critical thinking as a composite of attitudes, knowledge and skills which includes attitudes of inquiry that involve an ability to recognize the existence of problems and acceptance of general need for evidence in support of what is asserted to be true knowledge of the nature of valid inferences, abstractions and generalizations in which the weight or accuracy of different kinds of evidence are logically determined and skills in employing and applying the above attitudes and knowledge (as cited in Evancho, 2000).

Critical thinking is the art of analyzing and evaluating thinking with a view to improving it (Paul and Elder, 2006). According to Glaser (1942), critical thinking calls for a persistent effort to examine any belief or supposed form of knowledge in the light of the evidence that supports it and the further conclusions to which it tends (as cited in Bonk and Smith, 1998). It also generally requires ability to recognize problems, to find workable means for meeting those problems, to gather and marshal pertinent information, to recognize unstated assumptions and values, to comprehend and use language with accuracy, clarity, and discrimination, to interpret data, to appraise evidence and evaluate arguments, to recognize the existence (or non-existence) of logical relationships between propositions, to draw warranted conclusions and generalizations, to test the conclusions and generalizations at which one arrives, to reconstruct one's patterns of beliefs on the basis of wider experience, and to render accurate judgments about specific things and qualities in everyday life (as cited in Fisher, 2001).

Angeli, Valanides and Bonk (2003) investigated the quality of asynchronous discussion forums. In that study 146 undergraduate students teachers from one university in the United States participated. The results of the study indicated that well-structured online discussions do not affect the students' critical thinking skills. There is no significance relations between well structured and ill structured online discussions. Wang and Woo (2007) researched the effectiveness of class discussion in face-to-face and online settings have focused on how both settings have context-specific advantages. Data were collected during the January 2005 semester from the course entitled Constructive Learning with the Internet. This is an elective course which earns students two academic units towards graduation. The students in that study were doing a 1-year Post-Graduate Diploma in Education (PGDE) programme at the National Institute of Education (NIE) of Singapore. Face-to-face discussions tend to have greater efficiency, immediacy of feedback, no

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technological issues, greater perceived interactivity and important verbal and non-verbal communication cues present.

Bradley, Thom, Hayes and Hay (2008) showed that whether different question types influenced the quantity and quality of students' online submissions. Limited focal and direct link question types generated the most words, followed by brainstorm and open focal question types. Application and course link question types generated the fewest words. Limited and open focal question types generated the most complete answers, followed by brainstorm type and then direct link type. Application and course link question types generated the least complete answers. Course link, brainstorm and direct link question types resulted in higher levels of thinking than limited focal type. Open focal and application question types resulted in the lowest level of thinking.

The research of Demirtaşlı-Çırıkçı (1996) on senior Science and Social Sciences students, it was aimed to compare the female and male students' points which they got from Watson-Glaser Critical Thinking Appraisal Scale. According to the findings of this research, there was not a significant difference between the students' grades on the basis of their gender and the programmes they were attending.

Çubukçu (2006) aimed to determine the disposition of critical thinking of the teacher candidates who were in the faculty of Education at Eskişehir Osmangazi University. According to the findings of this research, age, the high school they graduated, university exam entrance point type, the programmes they were attending, income level and social activities were influential on candidates' thinking potential-capacity and their thinking skills as different variables.

Adam et al. (1999) designed a longitudinal study so as to find out if a difference between critical thinking skills existed in the scores of sophomore-level students and scores of the same students at the senior level. The researchers found out that there was no statistically significant difference in the total Watson-Glaser Critical Thinking Appraisal raw scores and in each of the subtests of inference, recognition of the assumptions, deduction, interpretation, and evaluation of arguments between the students first at the sophomore level and again at the senior level (as cited in Dayioğlu, 2003).

In this sense, the purpose of this study is to examine the effects of blended learning environment which supports the course management system on the critical thinking skills of students.

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Methods

Procedure

The model of the study is one group pretest-posttest group design. Watson-Glaser Critical Thinking Appraisal is pretested at the beginning of the course, implementing blended learning, and then again posttested at the end of the study. It would seem that any differences between the pretest and posttest measures would be due to how the critical thinking skills improvement. Students participated in the study enrolled in course offered by the Computer and Educational Technology Department of Faculty of Educational Sciences at Ankara University in Turkey.

There are serious weaknesses in this design. With the exceptions of selection and morality threat to internal validity, which are not factors due to the lack of a control group, this design is subject to five other threats to internal validity. If a historical event related to the dependent variable intervenes between the pretest and the posttest, its effects could be confused with those of the independent variable. Maturation changes in the subjects could also produce differences between pretest and posttest scores. If measures are used on a pretest and a different test measure was used on the posttest, a shift of scores from pretest to posttest could occur resulting in a testing threat. Regardless of the measurement process utilized, instrumentation changes could produce variation in the pretest and posttest scores. Finally, if the subjects were selected because they possessed some extreme characteristic, differences between pretest and posttest scores could be due to regression toward the mean (Abrahams, 1997).

Measurement

The Watson-Glaser Critical Thinking Appraisal consists of a series of test exercises which require the application of some important abilities involved in critical thinking. The exercise includes problems, statements, arguments, and interpretations of data similar to those which citizen in a democracy might encounter in his daily life as he works, reads newspaper or magazine articles, hears speeches, participates in discussions on various issues, etc (Watson and Glaser, 1964).

The form which contains 100 items was used in the context of research. And this form can be completed in about 50 minutes. The test is available in two forms, Ym and Zm,

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each consisting of five subtests designed to measure different though interdependent, aspects of critical thinking. In this stduy the Ym form was used.

The five subsets are as follows (Watson and Glaser, 1964):

Test 1. Inference Subtest (20 items): This subtest measures samples ability to discriminate among degrees of truth or falsity of inferences drawn from given data.

Test 2. Recognition of Assumptions Subtest (16 items): This subtest measures samples ability to recognize unstated assumptions or presuppositions which are taken for granted in given statements or assertions.

Test 3. Deduction Subtest (25 items): This subtest measures samples ability to reason deductively from given statements or premises; to recognize the relation of implication between propositions; to implication or a necessary inference from given premises is indeed such.

Test 4. Interpretation Subtest (24 items): This subtest measures samples ability to weigh evidence and to distinguish between (a) generalizations from given data that are not warranted beyond a reasonable doubt, and (b) generalizations which, although not absolutely certain or necessary, do seem to be warranted beyond a reasonable doubt.

Test 5. Evaluation of Argument Subtest (25 items): This subtest measures samples ability to distinguish between arguments which are strong and relevant and those which are weak or irrelevant to a particular question at issue.

The validity and reliability of the instrument. The Ym form of Watson-Glaser Critical Thinking Appraisal was translated into Turkish by Demirtaşlı-Çıkrikçi (Çıkrikçi, 1993). The appraisal was implemented in grade 9, grade 10 and grade 11 in a high school in Ankara. The KR-20 reliability coefficient ranged from .11 to .57. She explained that this coefficient was low since the homogeneity of the subjects caused the decrease in the consistency level as a result of diminishing the variances.

The validity of the Critical Thinking Appraisal is examined in relation to three categories as content validity, construct validity and predictive validity. It is explained that “the extent to which this appraisal measures a sample of the specified objectives of such instructional programs is an indication of its content validity” (Watson and Glaser,1964).

Watson-Glaser Critical Thinking Appraisal was implemented in this study since it is one of the tests whose statistical analyses have mostly been conducted and it is the only instrument which has the Turkish version.

Table 2. 1. Watson-Glaser Critical Thinking Appraisal Sub tests KR-20 Reliability Coefficient

Subtests	Grade 9	Grade 10	Grade 11
Test 1- Inference	.09	.42	.45
Test 2- Recognition of Assumptions	.56	.10	.24
Test 3- Deduction	.13	.34	.24
Test 4- Interpretation	.57	.50	.26
Test 5- Evaluation of Arguments	.19	.34	.11

Participants

There are 44 preservice teachers who attending the course of Design and Use of Instructional Material in the Department of Computer and Instructional Technology Education of Faculty of Educational Sciences at Ankara University in third grade who constitute the study group. In order to reach the identified goals of the course, following will be pursued; a. The students are required to attend the classes regularly, b. The students are required to participate in the discussions, and also to demonstrate and to reflect on their teaching/learning process, c. The students are required to prepare a course plan about an instructional material, which they will choose in the curriculum.

Pretest was conducted online with 55 preservice teachers on 16 September, 2008 and posttest was conducted on 20 November, 2008 but the number of the forms returned was only 44. 11 preservice teachers' most of the items in the form were not fulfilled. This study was conducted in first 5 weeks of academic year 2008-2009.

Results

According to the findings of this study, both variables should be normally distributed. We checked for normal distribution with a Q-Q plot and Kolmogorov Simirnov test. The mean score of WGCTA on the pretest was 57.61 ($Sd = 7.44$), the mean scores of subset 1, subset 2, subset 3, subset 4 and subset 5 on the pretest respectively were 7.81 ($Sd=2.11$), 9.22 ($Sd=2.53$), 15.40 ($Sd=3.09$), 16.84 ($Sd=3.34$), 8.31 ($Sd=1.92$). Pretest KR-21 value was 0.75. The mean score of WGCTA on the posttest was 57.13 ($Sd = 7.59$), the mean scores of subset 1, subset 2, subset 3, subset 4 and subset 5 on the posttest respectively were 7.35 ($Sd=2.20$), 9.22 ($Sd=2.60$), 15.59 ($Sd=2.60$), 16.02 ($Sd=2.79$), 8.54 ($Sd=1.60$).

Paired-samples t test was carried out to evaluate the difference in the students' critical thinking levels in pretest and posttest. There was no significant difference obtained in posttest and pretest ($t=.369$ $p=.714$).

Table 3. 1. The Comparison of Pretest and Posttest Scores

	Pretest		Posttest		t-test	
	Mean	Sd	Mean	Sd	t	p
Inference	7.81	2.11	7.35	2.2	0.154	0.878
Recognition of Assumptions	9.22	2.53	9.22	2.6	0	1
Deduction	15.4	3.09	15.59	2.6	-3.63	0.718
Interpretation	16.84	3.34	16.02	2.79	1.417	0.164
Evaluation of Arguments	8.31	1.92	8.54	1.6	-0.773	0.444
General Total	57.61	7.44	57.13	7.59	0.369	0.714

In the subtest 1, there was a significant difference obtained ($t=.154$, $p=.878$). From the subtest 1, mean of the pretest ($M=7.81$, $Sd=2.11$) did not have significantly different scores than the means of the posttest ($M=7.75$, $Sd=2.20$). In the subtest 2, there was a significant difference obtained ($t=0.00$, $p=1.00$). From the subtest 2, mean of the pretest ($M=9.22$, $Sd=2.33$) did not have significantly different scores than the means of the posttest ($M=9.22$, $Sd=2.60$). In the subtest 3, there was a significant difference obtained ($t=-3.63$, $p=.718$). From the subtest 3, mean of the pretest ($M=15.40$, $Sd=3.09$) did not have significantly different scores than the means of the posttest ($M=15.59$, $Sd=2.60$). In the subtest 4, there was a significant difference obtained ($t=1.417$, $p=.164$). From the subtest 3, mean of the pretest ($M=16.84$, $Sd=3.34$) did not have significantly different scores than the means of the posttest ($M=16.02$, $Sd=2.79$). In the subtest 5, there was a significant difference obtained ($t=-.773$, $p=.444$). From the subtest 5, mean of the pretest ($M=8.311$, $Sd=1.92$) did not have significantly different scores than the means of the posttest ($M=8.54$, $Sd = 1.60$).

Discussion and Conclusion

The results of the research indicated that there was no significant difference in the pretest and posttest scores. As mentioned above, study would be a bit short to be able to improve of critical thinking skills. Another reason of this might be that online learning

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activity was not support face to face lesson enough. Because of the short period of time, the discussion forms couldn't be used to support critical thinking skills of students. Some students had difficulties to find computers for discussion forms. On account of these difficulties, researchers couldn't make synchronous discussions among students. Yuan, Kunaviktiluk, Klunklin and Williams (2008) examined the effect of problem-based learning on the critical thinking skills of students and Wannapiroon (2008) developed a problem-based blended learning model in developing undergraduate students' critical thinking. Two of the research findings showed that there were a significant difference in the pretest and posttest scores. And in another study, Şendağ and Odabaşı (2009) investigated how the online problem based learning approach employed in an online learning environment influenced undergraduate students' critical thinking skills and content knowledge acquisition. The results indicated that learning in the online problem based learning group did not have a significant effect on the content knowledge acquisition scores but learning in the online problem based learning group had a significant effect on increasing the critical thinking skills. They conducted the studies by using a model (as problem based learning) and they conducted their studies for average 11 weeks and throughout the semester. In our study, there was no significant difference in the pretest and posttest scores. In this study if we had used any models (as problem based, scenario based, project based, etc.) as Yuan et al. (2008)'s, Wannapiroon (2008)'s and Şendağ and Odabaşı (2009)'s, there might have been a significant difference in the pretest and posttest scores. And a longer period would also strengthen the study's findings. Conducting the study over a longer period of time might provided more useful information about critical thinking skills of students.

With respect to the subtests in the critical thinking appraisal, the subjects got the highest score from Test 4, Interpretation. This showed that they were good at "weighing evidence and distinguishing between generalizations from given data and generalizations to be warranted beyond a reasonable doubt". However, the lowest mean was obtained from Test 1, inference. This revealed that they were not good at "discriminating among degrees of truth or falsity of inferences drawn from given data". To improve the critical thinking skills of students, the study can do in a long period and much more critical thinking activity can implement. For this, there can be much more synchronous and asynchronous discussions, forums etc. For future studies it can be said that there can any research on just online learning environment different from blended learning environment. And any ill-structured

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scenarios can be given to students on the blended learning environment and discuss with students about these scenarios. This study implemented on one group of student. For future study, it can be any researches implemented on more group of student.

References

- Abrahams, D. (1997). Introduction to research methods and program evaluation. Accessed at <http://www.socialresearchmethods.net/tutorial/Abrahams/SRM%20main.html> in 21.12.2008.
- Anderton, B. (2006). Using the online course to promote self-regulated learning strategies in preservice teachers. *Journal of Interactive Online Learning*, 5(2), 156–177.
- Angeli, C., Valanides, N., & Bonk, C. J. (2003). Communication in a web-based conferencing system: the quality of computer-mediated interactions. *British Journal of Educational Technology*, 34(1), 31-43.
- Bonk, C. J. & Smith, G.S. (1998). Alternative instructional strategies for creative and critical thinking in the accounting curriculum. *Journal of Accounting Education*, 16(2), 261-293.
- Bradley, M.E., Thom, L.R., Hayes, J. & Hay, C. (2008). Ask and you will receive: how question type influences quantity and quality of online discussions. *British Journal Of Educational Technology*, 39(1), 888-900.
- Çubukçu, Z. (2006). Critical thinking dispositions of the turkish teacher candidates. *The Turkish Online Journal of Educational Technology*, 5(4), Accessed at <http://www.tojet.net/articles/544.htm> in 21.12.2008.
- Dayıoğlu, S. (2003). *A descriptive study on the critical thinking levels of the students at the unit of english preparatory school at hacettepe university*. Unpublished Master Thesis. Middle East Technical University, Ankara, Turkey.
- Demirtaşlı-Çırkıççı, N. (1996). Eleştirel düşünme: bir ölçme aracı ve bir araştırma. iii. ulusal psikolojik danışma ve rehberlik kongresi. 15-16 April 1996; Çukurova University, Adana. 208-216.
- Demirtaşlı-Çırkıççı, N. (1993). Watson-Glaser eleştirel akıl yürütme ölçüğünün lise öğrencileri üzerindeki ön deneme uygulaması. *Ankara University Journal of Educational Science Faculty*, 25(2), 559-569.

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- Fisher, A. (2001). Critical thinking: an introduction. london. cambridge university. Accesessed at <http://assets.cambridge.org/052100/9847/sample/0521009847ws.pdf> in 21.12.2008.
- Gelder, T. V. (2005). Teaching critical thinking: some lesson form cognitive science. *College Teaching*, 53(1), 41-48. Accessed at <http://heldref-publications.metapress.com/link.asp?id=p018250211l37r28> in 21.12.2008.
- Owston, R.D., Sinclair, M. & Wideman, H. (2006). Evaluation of a blended professional development program for middle-school mathematics and science teachers. paper presented at the annual meeting of the american educational research association, san francisco. Accessed at <http://www.edu.yorku.ca/%7Eowston/AERA06.pdf>.
- Paul, R. & Elder, L. (2006). The miniature guide to critical thinking: concepts & tools. foundadtion of critical thinking. Accessed at http://www.criticalthinking.org/concepts_tools.pdf in 21.12.2008.
- So, H. J. & Brush, T.A. (2008). Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: relationships and critical factors. *Computer and Education*, 51(1), 318-336.
- Şendağ, S. & Odabaşı, H. F. (2009). Effects of an online problem based learning course on content knowledge acquisition and critical thinking skills. *Computers and Education*, 53 (1), 132-141.
- Watson, G. & Glaser, E. M. (1964). Manuel of critical thinking appraisal. Newyork, Harcourt, Brace & World, Inc.
- Wang, Q. & Woo, H.L. (2007). Comparing asynchronous online discussions and face-to-face discussions in a classroom setting. *British Journal of Educational Technology*, 38(2), 272-286.
- Wannapiroon, P. (2008). Development of problem based blended learning model in undergraduate students' critical thinking. Thaicyber University Ejournals. 1(2). Accessed at ejournals.thaicyberu.go.tr/index.php/ictl/article/view/39/39 in 14.04.2009.
- Yuan, H., Kunaviktikul, W., Klunklin, A. & Williams, B.A. (2008). Improvement of nursing students' critical thinking skills through problem-based learning in the people's republic of china: A Quasi-Experimental Study. *Nursing and Health Sciences*, 10(1):70-6.