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The Effect of Blended Learning on Students' Achievement, Perceived Cognitive Flexibility Levels and Self-Regulated Learning Skills*

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Abstract

Blended learning (b-learning) is considered as the dominant instructional model in higher education. Herein, the study focused on the effectiveness of b-learning on a teacher training program in higher education and mainly aimed at revealing the effect of b-learning on students' achievement, perceived cognitive flexibility levels and self-regulated learning skills and also examining the instructor's, learners' and experts' opinions as curriculum stakeholders on b-learning based program. One of the mixed methods - the concurrent triangulation design- was made use of in the study. One sample time series design was implemented for the quantitative phase of the study and statistical hypotheses were tested. In the qualitative phase, how the stakeholders evaluated implementation of the b-learning based program was investigated. The study was conducted in "IT & Ethics" course of Computer Education and Instructional Technology Program at Faculty of Education, Ege University. The participants were 65 senior students who enrolled the course in 2013 spring semester. During curriculum design, needs' analysis findings led design process and the principles of b-learning and Bloom's revised taxonomy were taken into account. B-learning was implemented through face to face classroom sessions and on-line learning environment in which experts were present. Besides empirical treatment material as b-learning based curriculum design the data collection tools of the study included the achievement tests, perceived cognitive flexibility and self-regulated learning skills scale, reflective diary, interview guide and weekly evaluation notes of experts. In order to find out the effect of b-learning on achievement, perceived cognitive flexibility levels and self-regulated learning skills, one way ANOVA for repeated measures and paired samples t-test with Bonferroni correction were performed. On the other hand, the qualitative findings attained through content analysis method were classified as implementation, feedback for implementation and proofs for effectiveness of b-learning based program implementation themes. The results revealed that b-learning based program had a positive effect on the students' achievement, perceived cognitive flexibility levels and self-regulated learning skills. According to the stakeholders' views, b-learning based program implementation led students to think, inquire and explore the subject matter, share their opinions, discuss and appraise others' opinions. Also, it was revealed that students gained different perspectives and were able to think deeply and critically. Hence, the stakeholders implied that the students were able to transfer those skills to real-life. This study suggested that b-learning based curriculum development studies which were guided by learning goals, characteristics of learner group, teaching and learning theories, qualified instructor and expert team, technological infrastructure, essential budget and management support to be planned, designed, implemented, evaluated and disseminated in higher education.

Keywords: blended learning, hybrid learning, on-line learning, achievement, cognitive flexibility, self-regulated learning skills.

1. Introduction

As indispensable factors of the 21st century, information and communication technologies have a great impact on teaching and learning as so the whole life. By means of relevant cost and high speed transfer via different tools, computer and Internet usage is raising in parallel with the opportunities of distance learning. Nowadays, distance learning is effective with e-learning technologies (Eryol, 2009). The factors which make e-learning attractive are the flexibility of time and place, ease of learning (for instance: virtual communication application on the Internet such as video conference or audio and video call etc.), and also it removes boundaries for learning and offer virtual libraries and schools without walls (Aşkar, 2003; Halis, 2001). E-learning supports individual learning enables repetition of the lessons providing digital course content, helps better understanding it by visualization (Tan & Erdoğan, 2004; Yalın, 2000). On the other hand, asynchronous e-learning has some

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limitations such as students' isolation feelings and decreased motivation (Doğan, Duman & Seferoğlu, 2011); insufficient communication and social interaction in instructional activities (Haefner, 2000). This learning model that is indicated to remove these unfavorable features is called blended learning (b-learning). B-learning which is called by ASTD (The American Society for Training and Development) (2010) as learning process integrating face to face and online learning aspects, emerges by using e-learning technologies in traditional learning environment. As traditional teaching was inadequate, e-learning applications were needed and teaching activities were performed in a blended way. An effective teaching planning is ensured by taking account of student's characteristics and necessities (Şimşek, 2009). So, b-learning takes account of individual learning speed can create an effective and flexible learning environment.

Studies on b-learning implementation in higher education suggest that b-learning makes students' transfer theoretical knowledge to real-life (Osguthorpe ve Graham, 2003); makes them responsible for their own learning by means of the flexibility of how, what, when to study (Graham, 2006) and also helps students get prepared before lessons, review materials and further investigate the content and self-evaluate (Kirişçioğlu, 2009). Various results about b-learning effects on academic success and attitude towards lessons are remarkable. Some of them indicated that b-learning increases academic success (El-Deghaidy & Nouby, 2008; Yılmaz, 2009) and positively effects lesson attitudes (El-Deghaidy & Nouby, 2008) while some showed no significant effect on academic success and attitudes (Delialioğlu & Yıldırım, 2007). Besides, Ateş et al. (2008) mention possible inequalities in b-learning implementation since there are students who have no PC and/or Internet access and computer use skills that we need to consider before implementation. Nevertheless, many studies revealed students' positive perceptions and views on b-learning (Ateş et al., 2008; Baran et al., 2010; Ersoy, 2003; Geçer & Dağ, 2012; Tsai et al., 2011, Uğur, 2007; Yılmaz, 2009; Yılmaz & Orhan, 2010). Likewise, it is identified that their social presence perceptions increase the pleasure of b-learning (So & Brush, 2008).

Within this study, researchers claim that b-learning especially with problem based design provides students flexibility in their cognition and mention importance of the cognitive flexibility. Cañas (2009) describes cognitive flexibility as people capabilities of adapting their cognitive processing strategies to the new and unexpected circumstances. Studies on cognitive flexibility reveal positive correlation between cognitive flexibility and two constructs of communication competence as assertiveness and responsiveness (Martin & Anderson, 1998); peer collaboration and collaborative language skill (Ciairano et al., 2006); social competency (Bilgin, 2009b); problem solving skills (Bilgin, 2009b; Orendain & Wood, 2012; Yücel, 2011); extraordinary and unexpected incidents (Ritter et al., 2012); gaming condition emphasizing maintenance and rapid switching between multiple information and action sources (Glass et al., 2013) and also indicated formal creativeness as a predictor for cognitive flexibility (Çuhadaroğlu, 2011). On the other hand, self-regulation which gained importance in the 21st century is a part of effective learning (Ün Açıkgöz, 2002) and self-regulated learning skills (Turan & Demirel, 2010) are skills which are emphasized to be developed. Therefore, we find it helpful to design, carry out and examine instructional programs which intend to develop students' self-regulation skills and cognitive flexibility.

In this context, our study group is student teachers. In order to determine the needs and to guide the program design, researchers did the need analysis in October and November 2011. During needs analysis, we used document analysis, interview and questionnaire techniques for data collection. So we examined instructor's current lesson plans, interviewed him and administered a survey to the 40 CEIT students who have not taken the course yet. The need analysis results showed us following issues for curriculum design:

- course objectives need to be updated,
- program must base on inquiry and help students lead their own learning and discuss ethical problems,
- a problem based approach must be applied to develop cognitive flexibility,
- the content must connect with real-life and scenarios,
- besides student-teacher and student-student interaction, experts-students interaction can be established,
- course syllabus and materials can be shared with a course web site systematically.

We consider this analysis as guidance for the program design and as an example practice for developing programs in teacher training. Research design of the present study is one of the mixed models, concurrent triangulation design. In order to test the effectiveness of complementary teaching models or methods in teaching and learning processes of teacher training programs, we investigated b-learning's effects on students' achievement, perceived self-regulated learning skills and cognitive flexibility levels besides we consulted instructors', experts' and students' views on b-learning based program. So, the study has concurrently two phases: the first is quantitative phase with a single group time series design. In this phase we examined following statistical hypothesis:

1. There is no significant difference between the first and second achievement means of the group whom b-learning based program implemented.
2. There is no significant difference between the second and third achievement means of the group whom b-learning based program implemented.
3. There is no significant difference between the third and fourth achievement means of the group whom b-learning based program implemented.
4. There is no significant difference between the first and second perceived cognitive flexibility means of the group whom b-learning based program implemented.
5. There is no significant difference between the second and third perceived cognitive flexibility means of the group whom b-learning based program implemented.
6. There is no significant difference between the third and fourth perceived cognitive flexibility means of the group whom b-learning based program implemented.
7. There is no significant difference between the first and second perceived self-regulated learning means of the group whom b-learning based program implemented.
8. There is no significant difference between the second and third perceived self-regulated learning means of the group whom b-learning based program implemented.
9. There is no significant difference between the third and fourth perceived self-regulated learning means of the group whom b-learning based program implemented.

Furthermore, we investigated “How do the stakeholders evaluate the b-learning program application?” research question for the qualitative phase of present study.

2. Method

2.1 Research design

One of the mixed method designs, concurrent triangulation design (Creswell, 2003) was conducted in the present study. As Patton (1987) implies, one data collecting strategy has its own strengths and weaknesses. Especially for research problems in social studies, qualitative and quantitative data help understanding the complexity of the social phenomenon and in that way using different methods together brings strengthens the study by providing different perspectives (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2009; Creswell, 2003; Patton, 1987; Tashakkori & Teddlie, 2003). In concurrenct triangulation design, the researchers collect qualitative and quantitative data simultaneously, analyze independently and entegrate results in interpretation phase as Tashakkori & Teddlie (2003) state. The quantitative phase of the study was designed by time series design which is a quasi-experimental design including repeated measures (Bakkaloğlu, 2004; Fraenkel & Wallen, 2003; Karasar, 2008; Vadum ve Rankin, 1998). Researcher is interested in the direction and trend of the changes in repeated measurements taken before and after the experiment starts (Büyüköztürk et al., 2009). Karasar (2008) and Wiersma (2000) reported that dependent variable in a time series design is measured periodically and independent variable is applied in the first half of the measures. So, we measured dependent variables four times, two of them before and two of them after experimental process, at one month interval. The first measure after experiment-which is the third in all four- was taken at the mid of the process while the latter was at the end. The first measure helped us to realize the effect of experimental process on dependent variables so it increased internal validity of the study. With these measurements, we were able to track the changes on dependent variables before we start the experiment. Main reason for choosing time series design is the concern for validity and reliability issues because of the predicted and uncontrollable interaction between experimental and control groups when they are assigned. Furthermore, determining the effects of the experimental process in time is only possible with repeated and multiple measures. Since reflections about the process require quantitative data, concurrent triangulation design (Creswell, 2003) was applied. Table 1 presents the research design.

Table 1. *Research design*

Group	O1	O2	X	O3	O4
G	1. SDF 2. AT 3. CFS 4. SLSS	1. FIE 2. AT 3. CFS 4. SLSS	1. Reflective Diary Form for instructor 2. Experts' weekly notes 3. Experts' ODES scores	4. $AT_{(P)}$ 5. CFS 6. SLSS	7. $AT_{(P)}$ 1. CFS 2. SLSS 3. CEF 4. IG 5. EEF

O: Observation; SDF: Student Demographics Form; AT: Achievement Test; CFS: Cognitive Flexibility Scale; SLSS: Self-regulated Learning Skills Scale; FIE: Form for IT & Ethics; ODES: On-line Discussion Evaluation Scale; $AT_{(P)}$: Parallel Achievement Test; CEF: Course Evaluation Form; IG: Interview Guide; EEF: Expert Evaluation Form; X: Blended learning based IT & Ethics Program

O1, the first measurement, was taken on December; the second (O2) was taken on February; the third (O3) one was taken on April while the fourth (O4) was taken in the last days of May, 2013 in which Taksim Gezi Park events happened in Turkey. We mention the possible effects of this act on the findings later in this paper. The independent variable is blended learning approach combining F2F and on-line learning, while the dependent variables are achievement, self-regulated learning skills and cognitive flexibility.

2.2 Study Group

The study group is of senior students who enrolled the IT & Ethics course of CEIT Program at Faculty of Education, Ege University in 2013 spring semester. The number of participants was 65 (43 male, 22 female). GPA as an indicator for a*cademic background* showed that 50.8% (n=33) has 2.5-2.99, 23.1% (n=15) has 3.0-3.49 points and 58.5% (n=38) of them graduated vocational high school. *Socio-economic background* information reflected that 41.5% of them are living with their friends; 38.5% of their fathers graduated elementary school while 33.8 of them high-school; 50.8% of their mothers graduated elementary school; 87.7% of their mothers was unemployed while 41.5 of their fathers was so; 29.2% has a monthly income as 1000-1500 TL (475$ - 712$); nearly all of them (98.5%) has a PC and Internet access which is essential for the present study.

Moreover, we asked "Which words come up your mind when one say information and ethics?" in the form which may help us to understand their conceptual awareness for IT & Ethics. All the answers were related to IT ethics, for example more than half of the group (55.38%; n=36) mentioned morality and moral values. 35.84% (n=23) recalled pirated products while 32.31% (n=21) did regulations and respect for work. Since ethics is a part of philosophy examining people's moral behavior models (Aydın, 2010); one can suggest correct conceptual awareness for the group. Hence, 66.2% of them mentioned their care for ethics while 72.3% implied information ethics and vocational ethical principles. Also, 60% reported they value ethics instruction while 53.8% care privacy and confidentiality of personal data on the Internet.

We also asked students what type of learning environment they prefer for IT and Ethics course and had many replies. 68.3% (n=41) wrote that they prefer blended learning model while the other prefer face-to-face instruction. Table 2 presents the examples for the reasons of their preferences.

Table 2. *Some examples for why the students prefer blended learning or face-to-face instruction for IT & Ethics course.*

Face-to-face instruction	B-learning environment
Internet asocializes the people; we need to discuss ethics F2F.	Theoretical information must be discussed F2F while the examples and applications must be distributed on-line.
The course may be inefficient on the net; participants may be reluctant and irregular so the lessons cannot go on seriously.	On-line interactions out of class can raise permanency of learning the content.
There may disconnections and technical problems on the net.	F2F instruction is more effective than on-line instruction, though on-line instruction helps saving time in comparison with F2F.
I think that on-line lessons lack of reality and the people are not sincere much.	B-learning must be applied since we are CEIT students. Via b-learning, we can also examine on-line examples that we didn't see before.
	A person must join the class on-line to express himself comfortable.

The answers above suggest us that the study group is familiar with the cognitive and affective aspects of the lesson content and that they value these concepts. Furthermore, most of them are willing to take the course via b-learning model which motivates us to apply and examine the effects of b-learning.

2.3 Data collection tools

This section includes the empirical treatment material as b-learning based IT & Ethics course program design and quantitative and qualitative data collection tools in order to answer research questions.

2.3.1 Empirical treatment material: At first, the work group was established in order to develop the empirical treatment material. This work group consists of the first author as field expert, the course lecturer as implementer, the second author as curriculum & instruction expert and a measurement & evaluation in education expert. Secondly, we prepared the work plan. For the needs analysis, we collected views of the learners' and the instructor's as curriculum stakeholders; with the help of related literature we mainly aimed at reaching following goals in curriculum design:

- Revising and updating the lesson objectives according to the needs analysis suggestions.
- Designing inquiry based activities for the learners to self-regulate their learning and discuss with each other on ethical issues.
- In a problem-based approach, finding real-life examples related to information ethics and designing sample cases in order to improve cognitive flexibility of the learners.
- Establishing field expert-learner interaction besides learner-teacher and learner-learner interactions.
- Not just with a single electronic platform but sharing course materials, announcements, etc. all course information via a course web page designed by two CEIT experts.

2.3.2 Quantitative data collection tools: Eight quantitative data collection tools used in the study are as follows.

1- Achievement Test: During the development process, the first author wrote 22 items according to five field experts' opinions and administered them on June, 2012 to the students who had this course before. Pilot study was conducted on 101 participants (46 female and 56 male). Henrysson method (Atılgan, 2009) was used for statistical analysis of the items. Later, we selected nine items which has above 0.30 discrimination index. Average test scores were calculated as 5.02; standard deviation as 2.47 and the variance as 6.10. Besides, average difficulty level of the test was 0.56, indicating nearly optimum difficulty and KR-20 reliability index was 0.74, indicating good reliability (Atılgan, 2009) of the overall test.

2- Parallel Achievement Test: As our research design suggests, we measure learners' course achievement before, during and at the end of the program. Since it is possible that taking the same test several times has some disadvantages (remembering the test items, memorizing the right answers during the process, etc.) which can contaminate the validity of the results, we developed a parallel achievement test too. Therefore, we selected nine more items with above 0.30 discrimination indexes from the pilot test we administered before which we had luckily.

3- Cognitive Flexibility Scale (CFS): Bilgin (2009a) developed the CFS with 19 items which include adjective pairs to measure how one perceive himself/herself cognitively flexible. He tested reliability and validity on a sample of 637 adolescents. The internal consistency for the scale was found to be .92. Item-total correlations of the items were between .49 and .63. Test-retest correlation coefficiency within an eight-week interval was .77, and the split-half coefficiency was .87.

4- Self-regulated Learning Skills Scale (SLSS): The SLSS was developed by Turan & Demirel (2010) aimed at determining students' perceived self-regulated learning skills. It is five point scale with four dimensions and 41 items. The dimensions and the number of items are as follows: (1) Motivation and action for learning (7 items); (2) Planning (8 items); (3) Strategy use and evaluation (19 items); (4) Dependence on learning (7 items). In preliminary study by Turan & Demirel (2010), students' short notes about their learning ways, related literature and seven experts' views were taken into account and 66 items were written. Pilot study was conducted on 908 college students. KMO result for the scale was .96 and Barlett test was significant at p=0.01 level. Exploratory factor analysis resulted 41 items with above 1.5 eigenvalues were grouped under four dimensions. Cronbach α for the subscales were found as 0.88, 0.91, 0.83, and 0.76 as from the first to the fourth dimension while the overall Cronbach α for the scale was 0.91.

5- Student Demographics Form (SDF): Before instruction, SDF administered in order to get to know students. This form was prepared with the help of three experts who have PhD in the field of curriculum and instruction. Final version of SDF includes 24 items including general characteristics (age, gender etc.), academic and socioeconomic background and readiness for IT & Ethics course questions. The data gathered by SDF was made use of to describe the study group.

6- On-line Discussion Evaluation Scale (ODES): In order to assess learners' performance for weekly WBL activities designed within b-learning based program, a scale developed by Kalelioğlu & Gülbahar (2010) was applied. During development of ODES, these researchers collected experts' opinions. The number of the experts is 12 who had experience in managing on-line discussions at higher education level. According to literature records and experts' opinions, researchers determined 10 criteria for assessing the quality of on-line contribution which is useful for chat and forum environments.

7- Course Evaluation Form (CEF): CEF developed in order to collect views of the study group about b-learning based program implementation and its effectiveness at the end of the program. Related forms and studies were reviewed such as Ateş (2012) and form items were prepared in accordance with elements of an instructional program. Three experts with PhD in the field of curriculum and instruction and one IT expert with PhD in instructional technology were collected. In the final version of the CEF, there were 18 items which consisted of open-ended, Yes/No and five point question types.

8- Expert Evaluation Form (EEF): EEF was developed in order to collect views of five field experts who took part in WBL activities evaluation on b-learning based program implementation and its effectiveness. Considering the CEF items applied to the learners, this questionnaire was developed in the same way with CEF via three experts' opinions. EEF includes 11 items which consists of open-ended, Yes/No and five point question types.

2.3.3 Qualitative data collection tools: Following three qualitative data collection tools were used in the study.

2.3.3.1 Reflective Diary Form: Documents diversifying the data increase the validity of the study significantly when used with other data collection methods together (Yıldırım & Şimşek, 2008). Therefore, the instructor's reflections of the lessons considered as a valuable data resource which can provide evidence for applicability of the program design. In the literature review to prepare diary format, sample forms (Başbay, 2008; Yurdakul, 2004) were revised and the form took its last shape in accordance with the opinion of three experts who have PhD in the field of curriculum and instruction. On the form, it is intended that instructor write his observations and opinions with regard to the functionality of the design and the effectiveness of the course he teaches.

2.3.3.2 Interview Guide: After curriculum design is implemented, determining how the instructor evaluated learning based curriculum applications from the stakeholders is within research question. For this purpose, interview form approach involving all aspects and questions related to the research problem (Yıldırım & Şimşek, 2008) is preferred and semi-structured interview form is developed. During the preparation process of the form, sample forms (Başbay, 2008; Yurdakul, 2004) are utilized through the literature review and opinions of three experts who have PhD in the field of curriculum and instruction are taken. Besides, one question is simplified a bit after the trial interview with a lecturer at Department of Computer and Instructional Technology Education.

2.3.3.3 Experts' notes: For the purpose of enriching data by providing diversity and determining the development level of student in the process, unstructured qualitative assessment notes which experts recorded on a weekly basis are also analyzed. The data set involves feedbacks and reviews of five experts with regard to the weekly

contributions of students in their group.

2.4 Process

The scales were administered four times at intervals of one month according to research design through the spring semester in 2012-2013 academic year. While in the first two measurements achievement test was used, in the last two measurements parallel achievement test was used. In this way, students answered the same questions only twice rather than four times. Sequence of experimental operations and the data collection process are summarized below:

1. During the three months before the program implementation, the development of measurement tools which would be used in the study was completed and website of the course was made ready for use.

2. For the three scales to be used in the study (CFS, SLSS, ODES), researchers got permission from the authors via e-mail in October 2013.

3. A month before the start of the study, Student Demographics Form, Achievement Test, Self-Regulated Learning Skills Scale and Cognitive Flexibility Scale were applied to the students.

4. In the first lesson, the instructor shared course syllabus which cover learning tasks of the lesson, exams and assessment with students.

5. In the lesson right before the implementation; AT, SLSS and CFS were applied to the students once again.

6. During the implementations, instructor filled in the reflective diary form and handed in them to the researcher at the end of each week.

7. At the end of a month, Parallel Achievement Test, SLSS and CFS were applied to the students this time.

8. Throughout the process, students attended to ten WBL activities. Their contributions were evaluated with qualitative assessment notes and ODES scores given by the experts who were assigned to them under the supervision of the instructor.

9. The first author made the necessary updates for weekly topics on the course website according to instructor's suggestions.

10. Approximately one month later -at the end of the program-, AT(p), SLSS and CFS were applied to the students once again. Besides, program design was evaluated by stakeholders. While students were surveyed, semi-structured interview was conducted with the course instructor and five CEIT experts completed the questionnaire via e-mail.

2.5 Data analysis

2.5.1 Quantitative data analysis: First, it is checked whether the necessary assumptions were met for repeated measures data and then analysis of one-factor variance was performed in repeated measurements. In order to determine in which measurements there were significant changes, paired samples t-test was performed. While applying paired samples t-test with Bonferroni correction for multiple comparisons, significance level was calculated as p=0.05/3= 0.017 for three comparisons (Akgül & Çevik, 2003; Leech, Barrett & Morgan, 2008). For analyzing CEF and EEF, frequencies and percentages were reported.

2.5.2 Qualitative data analysis: In general data description, analysis and interpretation steps are followed. On the qualitative data of the study, content analysis was performed by the first author. At first, a data analysis plan was prepared. As Yurdakul (2004) suggests, an inductive approach was chosen by pursuing preliminary, coding, developing themes, data interpretation and reporting stages.

As a result of thematic coding, the researcher forming a system where he can organizes the data defines the data he obtained according to this system considering the certain cases, comments and presents them in a clear way (Yıldırım & Şimşek, 2008). In present study, we provided appropriate citations about the findings of the qualitative sub-problems. Findings of perceived learning outcomes which correspond to remembering, understanding and applying steps of cognitive domain; receiving, responding and valuing steps of affective domain; perception, set and guided response steps of psychomotor domain were classified as lower order learning outcomes, while the others correspond to upper level of the third steps of cognitive, affective and psychomotor domains were classified as higher order learning outcomes (Koç, 2002).

2.5.3 Measures for Validity and Reliability of Qualitative Findings: In order to create a holistic picture about a phenomenon or a fact in a qualitative research, researcher should use additional methods (triangulation, verification of participants, and verification of colleagues) which help confirming the data he obtains and the results he gets (Yıldırım & Şimşek, 2008). Validity and reliability measures for qualitative format (Bogdan & Biklen, 1998; Creswell, 2003) are: explaining how he comes up with the results by reporting the data in detail; describing the researcher's role in the process; reflecting different perspectives; using triangulation in terms of data sources and data collection methods; confirming the data by participants and coding the data by one more expert. The entire qualitative data set was reanalyzed by a second coder who is also the second author. After reviewing all the qualitative analysis, researchers reported the findings together. In order to protect the participants' rights in terms of qualitative research ethics, the following measures were taken: written and oral expression of the aims of the study; the use of recording devices with permission; allowing participants to read the data set and to delete some of them if necessary for them; keeping the participants' identity, personal information and the data confidential.

3. Results

3.1 Effect of b-learning based program on achievement

In quantitative phase, effect of b-learning based program on achievement was tested by means of statistical hypotheses. Four measures of the students' achievement tests results were given in Table 3.

Table 3. *Means and Standard Deviations of the Four Achievement Tests (n=65)*

	Measures	$\bar{X}$	*SD*
Measure 1	AT1	4.66	1.35
Measure 2	AT2	5.09	1.54
Measure 3	$AT_{(p)}3$	5.72	1.07
Measure 4	$AT_{(p)}4$	6.03	1.10

AT= Achievement Test; $AT_{(p)}$= Parallel Achievement Test

As shown in Table 3, each mean scores of the achievement tests increased from the first measure ($\bar{X}$=4.66; *SD*=1.35) till the last one ($\bar{X}$=6.03; *SD*=1.10). The single-factor repeated-measures ANOVA was conducted to assess whether there were differences between the mean scores of the four achievement tests. The following assumptions were tested, independence of observations, normality and sphericity. Homogeneity of variances and normality were found to be met. Yet, Mauchly sphericity test was significant at p=0.01 level (p=0.004), multi-variate test (Akgül and Çevik, 2003) was chosen. Epsilon values were higher than 0.75, therefore Huynh-Feldt correction was used. Results indicated that the participants had four different achievement scores [F (2.69, 172.21)= 16.80, p< 0.01, eta^2 = 0.21]. In support of this, polynomial contrasts indicated that there was a significant linear trend, $F(1, 64)$ = 40.64, p< 0.01, eta^2=0.39, suggesting that each mean scores of the achievement tests were increased one after another.

On the other hand, paired differences of achievement tests showed that second pair difference [(AT2)-($AT_{(p)}3$)] was significant (p=0.006) [$t(64)$= -2.83, p<0.01] suggesting the acceptance of the first statistical hypothesis. This finding indicates that before experimental process no learning took place in other lessons that could affect achievement of this course. In other words, no change existed that could affect experiment which is considered as a proof for internal validity. The second statistical hypothesis was rejected suggesting that b-learning based program implementations significantly increased students achievement scores of IT & Ethics course. Regarding achievement, the third statistical hypothesis of the study was also accepted. Insignificant difference between $AT_{(p)}3$ and $AT_{(p)}4$ measures is considered as a result of the widespread social events in Turkey on June, 2013 (namely Gezi Park events) which took place during the fourth measures of the data collection.

3.2 Effect of b-learning based program on perceived cognitive flexibility

Secondly, in quantitative phase, effect of b-learning based program on perceived cognitive flexibility was tested by means of statistical hypotheses. Four measures of the students' perceived cognitive flexibility results were

given in Table 4.

Table 4. *Means and Standard Deviations of the Four Cognitive Flexibility Measures (n=65)*

	Measures	$\bar{X}$	*SD*
Measure 1	CFT1	76.85	11.06
Measure 2	CFT2	79.20	9.56
Measure 3	CFT3	82.05	9.28
Measure 4	CFT4	83.06	9.69

CFT: Cognitive Flexibility Test

Table 4 presents an increase of mean perceived cognitive flexibility levels from the first ($\bar{X}$=76.85; *SD*=11.06) till the last measure. Similar with the achievement scores analysis, single-factor repeated-measures ANOVA was conducted to assess whether there were differences between the mean scores of these four tests. Initially, independence of observations, normality and sphericity assumptions were tested and homogeneity of variances and normality were found to be met. Since, Mauchly sphericity test was significant at p=0.01 level (p=0.002), multi-variate test was chosen. Epsilon values were found to be higher than 0.75, therefore Huynh-Feldt correction was used. Analysis results indicated significance of F value [F(2.56, 164)=14.94, p<0.01, eta^2=0.19] and polynomial contrasts indicated a significant linear trend, F(1, 64)=30.70, p<0.01, eta^2= 0.32 suggesting significant increase in perceived cognitive flexibility mean scores.

Paired differences of cognitive flexibility tests showed that second pair difference [(CFT2)-(CFT3)] was significant (p=0.002) [t(64)= -3.18, p<0.01] therefore the fourth statistical hypothesis was accepted suggesting no learning took place in other lessons that could affect perceived cognitive flexibility. On the other hand, the fifth statistical hypothesis was rejected suggesting b-learning based program design implementations significantly developed perceived cognitive flexibility levels of participants. Like the fourth, the third statistical hypothesis was also accepted. Especially during the first month of the program implementations, the students' great efforts to be able to focus on new and complex tasks for them as deeply thinking and making comments on case based ethical problems are considered as a reason for the significant difference between the first two measures and insignificant difference between the last two ones.

3.3 Effect of b-learning based program on perceived self-regulated learning skills

Thirdly, in quantitative phase, effect of b-learning based program on perceived self-regulated learning skills (SLSS) was examined and the four measures of the SLSS were given in Table 5.

Table 5. *Means and Standard Deviations of the Four Self-Regulated Learning Skills Measures (n=65)*

	Measures	$\bar{X}$	*SD*
Measure 1	SLSS1	157.97	16.45
Measure 2	SLSS2	159.21	17.52
Measure 3	SLSS3	163.51	16.78
Measure 4	SLSS4	162.95	20.27

SLSS: Self-Regulated Learning Skills

Table 5 shows that the students' mean SLSS scores increased from the first ($\bar{X}$=157.97; *SD*=16.45) till the third one ($\bar{X}$=163.51; SS=16.78) with a slight decrease in the last measure ($\bar{X}$=162.95; *SD*=20.27). Similar with the achievement and cognitive flexibility analysis, single-factor repeated-measures ANOVA was conducted to assess whether there were differences between the mean scores of these four tests. Initially, independence of observations, normality and sphericity assumptions were tested and homogeneity of variances and normality were found to be met. Since, Mauchly sphericity test was significant at p=0.01 level, multi-variate test was chosen. Epsilon values were found to be higher than 0.75, therefore Huynh-Feldt correction was used. Analysis results indicated significance of F value [F (2.77, 177.09) =5.61, p<0.01, eta^2=0.08] and polynomial contrasts indicated a significant linear trend, F (1, 64) =11.34, p<0.01, eta^2= 0.15 suggesting significant increase in self-regulated learning skills mean scores.

When we investigate the paired differences of SLSS measures, second pair difference [(SLSS2)-(SLSS3)] was significant [$t(64)= -3.70$, $p<0.01$] therefore the seventh statistical hypothesis was accepted suggesting an evidence that no learning took place in other lessons that could affect perceived self-regulated learning skills. Nevertheless, the eighth statistical hypothesis was rejected suggesting b-learning based program design implementations significantly developed students' perceived self-regulated learning skills. As the seventh, the ninth statistical hypothesis was also accepted. As a reason for the insignificant difference between the last two measures, the students' great efforts during the first month of the program implementations to be able to adapt their replies to the declared criteria for evaluating on-line learning activities is considered.

Table 6. *Emerged Themes and Categories as a Result of Data Analysis*

Theme	Category	
1. Implementation Process	• Physical Setting • The Introduction of the lesson • Methods and Techniques • Equipment and Materials	• WBL studies • Roles and Responsibilities • Assessment and Evaluation
2. Feedbacks related to Implementation Process	• Learning and Teaching Process • Comprehension • Communication and Interaction • Instructor	• Assessment and Evaluation • The Position of the Course within the Program • Superior Ways
3. The Proofs for Program Implementation Efficiency	• Lower order learning outcomes	• Higher order learning outcomes

3.4. Stakeholders' evaluation of b-learning based program implementation

When the data related to the instructor's reflective diaries and interview, experts' weekly assessments and assessment surveys were analyzed, various findings on the process of program, scheme preparation and its effects were attained. Accordingly, themes and categories have been submitted respectively in the table 6.

3.4.1 Implementation Process: Physical setting, the introduction of the lesson, methods and techniques, equipment and materials, WBL studies, roles and responsibilities as well as assessment and evaluation take place respectively in the theme of Implementation process.

a) Physical Setting: B-learning based program is carried out in a crowded and U-shaped physical setting which in students cannot see the slides properly due to sunlight and inadequacy of available curtains.

b) The Introduction of the Course: As the instructor has stated in his diary, b-learning based program commence with the introduction of the lesson aim, comprehension, assessment-evaluation methods, online groups, interpretation evaluating experts and their criteria, written and electronic course resources. After his first lesson, the instructor has summarized how he covered courses in the following weeks expressing what topics, methods and techniques used and has reflected students' feedbacks related to lesson instruction.

c) Methods and Techniques: In the way the scheme foresees, It is mainly referred to such methods and techniques as discussion, exposition, question-answer and case study. The instructor gives clues related to the methods and techniques he used through his notes. For instance *"*... It is discussed why the concept of ethics has gained importance in recent 20 years...*"* [The instructor's diary-4]*"...It is addressed questions on the basis of true-life case study"* [The instructor's diary -6]. Students stated the methods and techniques supportively and respectively like that; discussion (n=57), question-answer (n=31), (expository instruction) exposition (n=25), case study (n=10), internet-based instruction (n=4), brainstorming (n=4), research (n=3), demonstration (n=3), problem solving (n=2), active learning and individualized instruction. Qualitative findings presented that the methods and techniques used in the course are carried out positive and coherent with the program scheme.

d) Equipment and Materials: Such equipment and materials as computer (n=64), projector (n=64), current news (n=64), presentation (n=64), pictures– photos (n=61), video (n=61), internet and web (Friendfeed) (n=54), articles (n=54), course books (n=16) and other books related to ethics (n=2) are used to back up the methods and

techniques in courses. With regard to instruction equipment and materials used in the course, there are several positive feedbacks like these: *"PP slides, pictures, videos, quotes by famous scientists and samples from daily life are presented."* [The instructor's diary -2] *"…To supplement content with pictures and photos raised attention."* [The instructor's diary -3] and *"It is seen that used materials are appropriate in general."* [The instructor's diary -4] Adversely, it is mentioned that there is a technical problem like that: *"Just the projector sometimes did not work…"* [The Instructor Interview].

e) WBL studies: It is determined that 58 (580/10) students attended to ten weekly WBL activities on average. According to that, the percentage of on-line attendance is 84.06%. The lowest attendance is on week 3 (n=53) and the highest one is on week 1 and 6 (n=62). In on-line setting, a group of experts have evaluated students' weekly studies in a coherent way with each other in five phases (to summarize answers, to emphasize attention-grabbing answers by using names, feedback and correction, expert evaluation, scoring student participation). Experts have presented feedback in terms of spelling and grammar, expression language, the quality of interpretation, research, and indication of sources, exemplification, communication rules in a coherent way with ODES and also attendance to activity.

f) Roles and Responsibilities: According to the instructor, students' roles and responsibilities are, to attend to both face-to-face and on-line setting, to complete weekly activities in allocated time, to read related researches, texts and books; to clear their thoughts about ethics by means of proper and versatile evaluation; to be able to see implications of unethical situations and to decide in that way. *The instructor* summarizes his own roles and responsibilities that he manages the instruction process and provides with attendance to on-line activities whereas it is described that experts' roles and responsibilities are virtual mentoring.

g) Assessment and Evaluation: Students predominantly and respectively answer the question to regard with what are the assessment and evaluation techniques within the scope of b-learning based program like these; on-line exam (n=64), open-ended exam (n=61), participation in the course (n=52), assignment (n=44). As one student has mentioned [Student Survey-58], it is thought that students tackle on-line activities within the scope of assignment.

3.4.2 Feedbacks related to Implementation Process: Feedbacks related to implementation process are examined under the themes of learning and teaching process, comprehension, communication and interaction, the instructor, assessment and evaluation, the position of the course in program and superior ways. Mentioned themes have been explained respectively in the following paragraphs.

a) Learning & Teaching Process: Positive feedbacks with relation to b-learning implementation are mostly taken by stakeholders. The instructor has taken positive feedbacks down like that *"At the end of the course, [to students] the satisfaction regarding the process of it has been observed at a high level [when it is asked] …"* [The Instructor Diary-4]. By presenting positive feedbacks concerning to *blended learning*, the most of the students (n=61) and also experts have emphasized that to give a course both at the class and on the internet is appropriate. Students (n=58) mainly suppose the contribution level of on-line dimension at b-learning while five students think that it is positive at medium level and one finds it negative.

Table 7. *Various Positive and Negative Attributes of B-learning Stated by the students*

Positive Attributes	*f*	Negative Attributes	*f*
Research – examination and mostly providing knowledge acquisition	27	Differences among Expert evaluations	4
Sharing, interpreting and evaluating our thoughts	25	Instead Friendfeed to use a different setting	3
Different point of view, production of a new idea	16	The stress of being evaluated through scores	2
More effective courses, providing transfer with current examples	11	Not reading what friends write	2
Leading to deep and critical thinking	11	The reduction of innovation effect of technology in time	2
The convenience to students who cannot participate in the course easily	9	Limited time to complete WBL activities	2
Continuation of teaching also outside of the class/school in a stress -free way and without time pressure	8	To get used to WBL setting	2
Opportunities for discussion and interaction	6		
Being in accordance with b-learning	6		
Permanent, effective, constant learning, internalization	6		
Ethical review and awareness	6		
Interaction with field experts and opportunity for getting feedback	6		

Table 7 presents that the most mentioned positive attribute is leading to more knowledge acquisition and research thanks to on-line activities (n=27). At the student survey number 43, such an expression related to activities draws attention: *"It enabled me to do researches on many topics which I have had no idea so far..."* It is determined that the participation in activities generally raised in on-line setting as the program goes by. Most students (n=54) have explained that there is no need for more different methods and techniques during the course. "*I suppose that exposition and discussion are the best methods in the course, which enables us to think about ethical violations as well as to interpret on them.*" [Student Survey-17].

b) Comprehension: When evaluations concerning content accordance are reviewed, it is seen that most students (n=60), the instructor and experts suppose that content is adequate in the general sense.

c) Communication and Interaction: When the data related to communication and interaction setting are analyzed during the program, most students (n=57) reported that all experts' and the instructor's communication and interaction are positive during the process. "*Leading is just made by providing with freedom of thought.*" [Student Survey-29]. On the other hand, six students evaluate the interaction in a positive way at medium level and one evaluates that it is inadequate. In the table 8, students' prominent views regarding communication and interaction in the process of learning –teaching are presented.

Table 8. *Students' Views on the Attributes of Communication and Interaction*

Setting Attributes	*f*	Chosen direct quotations
High -interaction	13	"Reciprocal student – teacher and student- student interaction patterns were high [Student Survey-21]
Clue, feedback and correction	13	"…Feedback, correction, clue, student participation [was provided]" [Student Survey -9]
Accepting listening	12	"Our teacher listened to our all interpretation patiently without discriminating between correct and incorrect …" [Student Survey 33]
Emotional setting	11	"Class climate was arranged in a very good way." [Student Survey -9]
Equal right to speak	10	"Teacher created a fair class atmosphere and recognized equal right to speak to everybody, which led the course to be a positive way." [Student Survey -51]
Discussion process	10	"The instructor was moderating discussions splendidly. When the discussion became more polemic, he changed the aspect of the discussion, which left a positive impression on both students and student-teacher patterns" [Student Survey -44]

d) The Instructor: Most students (n=60) point out that the instructor's teaching skills are adequate. When the qualitative data concerning to prepared program scheme are analyzed, it is seen that the instructor abided by the program both at class and on-line setting during the term and carried out all materials and activities at allocated time by setting determined methods and techniques to work. His expression related to the issue is like this: "There have been just some updates at planned activities. Except that, everything could readily be carried out just as it was designed." [The Instructor Interview]

e) Assessment and Evaluation: Most students (n=57) approve used assessment and evaluation instrument. As an example of students' views which mean very suitable is like this*; "It will be impossible to examine a specific topic in terms of ethics with a multiple- choice test. Thoughts were important at that term and we performed that properly during the course.* " [Student Survey -3] The statement of *"On-line exam and class exam were extremely suitable for the course"* can be given as an example of students views which mean suitable [Student Survey -5]. In summary, it is expressed that planned objectives, content, instruction and assessment-evaluation are suitable and there is no drawback in implementation.

f) The Position of the Course in Program: There are some opinions about the course of IT & Ethics at CEIT program. According to them, it should take place 2 hours per a week in the eighth term. 28 students mentioned that the class/term is suitable whereas 36 students and 1 expert mentioned that this is unsuitable. Example statements which are for suitable can be given from student survey number 20: *"I think freshmen, sophomore and junior students are hardly dry behind the ears [For this lesson] It is pat for senior students."* Most students (n=34) and expert5 who think that the class/term is unsuitable claim the course should take place at first year program instead the fourth -year one. As for its being a semester or yearly course, five students would like it to be yearly and one student prefers it to be must rather than elective: "*[To Ethical Principles] I have doubts to follow these at career, I do not think that half semester is sufficient to raise such awareness."* [Student Survey-48]. With regard to the suitability of weekly course hours, most students (n=55) think in a positive way. One student points out that it is more sufficient because there is also on-line dimension of the course. [Student Survey -55]. Eight students express that weekly course hours are not sufficient. Five of them suggest that the course should take place for 4 hours a week (2 days).

g) Superior Ways: Superior ways attributes of the b-learning implementation course taught by the instructor and experts are ranged like that; to run the program with a great team, the process of a good planning and implementation, the evaluation of on-line activities according to the scientific criteria, the possibility to give regular feedback students, to present students experience social media tools for an academic aim, to provide supply of a web site which belongs to the course and the issue that experts take place in weekly evaluations.

The instructor who emphasized that there is a great team involved in teaching process mention that six more people from the field has contributed to preparing lesson plans and current materials and evaluations of weekly comments, which made the implementation process successful. He adds that these contributions have a positive

effect on all course efficiency, result, student participation and the efficiency of materials. Experts have also emphasized the experience of a good planning and implementation process. For example, the course became more effective thanks to regular registration of weekly comments, standard criteria for evaluation, weekly regular feedback for students' writings and the direct correspondence of class and on-line activities [Expert Survey-4]. It is determined that the evaluation of on-line activities in accordance with scientific criteria is one of the superior ways of the course. Generally, it is explained under the assessment-evaluation theme that students (n=57) also think the issue of assessment and evaluation in a positive way. The possibility of giving a regular feedback to students is another superior way as well. The facility of experience using one of the social media tools for academic purpose is the issue that the instructor mentions. Students also addressed this finding as the contribution of Friendfeed usage under the category of proofs reflecting effectiveness of b-learning based program implementation.

Unlike previous years, the instructor comments on the contribution of web site supply for the course in this program like this: "*It was good that the syllabus, weekly activities, the word of the week, criteria for assessment and evaluation, students groups, some materials and videos etc. have taken part in the web site. This was important in terms of showing the given importance to the course and providing course information with students."* Another superior way mentioned is an expert group has taken part in the course.

3.4.3. Proofs Reflecting Effectiveness of B-learning based Program Implementation

22 of the students who participated in the h-learning practices scored its effectiveness as very effective, 41as effective, 1 as medium. Such statements of the participants as "The lesson was very effective with the help of in-class discussions and online activities." (Student Survey-5) and " I think the course was conducted very effectively without digressing from the core subjects" (Student Survey-58) support the findings. Proofs in terms of achieving the goals are obtained from the statements and evaluation results of the weekly WDO activities. The instructor states that cognitive and affective goals are achieved to a great extent. Majority of the students (n=40) also claim that the lesson was mostly in accordance with the goals and the main determiner of reaching the goals was their own future experiences: "You can learn all the goals in theory. But it is all related to how well you can apply them in practice. I think we will see if we have reached the goals or not when we have the opportunity to use them." (Student Survey-3). 18 students say that the goals are completely reached and their unethical behaviors are reduced. Students who think that the goals are partly achieved (n=5) have opinions regarding the transfer of the learning. There has been an increase in the evaluation scores of the weekly WDO activities based on the quantitative assessment of the experts. Accordingly, average score of the online activities was the lowest in the first week (80), it increased through the weeks and reached the highest (88) at the end. Additionally, proofs related to the effectiveness of the practices showed that the findings can be categorized under two themes: fundamental level learning outcomes and high level learning outcomes.

a) Lower order learning outcomes: Students and the instructor state that "Knowledge of the ethics" (n=12) was reached mostly in the cognitive domain. "Knowledge of informatics and ethics" (n=11) was often stated as the cognitive goal of the lesson. They also say they acquired "the knowledge of information ethics." (n=7). Besides, there were statements like "being able to give examples for the related lesson using the Internet", "knowledge of laws and legal right regarding information technologies", and "being able to explain the relationship between ethics and laws." Students (n=6) say the program was especially effective on "being able to explain the ethical rules and concepts". The instructor, the experts and one student emphasize that "being able to solve ethical problems and violation of ethics" was reached.

The most repeated positive effect of the lesson in terms of fundamental level affective goals was "being able to differentiate between what is ethic and what is not and ethical questioning" (n=35): "We often act before we even think if our behaviors are ethical or not. This kind of education (this lesson) makes you think twice before you act." (Student Survey-59). Another repeated feature among the affective learning outcomes was "the awareness of the informatics teachers about the informational ethics" (n=21). The statements on this matter are:

"…I can say that they have realized the importance of following ethical rules and values and their awareness was raised. I can easily state that their opinions on the matters that they had never thought about before or that they had no idea of have changed and become clearer." (Instructor Interview)

"As IT teachers, we have learned about dos and don'ts while on the Internet. We learned more about downloading, violation of copyrights and plagiarism." (Student Survey-45)

b) Higher order learning outcomes: Levels beyond the third level of cognitive, affective and psychomotor domains have been taken into consideration. Students (n=26) often repeated the positive effect "Supporting the ethical behavior". The statements related to this code are:

"I didn't expect this class would affect my life this much. Yet, I've become a person who pays attention to ethical rules and who warns the ones who don't." (Student Survey-23)

"…(this class) raised our awareness of how green we were before and how we should behave now." (Student Survey-45)

The instructor observed in the students the "ability of evaluating situations in terms of ethics" as a high level affective learning outcome. He said: "(one of the responsibilities of the students) is making reliable assessment and clarifying their thoughts on ethics." According to analysis, another repeated feature is "behaving according to the ethical rules" (n=20) and "adopting ethical rules and values" (n=15). In addition, "personalizing ethical behaviors" was also stated (n= 3). "Being able to use information technologies ethically" (n=13) was often stated as acquired. The instructor, the expert and the students all stated that "being able to follow virtual communication rules" and "being able to use the written language correctly" were also reached.

When all qualitative data set is studied, it is seen that focusing on current issues and using online activities in the process of designing and applying the program have made students think, question and research. Analyses have shown that there was consistency between program practices and its contribution to the students. According to the findings, students can share their opinions easily and evaluate the opinions of their peers thanks to the online activities (n=25). This helped students (n=16) develop a different viewpoint and understanding and led them to analytical and in-depth thinking (n=11). Findings have helped us to create that schema in Figure 1:

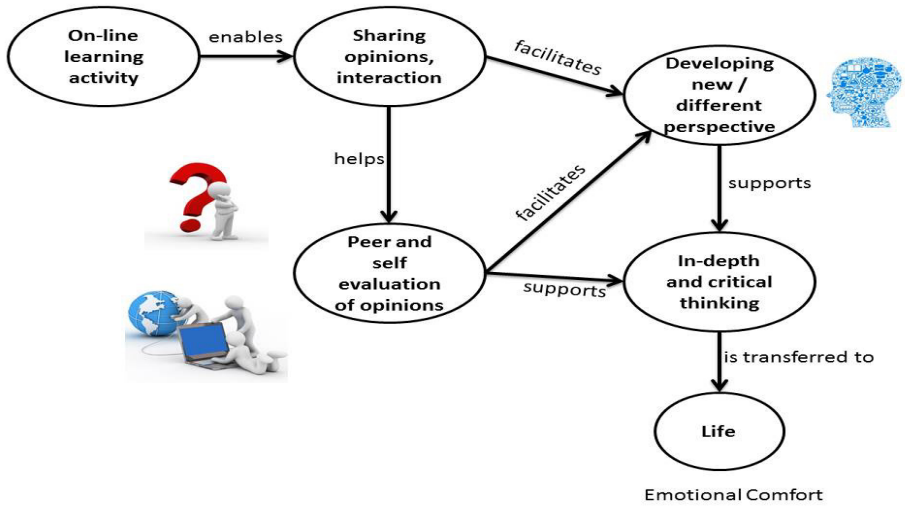

Figure 1. *The map of stakeholders' views about on-line learning activities*

When the opinions of stakeholders, which make up this map, are analyzed, it is seen that online activities initially support explaining and sharing thoughts among participants. Participants sharing their thoughts naturally required all the opinions to be discussed and assessed. Furthermore, two of the students stated "being able to discuss virtual behaviors ethically" and both the instructor and one student stated "being able to discuss ethical concepts" as the cognitive goals of the course. Students are understood to question each other's thinking patterns and thus to develop new viewpoints. It is also emphasized that "developing opinions regarding ethical behavior" (n=5) and "making original comments on the course-related subjects" were among the acquired goals of the course. Some of the statements by the instructor, the expert and the students are as below:

"(WDO activities) created a positive environment and helped us research on different discussion subjects, make original comments and gave us the opportunity to read about different ideas." (Student Survey-48)

"They had the opportunity to see the importance of multiple thinking through the questions in in-class and weekly online activities." (Instructor Interview)

"I concluded that students could think up more in details about informational ethics from what they wrote in the

latest activity." (Expert Survey-2)

Online activities also helped students develop analytical and in-depth thinking. Another positive effect mentioned by the instructor, the expert and the students was the students being able to approach situations using different viewpoints and critical thinking (n=10). Effective online activities and learning transfer through up-to-date examples are among the positive effects of h-learning mentioned by all stakeholders (n=11). As seen in Figure 1, the abilities acquired through online activities can be transferred to other areas of life. However, there were students who were hesitant about the learning transfer. For example, student 59 said "We, as IT teacher candidates, must pay attention to these matters but sometimes the real-life conditions are not for the ethics." The basic of the pattern formed by the analysis of opinions is the emotional comfort it provides. This shows that online activities are more suitable for the students who cannot easily speak up in the classroom.

4. Conclusion and Discussion

4.1 Conclusion and Discussion Concerning the Effect of B-learning on Achievement

The course success of the student group, to whom the B-learning-based program was applied, has been observed to increase meaningfully. There aren't only studies showing the positive effects of b-learning on the achievement/course success (Chen et al., 2010; El-Deghaidy & Nouby, 2008; Tsai et al., 2011; Woltering et al., 2009; Yılmaz, 2009) but also the ones showing that it doesn't have a meaningful effect on the achievement /course success (Delialioğlu, 2004; Delialioğlu & Yıldırım, 2007). El-Deghaidy and Nouby (2008) indicated the significant effect of b-learning on the course success in addition to Tsai et al. (2011) saying that the course success has increased through b-learning practices supporting self-regulated learning such as the weekly online activities in this study. However, Ünsal (2007), who examines b-learning in terms of student success and motivation, determined that there isn't a significant change among the student groups who received a face-to-face training and taught by the b-learning practices when it comes to the academic success and motivation grades although b-learning practices differs meaningfully from the face-to-face learning in terms of permanence grades. Moreover, he states that the mid-term averages of b-learning students has increased considerably compared to averages of the face-to-face students. When the measurement pairs were compared, a significant increase was found between the second measurement score done at the beginning of the program and the third one after a month while the program was still in use although other measurement pairs didn't show any sound difference. Since an empirical procedure wasn't conducted, not having a significant difference between the first measurement pair was an expected result. This can be reviewed as the evidence of internal validity because it shows that there has never been an alteration that can affect the achievement before the empirical procedure. During the time between the last two measurements, not having a significant difference despite the continuous learning can be due to timing of the measurement carried out as a part of the research design. Additionally, in the last measurement done at the end of the program, students might have had cognitive fatigue and negative effects of the social events at the time and of the approaching KPSS (reluctance and not being able to focus on the exams and the measurements etc.) can be observed. Reciprocal determinism theory by Bandura (1986) also suggests that behaviors are always under interaction with individuals and environment and they can be influenced by individuals and environment. It can be discussed that the proposal of b-learning-based program as the material of the empirical procedure in this study has affected student achievement in a positive and meaningful way when b-learning-based programs are perceived as an effective communication medium between student-student and teacher-student outside the classroom (Borup et al., 2011; Kirişçioğlu, 2009; Osguthorpe & Graham, 2003), and programs that foster the active participation in the lessons (Geçer & Dağ, 2012) and offer the richness of learning through information sharing in the discussion rooms (Osguthorpe & Graham, 2003; Ünsal, 2007).

4.2 Conclusion and Discussion Concerning the Effect of B-learning on Perceived Cognitive Flexibility

The average scores of the perceived cognitive level of flexibility of the students, to whom b-learning-based program was applied, increased in a linear trend from the first measurement to the forth one. When the difference among the measurement pairs was examined, it was revealed that the difference between the second measurement pair [(CFS2) – (CFS3)] was meaningful and the difference between the first and the third measurement pairs was not. A comparison to the other study results cannot be made because there is not a research finding in the literature explaining the effects of learning on the cognitive flexibility. However,

evaluating the research findings reported to have affected the cognitive flexibility is seen beneficial. The literature suggests that the cognitive flexibility is increased together with the social efficacy (Bilgin, 2009b) and problem-solving abilities (Bilgin, 2009b; Orendain & Wood, 2012; Yücel, 2011). Thus, b-learning-based programs designed with a problem-oriented and constructivist perspective are thought to lead to a change in the cognitive schemata of the students in accordance with qualitative results. It can be stated that students had the opportunity to think on the lesson subjects thanks to the online activities which were a part of the b-learning-based program, and then they discovered different viewpoints by interacting with their peers. In other words, focusing on the multiple viewpoints was achieved as Yurdakul (2004) asserted. In this way, it is understood that the students who rasped the subject/problem with different viewpoints were able to construct their own opinions. As are in the results of the achievement tests, a meaningful difference was observed between the second measurement pair while there was none between the other pairs. This case is thought to be the result of the justifications indicated in the results section related to the achievement tests.

4.3 Conclusion and Discussion Concerning the Effect of B-learning on Perceived Self-Regulated Learning Skills

The average scores of the perceived self-regulating learning ability of the student group, to whom b-learning-based program was applied, increased from the first measurement to the third one, and decreased slightly in the last measurement compared to the third one. A meaningful linear trend has been spotted in the scores of self-regulating learning. When the difference among the measurement pairs was examined, it was revealed that the difference between the second measurement pair [(SLSS2) – (SLSS3)] was meaningful and the difference between the first and the third measurement pairs was not. According to Woolfolk (2004), motivation to learn is one of the characteristics of the learners who have the self-regulating skills. The qualitative results of this study have shown that students did individual research on the relating subject matter, directed their own learning and synthesized case studies with the information they learnt through inquisition. Consequently, students can be thought to have the motivation to learn. Also, activities by the trainers and the associate have been observed to increase the motivation for the lesson. Literature also offers studies about the positive effects of b-learning on the perceived self-regulating learning skills (Bele & Rugelj, 2007; Garrison & Kanuka, 2004; Poon, 2013; Ünsal, 2007; Woltering et al., 2009). The online activities of b-learning can be considered the reason leading students to the self-regulating learning. As are in the results of the achievement tests and the perceived cognitive level of flexibility, a meaningful difference was observed between the second measurement pair while there was none between the other pairs. Similarly, not having a meaningful difference is an expected situation since an empirical procedure wasn't carried out between the first measurement pair, and this situation can be seen as the proof of internal validity showing there hasn't been a change affecting the perceived level of cognitive flexibility before the empirical procedure. When it comes to the third measurement pair, it was seen that the scores of the third and the forth measurements remained almost the same. The second measurement range corresponded the time when the program started. During this time, students struggled to follow the evaluation criteria while responding to the online learning activities, so they are thought to have used the self-regulating skills to the most between the second measurement pair.

4.4 Conclusion and Discussion Concerning Stakeholders' Evaluation of the Program Based on B-learning

Based on the descriptions regarding the implementation process, it was observed that the activities of the b-learning based program held in class were conducted in an appropriate physical environment in general, and that the instructor created rich educational situations within the scope of the program design, used various techniques, equipment and materials and carried out several activities of testing and assessment. In addition, it was interfered that the instructor assumed the role of a guide, encouraged students to participate and students had active tasks both in and outside the classroom during the process. It was therefore concluded that the program design was conducted abiding by the program design developed in the study. Consistent with the pattern in Figure 1, the fact that the process had been planned in accordance with the principles of program development, and the experience and competence of the instructor were seen as the factors that enabled the program design to be implemented as it was planned. As Demirel (2008) stated, teachers' role cannot be ignored in achievement of program implementations.

According to the qualitative findings concerning the implementation process, b-learning based program encouraged students particularly for research and investigation, to share their opinions with their peers and experts through interaction, to develop viewpoints and to *transfer* what has been learnt with up-to-date examples by increasing the efficiency of the lesson. According to the social cognitive theory which is based on sequential

linear cognitive interaction learning theory, expectations occurring as a result of the mutual interaction of the individual and the environment underlie the transfer in learning (Bigge and Shermis, 2004). Moreover, it was concluded that b-learning based program was appropriate with many of its features, learning-teaching activities could be carried out in a sound way and that it was evaluated positively in general by all the stakeholders. There are several studies supporting this finding in the literature. For example, various findings can be found showing that positive opinions were expressed about blended lessons (Ateş et. al. 2008; Uğur, 2007; Woltering et. al., 2009; Yılmaz, 2009; Yılmaz & Orhan, 2010); b-learning increased the interest in the lesson (Dönmez, 2005; Kirişçioğlu, 2009); and that it increased motivation for learning (Kirişçioğlu, 2009; Yılmaz & Orhan, 2010).

Evidence showing the efficiency of the b-learning based program implementations revealed that the b-learning based program was effective, the objectives of the course were mostly achieved and that the main determiner of achieving the objectives according to students was their own future experiences. The fact that students' grade averages they got for their performances in the weekly WBL activities increased in time was another indicator that the course achieved its objectives gradually.

Considering all the qualitative and quantitative findings of the study, various factors were considered to be effective for the success of b-learning implementations. These factors, which can also be called the *success criteria of b-learning*, are presented in Figure 2.

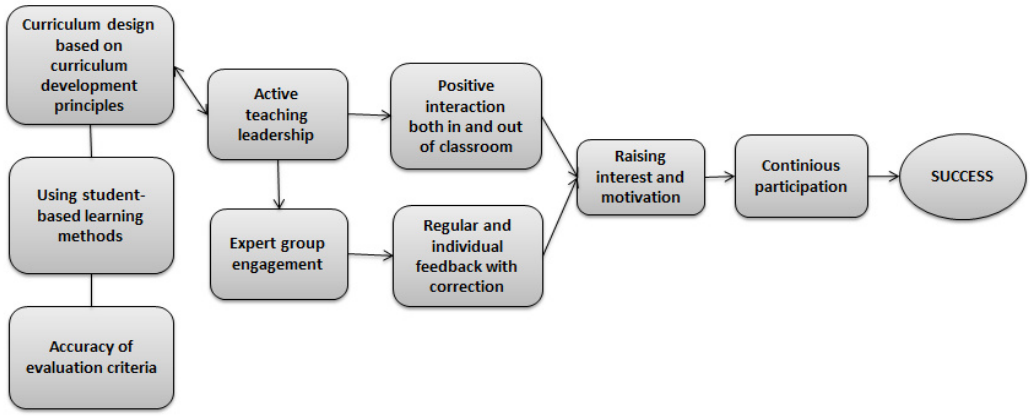

Figure 2. *Map of the factors considered to make b-learning successful*

The variables included in this map which reflects the results of the study are also corresponded in the b-learning literature. For instance; there are some findings showing that *structured learning* via objective oriented lesson design and *student instructions* including testing-assessment criteria should be present in online discussions in b-learning (Morrison, 2013); b-learning provided an effective way of communication both in and outside the class (Borup et. al., 2011; Kirişçioğlu, 2009; Osguthorpe & Graham, 2003); and that it increased interest and motivation for the lesson (Dönmez, 2005; Kirişçioğlu, 2009; Yılmaz & Orhan, 2010). It was also seen that the pattern was consistent with suggestions that the teacher is the leader and guides students in online discussion groups (Morrison, 2013; Xin & Feenberg, 2006).

Finally, the students, instructor and experts provided positive feedback for b-learning approach. Therefore, as carried out in the study, higher education instructors are recommended to include more b-learning practices for which need analyses are carried out considering the principles of program development, which support in-class education with case study based online learning activities and which are designed in interaction with experts in the field. On the other hand, a recommendation for researchers is to study the effects of b-learning with experiment and control groups by employing an experimental design with a control group (under conditions where inter-group interaction is prevented or minimized). Our final word is that we think the future is blended learning in higher education, so we encourage educators to try blending!

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