THE IMPACT OF BLENDED LEARNING MODEL ON STUDENT ATTITUDES TOWARDS GEOGRAPHY COURSE AND THEIR CRITICAL THINKING DISPOSITIONS AND LEVELS

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ABSTRACT
The present study aims to determine the impact of blended learning model on student attitudes towards Geography course and their critical thinking dispositions and skills. An experimental pattern with pretest-posttest control group was used in the study. The study group consists of a total of 57 students – 28 in the experiment group and 29 in the control group – at Kırşehir High School. The experiment group was subject to hybrid learning through the Geography web page, while the traditional learning model was used for the control group. The data were collected through literature review, the Geography Attitude Scale, and the California Critical Thinking Disposition Inventory with Cronbach Alpha values of 0.92 and 0.88, respectively. The data were then subjected to percentage, arithmetic mean, t-test, ANOVA, Scheffé and Pearson correlation tests and the results were interpreted ($p<0.05$). As a results: Blended learning model contributed more to student attitudes toward geography course when compared to the traditional learning model; blended learning model contributed more to student critical dispositions and levels when compared to the traditional learning model; and there was a positive correlation between student attitudes toward geography course and their critical thinking dispositions and levels.

Key Words: Blended learning; Academic Achievement; Attitude; Geography Education

INTRODUCTION

Information technologies and economic reforms have brought about social, political, and economic changes throughout the world. Developments in information technologies have reshaped people's views towards themselves and their environments, as a result of which a parallel change and development at the same pace has become inevitable in the field of geography education. This change and development in the field of geography education is determined by numerous factors. One of the most important among these factors is teachers, which is undoubtedly followed by information technologies. A teacher has a crucial function in managing information technologies and establishing a link between students and information technologies (Oral, 2004).

It is indisputably accepted that the use of information technologies in geography education will greatly facilitate access to and transmission of information (Deniz, 1994). Today, the first thing that comes to mind about the impact of technology on education is computers and Internet use. Computers and the Internet which have become an integral part of daily life could not have been expected to be left out of teaching-learning environments (Deniz, 1994). Computers and Internet use have come to the foreground in the recent practices in geography education. In particular, geographical information systems (GIS) take the lead in this respect and there have been important attempts to introduce these systems into geography education (Bednarz 2004).

It could be argued that as a result of the increasing prevalence of computers and the Internet, in particular, online learning-teaching environments are rapidly becoming more widespread. However, online teaching-learning environments lack many advantages that face-to-face environments have, which led to the notion of blended learning. Sikora and Carroll (2002) reported that online higher education students tend to be less satisfied with totally online courses when compared to traditional courses. Therefore, a combination of online learning and traditional learning environments could be much more useful in solving education problems and meeting educational needs (Murphy, 2003). Furthermore, Graham, Allen and Ure (2003) argue that blended learning was developed for its potential advantages in offering a more effective education, convenience, and access to teaching-learning environments. On the other hand, advocators of the blended learning approach define blended learning simply as "maximizing the best of both worlds", or in other words, the chance to simultaneously benefit from the advantages of online environments and face-to-face learning environments (Morgan, 2002).

In the literature, blended learning is usually perceived in three different ways as media-based, method incorporation or a combination of online and traditional education methods (Usta, 2007). Media-based definitions generally underline the need to combine instructional media and techniques to produce educational

output (Bersin, 2004; Singh & Reed, 2001). Apart from this approach which perceives blended learning as a combination of tools, Driscoll (2002) consider blended learning as an environment in which different methods and strategies are used together. On the other hand, Young (2002) defined blended learning as a situation where online education is combined with traditional classroom-based instruction. In this instructional method, the advantages of traditional and online learning methods are supplementary for all education environments. Online educational components naturally become a part of traditional instruction method for students to experience interaction, flexibility, and harmony in classroom environment while they take all their courses online. Using the same approach, Singh and Reed (2001) defined blended teaching as an instruction program that uses more than one presentation method to improve the cost of program presentation and educational output. Blended learning is to incorporate various environments, activities, and technologies designed for a particular learner group and the term "blended" means bolstering classical teacher-centered instruction with other electronic media and materials in an integrative manner (Bersin, 2004). Consequently, blended learning could be considered as an approach which could allow creating suitable environments for students to achieve their learning objectives more easily in improved educational environments by applying appropriate technologies in various classroom environments under different conditions and thus, reducing education costs.

If properly designed, blended learning environments might combine the power of online environments with that of classical face-to-face environments. For designing blended learning environments, Horton (2000) proposes certain methods such as online components that combine face-to-face and online elements for a particular course and familiarize students with face-to-face sessions, online courses defined by students in class and supported by the teacher again in class, and online presentation materials to be used by teachers for in-class presentations.

One of the practices that are most often mentioned among those provided by blending is the opportunity for development on educational applications prevailing in both computer-centered and face-to-face learning environments. Within this framework, blended learning environments might help increase the student-centered strategies and activities (Morgan, 2002; Collis, 2003); facilitate the transition from teacher-centered instruction to a student-centered one (Morgan, 2002); increase student interest towards learning (Collins, 2003); and improve individual consultation services for students.

Access to education is one of the key factors which ensure development of distance education environments. Ease of access has increasingly become more important as more mature students with different external responsibilities are increasingly in need for more additional training. Blended education environments are regarded as a way of increasing conveniences while maintaining and balancing personal communication at the same time (Morgan, 2002; Collis, 2003). Reducing the time allocated to face-to-face sessions might reduce the limitations of time and place for students, thus providing students with flexibility with regard to time, place, and access to course content.

When designing a blended learning environment, the first point to be decided is to design a part of the blended subject matter as face-to-face and some as online. The more common blending technique is usually half-and-half. In other words, 50 percent consists of face-to-face activities in classroom environment and the other 50 percent of activities performed in an online environment (Osguthorpe & Graham, 2003). Table 1 presents the possible components that could be found in a blended environment and used in an online- and traditionally-managed classroom (Eunjoo, 2006 cited in Usta, 2007)

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Table1. *Blended Instruction Model*

Blended Learning (Courses in which a portion of online instruction is replaced by traditional classroom activities)					
Online Instruction			**Traditional Instruction**		
Instruction environment	Activities	Applications	Instruction environment	Activities	Applications
1.Computer-based online learning 2.Synchronous 3.Asynchronous 4.Unidirectional communication 5.Bidirectional communication	1.Introduction 2.Exercise 3.Individual study 4.Discussion 5.Homework 6.Group work 7.Analogy 8.Evaluation	1.Course supervision instruments 2. Video 3.Audial 4.Presentation tools (PowerPoint, Flash) 5.Communication tools	1.Classroom 2. Synchronous 3. Bidirectional communication	1.Introduction 2.Presentations and group work 3.Exercise 4.Evaluation	Varies from one classroom to another

Online blended learning is one of the best practices in a technology-based classroom (Usta, 2007). As a reason for a teacher to prefer a blended instruction environment, Osguthorpe and Graham (2003) point out to some considerations such as educational richness, access to information, social communication, individual activity, cost-effectiveness, and easy correction. Online communication media such as discussion forums, virtual classroom environments, listserv, and blogs could assist individual and group activities in synchronous and asynchronous learning. These media also assist various instructional approaches and learning models such as problem-based learning and cooperative learning, which allows students to work together irrespective of the number of group members (Slavin, 1987). Rossett and Frazee (2003) suggest that instruction tools and planning approaches are crucial components for a successful blending, and that all components of the instruction method can be appropriately combined. A blended model usually includes certain educational components. However, teachers have a wide range of options for blending and they are not only limited to the applications and activities previously known and used. Education might be a combination of formal and informal approaches, technology- and human-based activities, independent and enjoyable activities or direct and exploratory materials.

Schools of the information age are environments that train creative and critically thinking individuals who produce information and have access to the needed information; actively employ and spread information; and actively use information technologies (Balay, 2004). Within this framework, it is an anticipated outcome that the methods and technologies employed in the schools of the information age positively contribute to students' critical thinking dispositions and levels (Branch, 2000). Facione defines critical thinking as the process of purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based (Özdemir, 2005). On the other hand, although critical thinking is defined as an individual's ability to think openly, independently, and rationally, emphasis is made on the fact that the concept does not denote debate and constant negative criticism (Külahçı 1995). It is argued that various education stages include some course content that could only be learned through thinking and without intellectual processes, students will end up in attempting to memorize most information (Paul & Elder, 2001). Nevertheless, students are expected to analyze any presented information, or know how to use it (Brad, 1994). In this context, increased academic achievement is a natural outcome of making critical thinking education a part of educational processes (Elias & Kress, 1994). Yet, individuals cannot improve their critical thinking levels on their own. Currently, it is largely a responsibility of schools to help individuals acquire the skills of critical thinking and information analysis (Kökdemir, 2003).

Geography course has a distinct position for its possible contributions to critical thinking skills. As a discipline analyzing and synthesizing the information collected in the context of human-natural environment interaction, geography requires students to structure the acquired information by questioning it using these criteria at all stages. Thus, they improve their critical thinking skills through a questioning and synthesizing approach.

Schools of the information age are also expected to develop positive student attitudes both toward academic and social issues. To develop positive student attitudes towards geography course, teachers need to have positive attitudes and a sound information background, and to use technology along with modern instruction methods (Tekinarslan, 2006). Given the learning-instruction processes and their effectiveness, it is important to know about the affective characteristics of students such as their interest and attitude towards information technologies and academic subjects (Petty & Cacioppo, 1996).

In the context of the above explanations, the use of blended learning model in geography courses with dimensions such as human, environment, and human-environment interaction is expected to improve students' academic achievement in geography courses, to develop positive attitudes among them towards technology and geography course, and to positively contribute to their critical thinking dispositions and levels. Drawing upon this proposition, the present study attempted – as its problematic – to determine how blended learning model affects student attitudes towards geography course and their critical thinking dispositions and levels.

Research Questions

The present study aims to determine the impact of blended learning model on student attitudes towards Geography course and their critical thinking dispositions and skills. Thus, it sought answers to the following questions:

1. Does blended learning change student attitudes towards Geography course?
2. Does blended learning change students' critical thinking dispositions and levels?
3. What is the relationship between students' critical thinking dispositions and levels and their attitudes towards Geography course?

METHODS

An experimental pattern with pretest-posttest control group was used in the study. The study group consists of a total of 57 students – 28 in the experiment group and 29 in the control group – randomly selected from among the students studying in the Equally Weighted field at Kırşehir High School.

Procedures

The following steps were pursued throughout the experimental operation:

1. The experiment and control groups were randomly assigned. Thus, Class 10TM-G was selected as the experiment group, and Class 10 TM-H as the control group. Class size was taken into consideration in selecting the groups, while student success rates for the previous years and individual differences were neglected.
2. A presentation on "Blended Learning" was presented to the students on March 25, 2008. The students in the experiment group were informed about the way this instruction method would be used, as well as about the characteristics of the instruction process.
3. Both groups were administered the critical thinking and attitude pretests in order to determine whether the experiment and control groups were equivalent in terms of research variables and preliminary information.
4. The research application was carried out four hours a week in a four-week period between April 1, 2008 and April 30, 2008.
5. On May 6, 2008, one week after the application ended, the attitude scale and the critical thinking disposition inventory administered to the students before were re-administered as the posttest.

The following four-week program was administered on the experiment and control groups (Table2):

Table 2. *Four-week program was administered on the experiment and control groups*

Date	Application	
	Experiment Group	**Control Group**
March 25, 2008	Presentation on "Blended Learning"	-
April 1, 2008	Administering the pretest on critical thinking dispositions and levels and the attitudes towards geography	
April 8, 2008	Using the website designed in accordance with the Blended Learning Model, the geographical subject of soil, soil formation, and the factors affecting soil formation was treated	Using the classical methods (lecturing, questions and answers), the geographical subject of soil, soil formation, and the factors affecting soil formation was treated.
April 15, 2008	The subject of soil types and the factors affecting them was treated using the planned method for the experiment group.	The subject of soil types and the factors affecting them was treated using the planned method for the control group.
April 22, 2008	The subject of vegetation cover and the factors affecting their development was treated using the planned method for the experiment group.	The subject of vegetation cover and the factors affecting their development was treated.
April 29, 2008	The subject of chief plant formations and their distribution on the Earth was treated according to the Blended Learning Model.	The subject of chief plant formations and their distribution on the Earth was treated using the classical methods.
May 6, 2008	Administering the pretest on critical thinking dispositions and levels and the attitudes towards geography	

Within this framework, the following procedures were performed for the experiment and control groups:

a. Control Group

The control group was taught the Soil and Plant Geography, two subjects from the unit on The Three Elements of Nature using the traditional method. The traditional method used for the control group generally consists of teacher-centered, face-to-face learning environments in which the methods of lecturing and questions-answers are employed.

b. Experiment Group

In accordance with the online learning approach of the research, the experiment group was taught the subjects of the Soil and Plant Geography through a website with various visuals and animations specially designed for this purpose. The classes for the experiment group were held in a computer lab with one computer for each student. In this face-to-face learning process during the classes, the instructor introduced an outline of the subject and illustrated it with the visuals in the website.

After the course subject was presented, the students were assigned to perform the activities on the website outside the classroom environment to provide them with further details about the course subject, as well as with further various examples through the website.
The students delivered their activity assignments to the instructor through e-mail. Furthermore, they could also communicate with the instructor through e-mail whenever they had questions about the subject or the assignments. These activity assignments delivered to the instructor through e-mails were then added into the observation files of each student to follow up their improvement. The blended instruction model used in the study is seen in Table 3.

Table3. *Blended Education Model Designed for Geography Course*

Blended Learning (A sample geography course in which traditional classroom activities are replaced with a part of online instruction)					
Online Education Dimension			**Traditional Education Dimension**		
Instruction environment	Activities	Applications	Instruction environment	Activities	Applications
1.Computer-based online learning (Geography Website) 3.Asynchronous (e-mail) 5. Bidirectional communication	1.Introduction 2.Individual study 3.Homework 4.Analogy 5.Evaluation	1. Course supervision instruments 2. Animations 3.Other visuals (images, texts) 5.Communication media (e-mail)	1.Classroom 2.Synchronous 3. Course supervision instruments	1.Introduction 3.Exercise 4.Evaluation	No in-class applications were carried out.

General characteristics of the website used for the application are as follows:
1. Prior to the application, all students were given a username and a password to have access to the system. When they thus have access to the system using their usernames and passwords, they see a page with units, announcements, and activities, as seen in Figure 1. Currently, only the unit on "Natural Systems" is active on the page as the only unit included in the scope of the research.

The announcements section includes questions for students, activity assignments, and other announcements concerning the application.

Figure 1: Unit Introduction Page

2. Clicking on the unit on the screen shown in Figure 1, one sees the page presenting the subjects of the unit, which is displayed in Figure 2. As seen in Figure 2, the subjects of the unit are listed on the left hand side, and the titles are presented as a concept map, in which one can have access to any subject by clicking on the title.

As seen in Figure 3, textual information, images, and animations were designed for each concept in the concept map, which provides students with adequate examples about the subject. Moreover, the animations in the subject pages aimed to present step by step the concept formation stages and students were provided with the opportunity to repeat these animations as many times as they liked to. Some of these animations used on the website had been designed by the researchers, while some others had been taken from other websites.

3. The student administration system working on the website background saved certain information about each student such as the login time to the system, login duration, and the subjects studied. This allowed the researchers to check this information throughout the application period and warn students whenever they felt the need to do so. Thus, they tried to make the students perform the required activities on the website outside the classroom.

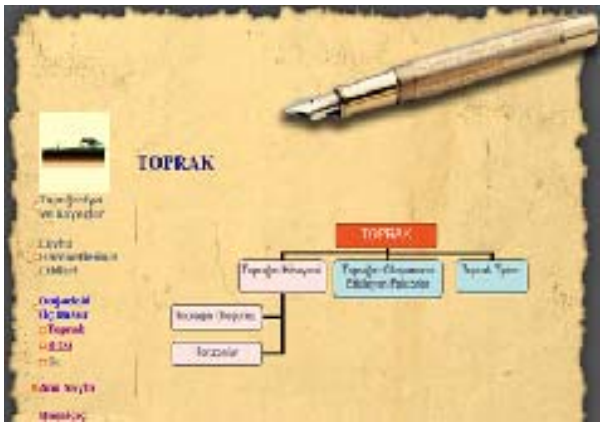

Figure 2: Subject Selection Page

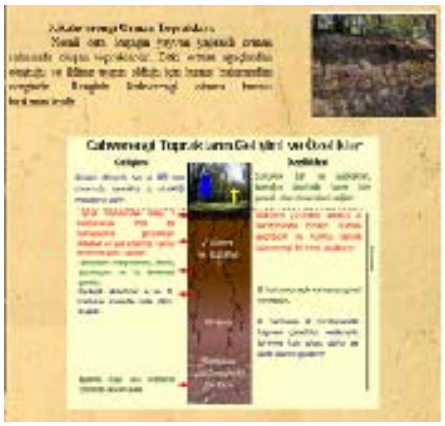

Figure 3: Presentation Page

DATA COLLECTION

a. The Geography Attitude Scale

The data concerning the attitude under study were obtained by administering the five-point Likert-type geography attitude scale developed by Demirkaya and Arıbaş (2004). The geography attitude scale consists of 30 items and has a reliability coefficient (Cronbach Alpha value) of 0.92. The odd numbered items in the geography attitude scale were designated as positive attitude items, while even-numbered items were designated as negative attitude items (Demirkaya & Arıbaş, 2004). The responses for each item used in the attitude scale were scored as "strongly agree=5", "agree=4", "undecided=3", "disagree=2", "strongly disagree=1". After the data entry, the scores in the negative items were changed into "strongly agree=1", "agree=2", "undecided=3", "disagree=4", "strongly disagree=5" and the arithmetic mean values were calculated in line with this scoring.

b. The Critical Thinking Disposition Inventory

To measure the critical thinking disposition, the study uses the California Critical Thinking Disposition Inventory (CCTDI). This inventory was developed thanks to the Delphi project sponsored by the American Philosophical Association in 1990. Rather than measuring any particular skill, the CCTDI is intended to assess an individual's critical thinking disposition, or in broader terms, his/her critical thinking level. The total CCTDI score is also used to test the validity of training programs developed to improve critical thinking dispositions and/or skills (Kökdemir, 2003).

Originally written in English, the inventory was translated into Turkish and was subjected to the required validity and reliability analysis by Kökdemir (2003). For the new version of the inventory consisting of a total of six subscales and fifty-one items, the internal consistency coefficient (Cronbach alpha) was found to be 0.88. The total variance explained by the inventory is 36.13 %. The internal consistency coefficient (Cronbach alpha) for each subscale is as follows: 0.75 for Analyticity Subscale and Open-Mindedness Subscale; 0.78 for Inquisitiveness Subscale; 0.77 for Self-Confidence Subscale; 0.61 for Truth-Seeking Subscale, and 0.63 for Systematicity Subscale (Kökdemir, 2003).

Adding up the response scores on this six-point Likert-type critical thinking disposition inventory, the researcher calculated the raw scores for each subscale, and by dividing the raw scores by the number of questions and then multiplying the quotient by 10, converted them into a standard score ranging between 6 at the lowest and 60 at the highest. For all the subscales, the possible lowest and highest values are constant. Facione, Facione and Giancarlo (1998 cited in Kökdemir, 2003) suggest that individuals with scores lower than 40 for each subscale have low critical thinking disposition skills in the subscale in question, while a score higher than 50 indicates high critical thinking dispositions. Therefore, taking the CCTDI as a whole, it could be argued that individuals with a score lower than 240 (40 x 6) have in general low critical thinking dispositions, while those with scores higher than 300 (50 x 6) have high dispositions (Kökdemir, 2003). The sum of the correct responses obtained in the achievement pre- and post-tests, each consisting of 30 multiple choice questions with five options each, were multiplied by the coefficient 3.3, and the scores of each student were evaluated out of 100 points.

Analysis
The data collected using the scales were subjected to the percentage, arithmetic mean, t-test, Anova, Scheffé and Pearson correlation tests, and the findings were interpreted. For the differences and relationships, a significance level of $p<0.05$ was deemed as sufficient.

RESULTS
1. Findings on Attitude
1.1. Equivalence of the Groups Prior to the Application
Table 4 summarizes the findings on the equivalence between the experiment and control groups in terms of attitude scores prior to the application.

Table 4. *Equivalence between Attitude Scores of the Groups prior to the Application*

	Variables	N	$\overline{X}$	sd	t	df	p
Attitude	Experiment Group	29	103,79	14,08	-2,259	55	0,072
	Control Group	28	111,28	10,78			

An examination of the t test results in Table 4 reveals that there is not any significant difference between the groups in terms of their attitude scores ($t_{(2-55)}$=-2.259 $p>0.05$). This could be interpreted as indicating that the groups were equivalent in terms of their attitudes towards geography course prior to the application, or, to put it differently, that the experiment and control groups had similar attitudes towards the geography course.

1.2. The Impact of Blended Learning Model on Attitude
Although the difference between the pretest attitude mean scores was found to be not significant, pretest-posttest attitude difference scores were calculated in order to check the effect of the obtained difference. Then, the significance between these difference scores was investigated using the one-way analysis of variance (ANOVA) for non-related measurements. Table 5 presents the pretest-posttest difference scores of the control and experiment groups.

Table 5. *The Pretest-Posttest Mean Attitude Difference Scores of the Groups*

Groups	$\overline{X}$	sd	N
Experiment Group	6,71	7,049	28
Control Group	-2,76	11,618	29

An examination of the pretest-posttest mean attitude difference scores of the groups in Table 5 reveals the following results: The experiment group is $\overline{X}$ = 6.71, while the control group is $\overline{X}$ =-2.76, indicating a higher mean difference score for the experiment group. Furthermore, following the application there was a negative change in the attitudes of control group students – who were administered the traditional method – towards geography course. A variance analysis was conducted to determine whether this observed difference was significant, and the results are presented in Table 6.

Table 6. *The Variance Analysis of the Pretest-Posttest Attitude Difference Scores of the Groups*

	Sum of Squares	df	Mean Square	F	P
Between Groups	1278,344	1	1278,344	13,729	0,000
Within Groups	5121,025	55	93,110		
Total	6399,368	56			

(η2=0,199)

An examination of the results of the one-way analysis of variance in Table 6 demonstrates a significant difference in terms of pretest-posttest attitude difference scores in favor of the experiment group [$F_{(1-55)}$=13.729, $p<0.01$]. This finding indicates that when compared to the traditional instruction method, the blended learning model contributes more to student attitudes towards geography course.

According to the results of the variance analysis, the factor's (inter-group) rate of explanation for the total variance in the dependent variable was calculated as η^2=0.199. This finding suggests that the 19% of the total variance in the difference scores of students' learning levels stems from the experimental application.

2. Findings on Critical Thinking Dispositions and Levels

2.1. Equivalence of the Groups Prior to the Application

Table 7 summarizes the critical thinking disposition and level pretest scores of the control and experiment group students.

Table 7. *The Critical Thinking Disposition and Level Pretest Scores of the Control and Experiment Group Students*

Subscales	Experiment Group (N=28)			Control Group (N=29)		
	Low-Scoring Group (%)	Middle-Scoring Group (%)	High-Scoring Group (%)	Low-Scoring Group (%)	Middle-Scoring Group (%)	High-Scoring Group (%)
Analyticity	3,6	46,4	50,0	10,3	65,5	24,1
Open-Mindedness	25,0	71,4	3,6	44,8	51,7	3,4
Inquisitiveness	32,1	53,6	14,3	41,4	48,3	10,3
Self-Confidence	78,6	17,9	3,6	55,2	37,9	6,9
Truth-Seeking	57,1	42,9	0	51,7	44,8	3,4
Systematicity	53,6	39,3	7,1	62,1	27,6	10,3
Total	35,7	64,3	0	44,8	51,7	3,4

As seen in Table 7 which presents the critical thinking subscales of both the control and experiment group students, the subscale with the highest high-scoring group percentage is analyticity (50.0% for the experiment group; 24.1% for the control group), which refers to being alert to potential problem areas and the use of reasoning and objective evidence even in the face of difficult problems (Kökdemir, 2003). On the other hand, the lowest one is truth-seeking for the experiment group (0%), which refers to the tendency to take into account the alternatives or differing opinions (Kökdemir, 2003); and truth-seeking and open-mindedness for the control group, which refers to tolerance to divergent views and self-monitoring for possible errors (3.4% for both) (Kökdemir, 2003).

An examination of total critical thinking scores reveals that the high-scoring group percentage of the experiment group is 0%, and the high-scoring group percentage of the control group is 3.4%. On the other hand, the middle-scoring students make 64.3% of the experiment group and 51.7% of the control group. These findings suggest that both groups have medium levels of critical thinking dispositions and levels.

Table 8 summarizes the change in critical thinking dispositions and levels of the experiment and control group students pertaining to the pretest.

Table 8. *Changes in Critical Thinking Dispositions and Levels of the Experiment and Control Groups according to the Pretest*

Variables		N	$\overline{X}$	sd	t	df	p
Critical Thinking Dispositions and Levels	Experiment Group	28	248,71	20,336	0,339	55	0,736
	Control Group	29	246,83	21,630			

An examination of Table 8 reveals that the experiment group students have slightly higher critical thinking dispositions and levels when compared to the control group students. However, the same table also demonstrates that there is not a significant difference between the total critical thinking scores of the experiment and control group students ($t_{(2-55)}$=0.339 $p>0.05$). This could be interpreted as indicating that the groups were equivalent to each other before the application, or, in other words, that the experiment and control groups had similar critical thinking dispositions and levels.

2.2. The Impact of Blended Learning Model on the Improvement of Critical Thinking Dispositions and Levels

Although there is not a significant difference between the pretest mean scores, the pretest-posttest difference scores were calculated in order to check the effect of the obtained difference. Then, the significance between these difference scores was investigated using the one-way analysis of variance (ANOVA) for non-related measurements. Table 9 presents the statistics on the pretest-posttest difference scores of the control and experiment groups.

Table 9. *The Pretest-Posttest Mean Critical Thinking Dispositions and Levels Difference Scores of Groups*

Groups	$\overline{X}$	sd	N
Experiment Group	18,07	14,912	28
Control Group	5,24	22,808	29

An examination of the pretest-posttest mean difference scores in Table 9 demonstrates that the mean difference score pertaining to the critical thinking dispositions and levels is $\overline{X}$ = 18.07 for the experiment group, and $\overline{X}$ =5.24 for the control group, indicating a higher mean difference score for the experiment group. In order to determine whether this observed difference was a significant one, a variance analysis was performed for the pretest-posttest difference scores in the critical thinking dispositions and levels, and the results are presented in Table 10.

Table 10. *Variance Analysis of the Difference Scores of the Groups in the Pretest-Posttest Critical Thinking Dispositions and Levels*

	Sum of Squares	df	Mean Square	F	p
Between Groups	2344,973	1	2344,973	6,270	0,015
Within Groups	20569,167	55	373,985		
Total	22914,140	56			

An examination of the one-way analysis of variance results in Table 10 demonstrates a significant inter-group difference in terms of their pretest-posttest difference scores in the critical thinking dispositions and levels in favor of the experiment group [$F_{(1-55)}$=6.270, p<0.05]. This finding could be interpreted as indicating that, when compared to an instruction performed using the traditional instruction method, the one using the blended learning model contributes more to student critical thinking dispositions and levels.

Table 11 summarizes the findings on the difference between the experiment and control groups in which of the sub-dimensions of the experiment and control groups.

Table 11. *Variance Analysis of the Pretest-Posttest Difference Scores of the Groups in terms of the Sub-dimensions of Critical Thinking Dispositions and Levels*

Variables		N	$\overline{X}$	sd	t	df	p
Analyticity	Experiment Group	28	-1,14	3,960	-1,886	55	0,065
	Control Group	29	0,93	4,325			
Open-Mindedness	Experiment Group	28	4,32	4,611	3,377		0,01
	Control Group	29	-0,31	5,670			
Inquisitiveness	Experiment Group	28	1,04	5,783	-0,155		0,878
	Control Group	29	1,31	7,479			
Self-Confidence	Experiment Group	28	04,93	9,341	1,443		0,155
	Control Group	29	1,59	8,118			
Truth-Seeking	Experiment Group	28	5,61	7,927	2,329		0,024
	Control Group	29	0,79	7,678			
Systematicity	Experiment Group	28	3,50	9,355	1,304		0,198
	Control Group	29	0,69	6,756			

Examining Table 11, it could be observed that student critical thinking dispositions and levels significantly differ in favor of the experiment group at the sub-dimensions of open-mindedness ($t_{(1-55)}$=3.377, p<0.01) and truth-seeking ($t_{(1-55)}$=2.329, p<0.05). On the other hand, such difference between the control and experiment groups is not the case for other dub-dimensions. This finding could be interpreted as indicating that, when compared to an instruction performed using the traditional instruction method, the one using the blended learning model contributes more to student critical thinking dispositions and levels, particularly at the sub-dimensions of open-mindedness and truth-seeking.

3. The Relationship between Attitude and Critical Thinking Dispositions and Levels

Table 12 summarizes the findings on the relationship between the attitudes of experiment and control group student towards geography course and their critical thinking dispositions and levels.

Table 12. *The Relationship between Attitude and Critical Thinking Dispositions and Levels*

Variables		Attitude	Critical Thinking
Attitude	**r**	1	0,309
	p		0,021
	df	0	54
Critical Thinking	**R**	0,309	1
	P	0,021	
	df	54	0

An examination of Table 12 reveals that, when the group variable is kept under control, there is a positively significant relationship between the pretest-posttest difference scores of student attitudes towards geography course and their pretest-posttest difference scores in critical thinking dispositions and levels ($r=0.309$ $p<0.05$). This could be interpreted as indicating that, the more positive the student attitudes towards the geography course, the higher their critical thinking dispositions and attitudes.

CONCLUSION AND DISCUSSION

The results of the study are discussed below:

1. Blended learning model contributes more to student attitudes towards geography course when compared to the traditional learning model. This finding is compatible with the literature: In a study examining attitude changes of adults towards an online course, Westbrook (1999) investigated attitude changes with regard to the use of technology in class, interaction, learning, time, and satisfaction. The participants of the study consisted of 22 graduate students enrolled in the online course titled "The Basics of Leadership" in a private university in the US. In the study, each student was administered the pretest and posttest measuring their attitudes toward education. The study demonstrated that a significant change took place in student attitudes towards their satisfaction levels in the online course. On the other hand, an examination of the time spent on course content revealed that the students spent significantly longer time for online courses when compared to the time spent for classical online courses. Furthermore, it was also stated that high participation obtained and the similarities in learning levels helped eliminate doubts whether online instruction offered an education that is as high-quality as face-to-face instruction.

Ersoy (2003) carried out a study with 65 undergraduate students enrolled in the course named "Programming Languages II" in the academic year 2002-2003 in order to demonstrate the contributions of web-based instruction to traditional face-to-face instruction. The course was taught using the traditional face-to-face instruction method and was supplemented by a web site. Three questionnaires were administered to the students to collect data to investigate the perceptions of students about web-based instruction, online cooperative learning, and web-based learning environment with regard to the online instructor. The results of the study revealed that students had positive perceptions about web-based instruction and online instructor, while they were uncertain about their perceptions about online cooperative learning.

Robison's (2004) study investigated the experiences of ten faculty members in designing and teaching blended learning courses at Brigham Young University. The results of the study revealed that the participant faculty members perceived three major benefits in the blended learning experience. First was the more effective use of class-room time; second was increased flexibility in meeting time constraints of both student and professor; and third was greater ability to meet the needs of individual students. Consequently, the study underlined the effectiveness of blended learning environments and recommended it to be used extensively in undergraduate courses.

A study by Ünsal (2007) which mainly aimed to compare the effectiveness of blended and face-to-face learning environments in terms of student achievement and motivation examined the course designed for the study with the dimensions of reaction, achievement and behavior assessment. In the study, both a web-based learning environment was designed in accordance with the blended learning approach, and a face-to-face learning environment was organized. Through this method, the study made a multidimensional evaluation of the effectiveness of the blended learning approach. The study was conducted on 22 control and 24 experiment group students enrolled in an undergraduate course called "Introduction to Computer Science-II." The results of the study revealed no significant difference between blended learning and face-to-face learning approaches in terms of academic achievement and motivation scores of students. However, a significant difference was detected

between blended learning and face-to-face learning approaches in terms of retention scores. On the other hand, the mean general achievement scores obtained in mid-term examinations by the students exposed to the blended learning approach significantly increased when compared to the mean scores of the students taught by face-to-face instruction approach. Other results of the study demonstrated that web-supported learning environment plays a crucial role in areas such as access to information, progressing at one's own pace, enriched learning, and individual studies.

Examining the effect of web-based constructive approach on student achievement in a PhD thesis, Eşgi (2005) investigated the effects of various methods on student achievement and their views on various applications, which included a website designed according top the Cognitive Construction Approach in the light of specified design principles, as well as printed material and face-to-face instruction support. Consisting of a total of 55 students, the sampling of the study was divided into three groups. 18 students in the first group were taught only through website; 18 in the second group were provided with printed material along with the website; and 19 students in the third group were offered the website, printed material and face-to-face instruction support. In the application process, the data were collected through a student achievement test and an opinion survey. At the end of the study, the third group came the first, the second group the second, and first group the third in terms of achievement. It was found that web-based instruction was boring and decreased sociability for the students in the first and second groups, while it was just the opposite for those in the third group.

Usta (2007) conducted a study titled "The Impact of Blended Learning and Online Learning Environments on Academic Achievement and Satisfaction" on 73 students enrolled in the course on "Planning and Evaluation in Instruction." This study reported that blended learning contributed more to academic achievement and retention of information when compared to online learning; and that the experiment and control group students were satisfied with student-student interaction, student-instructor interaction, instructor support, course structure and institutional support in distance education.

To sum up, in their studies Westbrook (1999) and Ersoy (2003) state that online courses positively affect both student attitudes and instructor perceptions. On the other hand, studies by Usta (2007), Ünsal (2007) and Eşgi (2005) argue that blended learning approach contributed more to academic achievement than face-to-face approach. Furthermore, in a study, Robison (2004) underlined the effectiveness of blended learning environments and recommended it for extensive use in undergraduate courses. Consequently, given the positive contributions of the blended learning model to critical learning outputs such as attitude, satisfaction, academic achievement and retention of information, it is clear that certain measures should be taken for the extensive use of this learning model in the system of education.

2. Generally speaking, the students have medium critical thinking dispositions and levels. A literature review reveals some research findings suggesting that critical thinking has a linear effect on student's academic performance (Kaasboll, 1998; Kökdemir, 2003). Given the importance of critical thinking, medium critical thinking dispositions and levels should not be considered as sufficient for students.

Titiz (2001) highlights the fact that memorizing is the greatest problem of current systems of education. Similarly, Yıldız (2003) also state that memorizing is one of the important problems of Turkish education system. The results of a study conducted by Akbulut (1999) demonstrates that questions asked by teachers are largely at the knowledge level; while only to a small extent at the comprehension level and none at the application level and higher levels. As a result, students are expected to make a habit of taking what they read as unquestionable facts without any recourse to critical evaluation. It could be suggested that such habits undermine the power of critical thinking disposition. Consequently, such applications inhibiting the improvement of critical thinking dispositions and levels should be carefully revised. It is important that education programs should be properly updated and instructors should be informed about the importance of critical thinking and how to improve it.

3. When compared to the traditional instruction method, the blended learning model contributes more to critical thinking dispositions and levels of students. Examining the sub-dimensions of critical thinking, this contribution is manifested particularly at the sub-dimensions of open-mindedness and truth-seeking.

It is further emphasized that open-mindedness refers to tolerance to divergent views and self-monitoring for possible errors, and the basic idea behind this trait is an individual's consideration of not only his/her own opinions but also those of others while making a decision (Kökdemir, 2007). Moreover, truth-seeking refers to the tendency to take into account the alternatives or differing opinions, and individuals with high scores in this

subscale are more likely to have higher skills of truth-seeking, question-asking and display more objective behaviors even in the face of new information inconsistent with his/her own views (Kökdemir, 2007).

The available literature suggests that blended learning requires students to have control on their own learning processes, and in turn improves their critical thinking and cooperative learning skills (Dziuban, Moskal & Hartman., 2004). Similarly, with regard to online courses allowing students additional time for reflective thinking and processing information, Rovai and Jordan (2004) state those students can process information better in online learning environments where they would be forced to analyze themselves what they learn, instead of decisions and interpretations of others. The additional time created for processing information also contributes to critical thinking skills of students and helps them develop further insight into their responses (Rovai & Jordan, 2004). Furthermore, Garrison and Kanuka (2004) suggest that the high-quality interactive communication enjoyed in blended learning environments could facilitate critical thinking as well as high-level learning, and blended learning also improves the critical thinking skills of students since it promotes independence and internal control. In their study, Lynch and Dembo (2004) also stressed the importance of internal control and argued that critical thinking skills and cognitive and metacognitive learning strategies might be useful in improving internal control in students; and online learning environments could also make crucial contributions to improving internal control. Consequently, it could be suggested that blended learning model helps students improve their ability to control their own learning processes, and thus, add to their critical thinking dispositions and levels.

4. There is a positive correlation between student attitudes towards geography course and their critical thinking dispositions and levels. In other words, the more positive the student attitudes towards the geography course, the higher their critical thinking dispositions and attitudes. As a discipline analyzing and synthesizing the information collected in the context of human-natural environment interaction, geography requires students to structure the acquired information by questioning it using these criteria at all stages. Thus, they improve their critical thinking skills through a questioning and synthesizing approach. In this context, students with positive attitudes towards geography course are expected to have high critical thinking dispositions and levels.

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