

A Study of Student's Perceptions in a Blended Learning Environment Based on Different Learning Styles

Buket Akkoyunlu and Meryem Yilmaz Soylu

Department of Computer Education and Instructional Technology, Hacettepe University, Turkey // Tel: +90 312 297 68 22 // buket@hacettepe.edu.tr // Tel: + 90 312 297 71 76 // meryemy@hacettepe.edu.tr

ABSTRACT

The rapid growth in the use of learning technologies, particularly the use of the web based technologies and communications have offered educators with many more opportunities to investigate the most suitable learning environments for their students' learning styles. The purpose of the present study was to examine the students' learning styles and their views on blended learning. The study was conducted with thirty-four students at Hacettepe University, Ankara, Turkey. The two instruments were the questionnaire designed to identify students' views on blended learning and Kolb's Learning Style Inventory (LSI) to measure students' learning styles. Additional data were gathered from achievement scores of students; and records demonstrate students' participation to e-learning environment. Results revealed that students' views on blended learning process, such as ease of use of the web environment, evaluation, face to face environment etc., differ according to their learning styles. Results also revealed that the highest mean score corresponds to face to face aspect of the process when students' evaluation concerning the implementation is taken to consideration. The overall findings showed no significant differences between students' achievement level according to their learning styles.

Keywords

Blended learning, Distance education, Learning styles, Kolb's learning style inventory, Teacher education

Introduction

New advances in the internet based technology have brought challenges and opportunities as well to education and training, in particular through online instruction.

The learning environments where instructional materials are transferred electronically or through the Internet or through course software with the help of computer technologies in teaching and learning environments and where the teacher and the learner are in different physical environments are known as e-learning. E-learning is also defined both as a kind of learning which occurs through the Internet, a network or only a computer and as audible, visual and interactive synchronous or asynchronous educational activities.

The most significant characteristics of e-learning are that the teacher and the learner are in different physical environments and that the communication throughout the teaching/learning process is carried out via e-mail, forums, etc. through the Internet.

E-learning is a common method since it is able to present the content of the course in a longer period of time compared to classroom environment and other methods; it allows education for seven days and twenty four hours; it reaches more number of learners; and it ensures a learning environment which is independent of time and place (Dziuban, Hartman, & Moskal, 2004; Osguthorpe & Graham, 2003) particularly for adult learners. However, e-learning environments pose such disadvantages as hindrance of the socialization process of individuals, lack of sufficient recognition between the teacher and the learner and limitations concerning the communication among learners. These disadvantages have evoked a search for new environments which combine the advantages of e-learning and traditional learning environments. This new environment is known as "hybrid learning" or "blended learning".

What is Blended Learning?

Blended learning environment integrates the advantages of e-learning method with some advantageous aspects of traditional method, such as face-to-face interaction. Blended learning brings traditional physical classes with elements of virtual education together (Finn & Bucci, 2004).

As Brown (2003) stated that blended learning supports all the benefits of e-learning including cost reductions, time efficiency and location convenience for the learner as well as the essential one-on-one personal understanding and motivation that face to face instructions presents.

There have been many other definitions of blended learning put forward in the literature. Simply put, Singh & Reed (2001) defined blended learning as a learning program where more than one delivery mode is being used with the objective of optimizing the learning outcome and cost of program delivery. Therefore, Singh (2003) proposed to refine this definition as “blended learning focuses on optimizing achievement of learning objectives by applying the “right” personal learning technologies to watch the “right” personal learning style to transfer the “right” skills to the “right” person at the “right” time.

Blended learning is described by Thorne (2003) as “a way of meeting the challenges of tailoring learning and development to the needs of individuals by integrating the innovative and technological advances offered by online learning with the interaction and participation offered in the best of traditional learning”.

The integration of e-learning environment and traditional learning environment may combine ideally the useful aspects of both methods. E-learning environments ensure the flexibility and efficacy which cannot be found in a classroom environment whereas face-to-face learning environment provides the social interaction which is required for learning. While definitions vary from one institution to another, blended learning is defined in this article essentially as a combination of face-to-face and web based environment.

However, it is important to construct equilibrium between e-learning and face to face environments, in view of the advantages of both methods, during the process of designing a blended learning environment.

Osguthorpe and Graham (2003) stated that instructional objectives, many different personal learning styles and learning experiences, the condition of online resources and the experience of trainers play an important role designing an effective blended learning environment and to establish the equilibrium between face to face and e – learning environment. With this in mind, researchers have adopted an approach that involves blending those components of the face to face and e – learning methods, that consider the learning outcomes for the course and students’ learning styles.

What is Learning Styles?

Today, instructors and researchers have realized the importance of learning styles. Educators have, for many years, noticed that some students prefer certain methods of learning more than others (Shell, 1991). Researches on learning styles have found that students’ learning styles affect performance in a learning environment. Learning styles form a student’s unique learning preference and help instructors in the planning of learning/teaching environment (Kemp, Morrison & Ross, 1998, p. 40).

The term learning style has been defined by many authors in the as follows:

People learn in different ways as the tendency to adopt a particular strategy in learning. Most students have a preferred learning style but some may adapt their learning styles according to tasks (Pask, 1976).

Learning style may also be defined as personal qualities that influence a student’s ability to acquire information, to interact with peers and the teachers, and otherwise participate in learning experiences (Grasha, 1996, p.41).

Learning styles are traits that refer to how individuals approach learning tasks and process information (Kemp, Morrison & Ross, 1998, p. 40).

Jensen (2003) defined it as a preferred way of thinking, processing, and understanding information (p. 31). It refers to a person's characteristic style of acquiring and using information in learning and solving problems.

Numerous studies have investigated the impact of learning styles in community college courses (Jones, Reichard & Mokhtari, 2003, Terry, 2001). Few studies to date have evaluated the students’ perceptions in learning styles and blended learning environment (Lemire, 2002; Raschick, Maypole & Day, 1998; Terrell & Dringus, 1999; Simpson &

Du, 2004; Richmond & Liu 2005). The studies about learning styles mostly focus on the success of learners in traditional learning environments, attitudes towards learning environments or the rate of involvement in the learning environment.

One of the most popular learning style inventories and one that is often used in distance learning and for adult research is the Kolb's Learning Style Inventory (Kolb, 1986; Dillie & Mezack, 1991; Dowdall, 1991; Diaz & Cartnal, 1999; Miller, 2005; Liegle & Janicki, 2006).

Kolb's Learning Style Inventory (LSI)

LSI is based on Kolb's Experiential learning model. In this model, knowledge is created from grasping and transforming one's experiences (Kolb, 1984). LSI was designed to place people on a line between concrete experience (CE) and abstract conceptualization (AC); and active experimentation (AE) and reflective observation (RO). The very brief explanations are as follows:

Concrete Experience: Looking at things as they are, without any change in raw detail.

Abstract Conceptualization: Looking at things as concepts and ideas, after a degree of processing that turns the raw detail into an internal model.

Active Experimentation: Taking what they have concluded and trying it out to prove that it works.

Reflective Observation: Taking what they have concluded and watching to see if it works.

These modes combine to form two learning dimensions: Concrete/Abstract and Active/Reflective. The theory states that while almost every individual utilizes all learning modes to some extent, each person has a preferred learning style, determined by obtaining scores on these two dimensions and mapping them on a grid. While CE and AC are two modes of grasping experience, AE and RO are two modes of transforming experience. The result is four learning styles:

- Divergers (CE/RO)
- Assimilators (AC/RO)
- Convergents (AC/AE)
- Accommodators (AE/CE) (Miller, 2005).

This research aims specifically at answering the following questions:

- a. What are students' views on blended learning environment?
- b. Are there distinguishable differences of students' views on blended learning environment in respect to their learning styles?
- c. Are there distinguishable differences of students' achievement scores in respect to their learning styles?
- d. What are students' frequencies of participation to the forum environment and face to face session in respect to their learning styles?

Method

The objective of this study is to describe the students' perceptions in learning styles and blended learning.

Participants

Study subject (participants) consisted of thirty-four undergraduate students enrolled in two courses (Authoring Languages in PC Environment and Instructional Design) at Hacettepe University, Faculty of Education, Department of Computer Education and Instructional Technologies, Ankara, Turkey.

As Table 1 shows 18 (53%) of the students were identified as divergers and 16 (47%) as assimilators. In other words, students fell into either the Diverger group or the Assimilator group.

Table 1. Students' Learning Styles

	n	%
<i>Assimilator (AC – RO)</i>	16	47
<i>Diverger (CE – RO)</i>	18	53
<i>Total</i>	34	100

An Assimilator combines Abstract Conceptualization and Reflective Observation – people with this learning style are best at understanding a wide range of information and putting it into concise, logical form; are less focused on people and more interested in abstract ideas and concepts. A Diverger combines Concrete Experience and Active Experimentation – people with this learning style are best at viewing concrete situations from many different points of view, are good at observing rather than taking action. These students brought into their respective settings of different ways and preferences for the learning content. However, participants only revealed the features of Assimilator and Diverger learning styles and that do not show the features of Convergents or Accommodators.

Kolb (1984) underlined that experiential learning model may indicate learning style norms within academic disciplines. Divergers migrate toward service-type careers, the arts, social sciences, or the humanities and teachers whereas scientists, engineers, technicians and academicians are examples of assimilators (Kolb & Wolfe, 1981; Kolb, 1984; Aşkar & Akkoyunlu, 1993; Nilson, 2003; Kvan & Jia, 2005). Participants are undergraduate students at Faculty of Education, Department of Computer Education and Instructional Technologies; they will be teacher or instructional designer etc. Besides, most of the participants (72%) come from vocational (such as computer or electrical department) high schools. Therefore, their background also supports the Kolb's model.

Data Collection Process

Data required for this study were collected by the researchers through a questionnaire and Kolb's Learning Style Inventory (LSI). Additional data were gathered from achievement scores of students; and records demonstrate students' reactions to e – learning environment.

The Questionnaire

The questionnaire was developed to identify students' views on blended learning environment.

After a literature review, a 50 item questionnaire was designed by the researchers. Statements in the questionnaire were categorized in two main parts. The first 35 items were prepared to identify students' views on the process of implementation (ease of use in web environment, online environment, face-to-face sessions, evaluations concerning the content) whereas the remaining 15 questions were developed to determine their views on blended learning environment in general.

The students were asked to rate each item on a scale ranging from 1-10. The scores obtained were ranked as follows: "1-5: low", "5.01-7: medium", "7.01-10: high". The alpha reliability coefficient of the scale was found as .72. Views and suggestions of subject specialists were taken about the content validation of the instrument and necessary revision was carried out accordingly.

Kolb's Learning Style Inventory

Kolb's Learning Style Inventory (LSI) was used to measure students' learning styles. David A. Kolb's Learning Style Inventory consists of 12 questions about the ways in which one learns best. Each question has four answers, which are to be ranked by an individual in terms of best fit on a scale of 1 – 4 (4 being best). Responses are organized into two bipolar concepts: Concrete Experience vs. Reflective Observation and Abstract Conceptualization vs. Active Experimentation. The numbers are summed to give scores for CE, AC, RO and AE. Then (AE – RO) and (AC – CE) are calculated and used abscissa and ordinate, respectively, on a graph that determines one's ultimate learning styles.

Kolb's Learning Style Inventory (LSI, 1978), revised in 1985, purports to categorize individuals on the basis of their self-reported preferred learning style. LSI adapted into Turkish by Aşkar and Akkoyunlu (1993) and its validation and the alpha reliability coefficient of the scale were calculated.

Achievement Score

In order to evaluate students' achievement scores, course assignments, sub scores gained through midterm examinations, studies during the process, final projects and their effort in the processes were marked and analyzed. Final marks for the project consisted of the sum of the marks obtained from course assignments (20%), the marks for the midterm examinations (20%), the marks for the final project (50%) and the marks for their effort in the processes (10%). The pass mark was set at 65%.

Frequency of Participation to the Forum Environment and Face to Face Session

The frequency of participation to the forum was recorded and their messages sent to the forum were saved. For the frequency of participation to face to face session was also recorded. Participation frequency in a process of 14 weeks ranges from 18 to 0. The participation frequency scale is as follows: "0-5: Low", "6-11: Medium", "12-18: High".

Procedures of the Study

In this study the course was delivered in a blended format, incorporating both web-based and traditional teaching. A web based environment was constructed for two courses (Authoring Languages in PC Environment and Instructional Design) to implement the study. Only students and course instructors/researchers were allowed to access to the web environment. The web based environment was designed as just upload and download functions for the practice sheets, exercises, texts and handouts and a Forum for discussion. In other words, it is quite simple in its structure. It also allows students to progress at their own pace.

The Forum was designed to increase interaction among students and the instructor. The Forum environment allowed for peer to peer, student – instructors, and instructor – student communication and gave students opportunities for sharing their experiences, questions etc. with each other and with the instructors. The instructors acted as moderators by responding to questions and comments, keeping the discussion on track and evaluating student performance in the process. The participation of students to the forum was checked and recorded on a weekly basis, and feedback was given to them regularly.

The contents of both courses were loaded into this environment every week by the researchers. The contents of courses were designed according to principles of tutorial instruction. Information in texts was presented in small units followed by questions. Besides the course contents, discussion questions, practice sheets or exercises took place in this environment. The web environment was updated regularly (announcements, weekly assignments, etc.) throughout the process.

The students had access to the materials one week prior to the face to face sessions and attended to face-to-face sessions after replying to the questions and performing the applications. The face to face meetings were held every two weeks. During the time in between, the instructors communicated via the forum. During face-to-face sessions the questions of students concerning the course content and their answers on the practice sheets were discussed. Practice sheets were prepared by both reviewing existing literature on the topic and also summarizing the literature in a meaningful way for the students. Participation in the forum environments and face to face sessions was obligatory and students were encouraged to participate and contribute to the process. Besides, the students' reflective reports and their feedback were also gathered in several ways.

Data were collected over a period of 14 weeks for this study. All data from each instrument were entered into a statistical analysis package for a later analysis. Statistical analyses were conducted using independent t test and percentage analysis. All statistical test reported in this article were conducted with a significance level of .005.

Findings and Discussion

The following are the results and findings of the research. The research questions were examined in the order of occurrence in the instruments.

What are students' views on blended learning environment?

As illustrated in Table 2, general mean score obtained from the questionnaire corresponds to 8.44 and the highest mean score ($\bar{x}=8.99$) corresponds to face to face aspect of the process. The scores as presented above are categorized as follows: "1-5: low", "5.01-7: medium", "7.01-10: high". This result can be explained in a several ways: Face to face features of the session provides social interaction between students and teachers. Besides, face to face sessions may be more similar to students' study preferences. Students' expectations could be met in the face to face sessions in the study; for instance, students could have been able to find all the topics which they had difficulty in understanding. One of the distinguishing features of most distance education classes is the absence of the face to face social interaction between students and teachers. Results of the findings showed that face to face interaction is a must for students. Besides, the students' reflective reports and their feedback showed that blended learning was felt to have enhanced their learning opportunities. Student feedback revealed that the provision of the blended learning was highly appreciated and positively rated by them.

The students' views on blended learning environment in respect of their learning styles were examined and the results are showed in Table 3.

Table 2. Students' Views on Blended Learning Environment

	<i>n</i>	\bar{x}	<i>sd</i>
Ease of use of Web Environment		8.02	.943
Online environment		8.30	1.256
Content	34	8.45	.878
Face-to-face environment		8.99	.648
Evaluation		8.56	.905
Blended Learning Method		8.31	.654
General		8.44	.719

Are there distinguishable differences of students' views on blended learning environment in respect of their learning styles?

Table, 3 illustrates students' views on both the blended learning process of implementation (ease of use in web environment, online environment, face-to-face sessions, and evaluations concerning the content) and their views on blended learning environment in general.

It shows that blended learning differ according to students' learning styles. In both groups, it is observed that the highest mean corresponds to face to face aspect of this process, when students' evaluation concerning the implementation is taken into consideration. Divergers in other words, concrete experiences tend to show a greater sensitivity to feelings and thus would be expected to have more interactions with peers and the teachers. Furthermore, assimilators prefer lectures for learning with demonstrations where possible, and respect the knowledge of experts. They will also learn through conversation that takes a logical and thoughtful approach. Besides, the researchers have observed that face to face classes forced the students to be actively engaged and connected to the process.

However, results from t – test revealed that in terms of differences in views of students on blended learning regarding their learning styles, a significant difference was noticed when comparing the means of those students classified as Assimilators. According to the Kolb's Learning Styles, assimilators respond to information presented in

an organized, logical fashion and benefit if they have time for reflection. Divergers are emotional and sensitive to people and thus would be expected to require more interactions with peers and the teacher.

The differences of students' achievement scores in respect to their learning styles were examined and the results are displayed in Table 4.

Table 3. Differences of Students' Views on Blended Learning Environment in Respect of Their Learning Styles

	Assimilator		Diverger		t	p
	\bar{x}	sd	\bar{x}	sd		
Ease of use of Web Environment	8.81	.714	7.32	.404	-7.611	.000
Online environment	9.49	.290	7.24	.688	-12.113	.000
Content	9.08	.550	7.90	.724	-5,330	.000
Face-to-face environment	9.43	.333	8.60	.611	-4,827	.000
Evaluation	9.26	.551	7.94	.672	-6,214	.000
Blended Learning Method	8.69	.420	7.96	.639	-3,891	.000
General	9.13	.245	7.83	.333	-12,799	.000

Are there distinguishable differences to students' achievement scores in respect of their learning styles?

As shown in Table 4, the results of independent t – tests indicate no significant differences between students' achievement scores in respect to their learning styles. Consequently, this finding signifies that students who have Assimilator and Diverger learning styles can be as equally successful in the online environment in this study.

Table 4. Differences of Students' Achievement Scores in Respect to Their Learning Styles

	Assimilator		Diverger		t	p
	\bar{x}	sd	\bar{x}	sd		
Students' Achievement Scores	84.18	7.53	82.72	6.11	-.625	.536

What are students' frequencies of participation to the forum environment and face to face session in respect to their learning styles?

Students' frequencies of participation to the forum environment and face to face session in respect of their learning styles were tracked (See table 5). As mentioned before, the high level of participation frequencies defined as 12 – 18 and low participation as less than 6. Data analysis revealed that both assimilators (63%) and divergers (61%) had the highest number of participation into face to face sessions during the process. The result can be explained in various ways: The face-to-face aspect of the application is more similar to students' study habits and it is possible that students found the answers of their questions during this process. In addition, the face to face interaction of students with each other and with the instructors is quite significant. Furthermore, assimilators see the instructor as the expert and prefer to obtain information directly from the instructor. They interact less with their peers and more with instructors. They are also goal oriented and may like to interact with the instructor to set expectations for assignments, exams and other course requirements. On the other hand, Divergers tend to be with people and are oriented to feelings. As a result, they may have found the online environment discussion to be uncomfortable and it was difficult for them to connect with others. As shown in Table 5, Divergers had the smallest number of participation to the Forum environment. One explanation of this result is that divergers are uncomfortable sharing their ideas in the online environment. Divergers require more support in an online environment.

Table 5. Students' Frequencies of Participation to the Forum Environment and Face to Face Session in Respect of Their Learning Styles

	Forum Environment						Face to Face Session					
	Low		Medium		High		Low		Medium		High	
	n	%	n	%	n	%	n	%	n	%	n	%
Assimilator	3	19	5	31	8	50	1	6	5	31	10	63
Diverger	11	61	4	22	3	17	3	17	4	22	11	61

Conclusion

Based on the result of the study, it appears that students' in the study group fell into the groups of either divergers or assimilators, according to Kolb's categories. As mentioned before, Kolb's (1984) experiential learning model point out learning style norms within academic disciplines. Divergers migrate toward service-type careers, the arts, social sciences, or the humanities and teachers whereas scientists, engineers, technicians and academicians are examples of assimilators (Kolb & Wolfe, 1981; Kolb, 1984; Aşkar & Akkoyunlu, 1993; Nilson, 2003; Kvan & Jia, 2005). Furthermore, Participants' demographic background support the Kolb's model.

The results revealed that overall mean score for students' views on blended learning environment is 8.44 and the highest mean score ($\bar{x}=8.99$) corresponds to face to face aspect of the process is quite high as specified by researchers. As mentioned by Clark (2006, p.10) although unprecedented levels of technological changes, learning is so often equated with the classroom for people who have gone through that process to think in any other way. Further, the results were consistent with the reviewed literature. Most of the literature underlined that human support is very important for learners and it introduces a personal touch to help with problems, sustain interest or motivate learners etc. (Clark, 2006; Dziuban, Hartman & Moskal, 2004; Brown, 2003; Singh & Reed, 2001).

Results showed that significant differences in students' views on blended learning were noticed regarding their learning styles when compared the means of those students classified as assimilators. According to the Kolb (1984) assimilators focus on logic, ideas and concepts; are good at systematic planning; prefer to work alone; and usually learn by thinking and watching.

There was no significant difference on students' achievement was found regarding their learning styles. It should not mean that "anything will do" but that the online course must be developed well in order to enable learning to occur.

Analysis of participation to the forum showed that assimilators were the most active learners while divergers were less active.

As some authors (Maddux, Ewing-Taylor, Johnson, 2002; Thiele, 2003) have noted, when designing e-learning environment, adequate support strategies must be provided for students with different learning styles and adapt online course design to accommodate these styles. Catering to the different learning styles could result in higher retention in e-learning environment.

Limitations

As evaluations of the students' perceptions in learning styles and blended learning environment are a relatively new field, a discussion of the limitations of this study deserves examination. One of the limitations of this study was that participants' learning style indicates only features of Assimilator and Diverger. As there was a desire to examine a sample with all four learning styles.

The another limitation was the teaching style of the instructor was not measured in the study. Therefore, it was impossible to determine how the instructors teaching styles effected to the students' experiences in the online classes and in the face to face classes. A longitudinal study is being planned to evaluate the students' perceptions in learning styles and in blended learning environment with an inclusion of an analysis of facilitator teaching styles.

The other limitation was the utilization of a non - probability sampling technique. Non – probability sampling is used when it is impossible or impractical to use random sampling techniques. Thus the case is limited in a large portion of educational research. While still valid, the results should not be over generalized.

Suggestions

It is important to know the students' learning styles to design and manage different web-based environments or other learning materials in various subject areas. Therefore learning style inventories and resulting data for the purpose of facilitating class preparation, designing class delivery methods, choosing educational technologies, and developing sensitivity to differing student learning preferences within the web based learning environment would be used by educators.

Further research is needed to understand;

- how learning styles contribute to the students' experiences in the online classes and in the face to face classes.
- how students' learning styles affect the level of engagement in the online classes.
- how the potential change occurs in learning styles with the introduction of blended learning environment on a long – term basis.
- how instructors' teaching style preferences effect the students' achievement, experiences in the online classes and in the face to face classes.

Further, face-to-face and online environments can be evaluated by examining the students' assessment of process such as the difficulties they encountered, their suggestions, etc. through open-ended questions. Another research is also needed that includes a sample with all four learning styles to define the students' perceptions in learning styles and in blended learning environment

Implications for Practice

This study is significant for educators, prospective teachers and academic institutions.

The result of this study should send an important message to the instructors and academic institutions who are keen on teaching their courses in an e – learning environment, for the following reasons:

Educators will encounter significantly different learning preferences. By examining the learning styles of the e – learning students and varied learner achievements and participation to e – learning environment, an instructor should consider all related factors and include the necessary components into the program when designing an e-learning course to facilitate student learning. In other words, assessing the learning style of e- learners in should give us indication of how e-learning systems should be developed.

At the institutional level, understanding the differences among students' learning styles may assist in creating flexible instructional strategies that allow for e- learning environment. Learning Style diversity, when understood, can translate into appropriate learning environments, which will enable learners to achieve success. Assessing Learning Style will identify how learners perceive, interact with and respond to the learning environment.

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