The Effect of Blended Learning and Social Media-Supported Learning on the Students' Attitude and Self-Directed Learning Skills in Science Education

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ABSTRACT
The main purpose of this study is to investigate the effect of blended learning and social media supported learning on the students' attitude and self-directed learning skills in Science Education. This research took place with the 7th grade 74 students attending to a primary school in Kadikoy, Istanbul and carried out "Our Body Systems" unit at 2011-2012 Academic Year. The design of the study was pretest–posttest control group design. Control Group is taught by using the traditional face to face approach with the 5E learning cycle, one of the experimental groups received blended learning model (face to face and internet based learning) with the 5E learning cycle and the other experimental group received social networking supported based on face to face approach and the 5E learning cycle model. Data were collected using the Science Teaching Attitude Scale and the Self-directed Learning Skills Scale. Quantitative data were analyzed by One-Way Anova, t-Tests and Kolmogorov Smirnov-Z Test of SPSS 17 Statistic Program. As a result, while blended learning experimental group increase science attitude and self-directed learning skills significantly than the control group; social media supported learning group has a positive impact on attitude and self-directed learning skills, although this change didn't make a significant difference compared with the control group.

Keywords: Blended learning, social media supported learning, social media, science education

INTRODUCTION
The use of computers, one of the key elements of the information era we are in, and the internet that has been developing in a meteoric pace since the 90s continue to become widespread in the world rapidly. This proliferation transforms societies as well. In conjunction with the rapid development of technology we have also been experiencing significant developments in the area of education in recent years. The education system needs to reflect the changes in all the sub-systems of the society in its structure as fast as possible and thus, it is in the struggle of using the technologies based on computers and the internet widely and effectively (Garrison & Kanuka, 2004).

Technology that has become an integral part of life now impacts education positively and brings along a number of opportunities. Learning – teaching approaches are changing and science education receives its share from these improvements. In the 21st century, the internet is being used in every area, particularly in the area of education frequently. Thus, it has become a requirement that, rather than using a single learning approach, multiple learning approaches are implemented in a blended way and also that the internet, portals providing content related to education and the social media are made use of effectively. This requirement poses the learning model of blended learning and the social media-supported learning model.

As technology and the internet developed, the convenience for access to information has increased superiorly and this has brought into question the probability that the significance of face-to-face learning environments will decrease over time. Thereupon, researchers have designed electronic learning environments and some universities and institutions have even applied programs to realize their education by electronic learning solely and have researched the issue whether this probability would come true (Driscoll, 2002; Singh, 2003; Osguthorpe & Graham, 2003). Electronic learning has become widespread gradually and it is being used along with the face-to-face learning model. Thus, blended learning has emerged as a learning model.

A review of the literature provides us with various definitions regarding blending learning. In international literature the model is referred to as blended learning, mixed learning and hybrid learning and in national

literature it is referred to as blended or mixed learning. In the model the favorable aspects of face-to-face learning and web-based learning are used and various methods and techniques are combined (Singh & Reed, 2001; Driscoll, 2002; Garnham & Kaleta, 2002; Graham, Allen & Ure, 2003; Osguthorpe & Graham, 2003; Wilson & Smilanich, 2005; Graham, 2006; Uluyol ve Karadeniz, 2008).

While the blended learning environment offers a number of strong aspects to the learners such as being able to study at desired places and desired times for desired periods and also to receive immediate feedback/correction/reinforcement through a web-based learning environment, it also offers other strong aspects such as discussions in the face-to-face learning environment, having direct interaction and communication with the teacher and learners, the learners are being able to see and review each other's learning products.

A number of researchers have mentioned the advantages of blended learning. These advantages are; i) providing flexibility and convenience in the learning environment ii) increase in the learning level and achievement, iii) increase in the permanence of knowledge, iv) increase in the interest in learning, v) increase in the motivation in the course, vi) interaction and vii) cost efficiency (Singh and Reed, 2001; Garnham & Kaleta, 2002; Young, 2002; Carman, 2002; Collis, 2003; Osguthorpe & Graham, 2003; Rovai & Jordan, 2004; Sancho, Corral, Rivas, Gonza´lez, Chordi & Tejedor, 2006; Cavalli, Gnudi, Iovino, Lorenzi & Malvisi, 2007; Lilje & Peat, 2007; Akın, 2007; Orhan, 2007; Altun, Gülbahar ve Madran, 2008; Finch, 2008; Karaman, Özen, Yıldırım ve Kaban, 2009; Uluyol ve Karadeniz, 2009; Uzun ve Şentürk, 2010).

In this century as the information technologies have been developing, in addition to social, cultural and economic life, learning and teaching processes have also been refashioned. As the technologies called Web 2.0 emerged after 2005 providing the opportunity for communication and interaction between the users and enabling sharing of videos and pictures, social media sites such as Facebook, Youtube etc. have been established. An overwhelming change was experienced in many social network sites and their popularities grew. In addition, the time the users spend in social networks, where numerous people from different age groups subscribe, has shown a substantial increase during the time between today and the emergence of the social networks (Gülbahar, Kalelioğlu ve Madran, 2010).

Social network sites are web-based services that allow individuals to construct a public or semi-public profile within a system bounded with rules, to view the lists of other users they are in connection with, to view and traverse their list of connections in the system (Boyd & Ellison, 2008). Social media is usually used for communication, socializing, friendship and sharing. However, recently using the social media technologies in education has also become an issue.

Social media sites are flexible and user-friendly. Therefore, compared to other learning management systems, they are used more easily. A number of educators and researchers can generate a community with simple steps, can share many things between each other and can communicate with each other. All these aspects provide facilities for the users. Social media sites can enrich education by providing blended learning experiences and they can provide benefits for educational institutions supporting the teaching and assessment processes (Jones, Blackey, Fitzgibbon & Chew, 2010).

It is believed that the significance of blended and social media supported learning will increase gradually. Therefore, it is of vital importance that research for both blended learning and also the social media is carried out with regard to a number of factors.

In the light of all these developments, the aim of this study is to examine the impact of blended and social media-supported learning on the self-directed learning skills and attitudes of the learners in science education experimentally.

The hypotheses that have been developed in line with the aims of the study have been listed below:
1- "Is there a meaningful difference between the attitudes of the students in the primary 7th grade science and technology lesson regarding the science course, for whom blended learning, social media supported learning and face-to-face learning were applied?"
2- "Is there a meaningful difference between the self-directed learning skills of the students in the primary 7th grade science and technology lesson, for whom blended learning, social media supported learning and face-to-face learning were applied?"

THE STUDY

In this study, that aims to examine the impact of blended learning and social media-supported learning on the

self-directed learning skills of the students and their attitudes regarding the science course in science education, an experimental design with pre-test-posttest control group has been used. Experimental designs are research designs at which data to be observed is produced under the control of the researcher in order to attempt to identify the cause and effect relationships (Karasar, 2005).

In this study quantitative data has been collected and analyzed. Quantitative researches attempt to justify the relations between the variables, searching for the reasons for these relations and explaining them. In quantitative research the researchers generate the general formation of the widely agreed stages that will guide them and it is expected that the model has been specified in advance (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz ve Demirel, 2009). The design of the research used in the study is displayed in Table 1.

Table 1 Research design

	Learning model	Pre-tests	Post-tests
Control Group	Face to face learning	SAS,SDLSS	SAS,SDLSS
Experimental Group-1	Blended learning	SAS,SDLSS	SAS,SDLSS
Experimental Group-2	Social media-supported learning	SAS,SDLSS	SAS,SDLSS

SDLSS: Self-directed learning skills scale, SAS: Science attitude scale

As is displayed in Table 1, control and experimental groups were formed and face-to-face learning was applied in the control group, blended learning was applied in experimental group-1 and social media supported learning was applied in experimental group-2.

Study group

The study group of the study comprises a total of 74 students in the 7th grade of a public school in the academic year 20111 – 2012 in Istanbul city, Kadıköy district. The groups were selected randomly and their distribution is displayed in Table 2.

Table 2 Gender distribution of the control and experimental groups

Gender	Control Group	Experimental Group-1	Experimental Group-2	Total
Female	13	15	14	42
Male	11	10	11	32
Total	24	25	25	74

According to Table 2, 42 of 74 students are girls and 32 are boys.

Data collecting tools

The following quantitative data collecting tools have been used to collect data:

1. Science attitude scale (SAS): The "Science Attitude Scale" used in the study was developed by Akınoğlu (2001) and its reliability coefficient (Cronbach Alfa) was specified as 0.89. In the attitude scale there are 20 judgment-related negative and positive statements regarding the attitudes of the students towards science classes. The scale comprising of expressions specifying whether the students like science classes and whether they enjoy activities related to this lesson is a 5-point likert scale. In this study the reliability coefficient of the scale (Cronbach Alfa) has been calculated as 0.85.

2. Self-Directed Learning Skills Scale (SDLSS): The "Self-Directed Learning Skills Scale" used in the study was developed by Aydede and Kesercioğlu (2009).

In this scale there are 25 judgment-related negative and positive statements regarding the self-directed learning skills of the students in science classes. The scale is a 5-point likert scale. It was given to 446 primary students and the reliability coefficient for the whole scale (Cronbach Alpha) was found 0.86 (Aydede and Kesercioğlu,

2009, p.53). In this study the reliability coefficient of the scale (Cronbach Alfa) was calculated as 0.79.

Implementation

The practices during this study were carried on for 32 hours (8 weeks). SAS and SDLSS were given to all groups in the school in two lessons in the first week as pre-test and in the last week they were given in two lessons as post-test and it was identified by the SPSS package program whether there was a meaningful difference between the results. The implementation periods of the tests were excluded from the study implementation time.

Control Group (Face-to-face Learning) Practices: In the control group the activities that were realized according to the learning outcomes in the unit "Systems in Our Body" were applied face-to-face in line with constructivist learning approach and in accordance with the 2005 science and technology curriculum.

In the control group all classes were started in line with the suggestions in the primary seventh grade science and technology teacher's book. The stages for testing previous knowledge and arousing curiosity, discovery, explanation, development and evaluation were carried out in weekly 4 lessons again in line with the 5E cycle lesson plan in the teacher's book. Methodologies used in the lessons were question – answer, discussion, group work, problem solving etc; the course book, student workbook, posters and laboratory materials were used as resources. Appropriate activities regarding the unit in the course book and student workbook were selected and carried out. At the end of each lesson homework from the course book and workbook was given for the students to come prepared to the next class. Homework was checked and assessed in the next class.

Experimental Group-1 (Blended Learning) Practices: In the Experimental Group-1 the activities carried out in line with the learning outcomes in the unit "Systems in Our Body" were applied in line with constructivist learning approach and in accordance with the 2005 science and technology curriculum by blended learning as face-to-face and supported by the internet.

As in the control group, in the Experimental Group-1 the classes were carried out in accordance with the 5E cycle lesson plan in weekly 4 hours, adapting these to the blended learning model as a combination of face-to-face and internet-supported learning. In this group, two lessons of the weekly 4-hour science and technology course were given to face-to-face activities and the other two lessons to web-based activities. While the face-to-face activities were carried out in the same way as for the other groups, some of these activities were carried out at the same time with the web-based activities. Some web-based activities were realized in the informatics class individually and as group work. Besides the course book, student workbook, posters and laboratory materials as resources, a virtual class practice (education portal) was also used. The unit activities in the course book and the student workbook, the animations, videos, interactive activities and screening tests on the portal and when necessary, presentations, videos and pictures from other sites were selected and carried out.

Before the study, a virtual classroom was created on the education portal in this group and it was provided that the students registered in this virtual class. The researcher selected interactive animations and videos on this portal outside class and prepared homework for the students to come prepared for the topics in the next lesson, which was sent to the virtual class. Also, in order to evaluate the learning outcomes for the previous lesson, homework comprising of screening tests and questions to be solved was prepared on the virtual class and sent to the students. It was monitored daily whether the students received the homework and worked on it. The students' percentage for completing the homework was followed up and the relevant learning outcomes were concentrated on more. The student scores, their answers and the correct answers on the screening tests sent were followed up on the system based on the outcomes and the topics that were not comprehended sufficiently were repeated briefly in the next lesson and additional homework was prepared.

Experimental Group -2 (Social Media-Supported Learning) Practices: In the Experimental Group-2 the activities were carried out according to the learning outcomes in the unit "Systems in Our Body". They were applied face-to-face and social media-supported outside class in line with the 2005 science and technology curriculum and according to the constructivist learning approach.

In the Experimental Group-2 the classes were carried out in accordance with the 5E cycle lesson plan in the teacher's book in weekly 4 hours. The lessons were conducted face-to-face with techniques such as question – answer, discussion, group work, problem solving etc.; the course book, student workbook, posters and laboratory materials were used as resources. Appropriate activities of the unit in the course book and the student workbook were selected and carried out.

In the Experimental Group-2 a Facebook page for the students was opened and it was provided that the students

subscribed to the page with their Facebook accounts. Outside class the students signed in at times they specified and followed what the teacher shared and took notes according to the teacher's instructions. Their notes were checked and assessed in the next lesson. Student interaction was provided by enabling the students to share videos, visuals, questions, documents, presentations and educational games on the Facebook page. The students asked questions to their peers and the teacher about the topics they could not understand and they also answered other questions.

Besides the Facebook page, other social media tools such as YouTube, Slide share, Dailymotion, Flickr were made use of. Videos over YouTube, presentations and pdf files with notes over Slide share and photographs and pictures related to the lesson were shared over Flickr. The resources on these sites were announced to the students on the Facebook page and they were also shared with them. The students made interpretations on what they learned at the shared resources and a discussion environment was created. The resources they shared and their interpretations were checked by the teacher continuously and feedback was provided.

Data analysis

In order to specify whether the data obtained provided normal distribution, the data received from applying SDLSS and SAS pre-test – post-test were evaluated by the One Sample Kolmogorov Smirnov-Z test.

Table 3 Data displaying normal distribution conformity of the pre- and post-tests applied to the control and experimental groups

	SAS Pre-test	SAS Post-test	SDLSS Pre-test	SDLSS Post-test
Kolmogorov-Smirnov (Z)	0,710	0,713	0,553	0,621
p	0,694	0,689	0,920	0,835

The meaningfulness (p) values stated in Table 3 were higher than 0.05 level which shows that the pre-test data of the students in the control and experimental groups have normal distribution. Therefore, the inter-group data were evaluated with one-way analysis of variance (anova) from parametric tests. Also, Tukey HSD as a post hoc technique was used in order to identify the group, from which the inter-group difference was arising.

FINDINGS

Findings for the first hypothesis

The first hypothesis of the study is to specify whether there is a meaningful difference between the SAS pre-test-post-test score averages of the students in the primary 7th grade science and technology lesson, for whom blended learning, social media supported learning and face-to-face learning was applied.

Table 4 Arithmetic mean and standard deviation results regarding SAS pre-test-post-test scores of the control and experimental group students

		Pre-test		Post-test	
Dimensions	N	$\bar{x}$	sd	$\bar{x}$	sd
Control Group	24	72,042	11,771	72,667	12,430
Experimental Group-1	25	74,040	9,071	82,920	8,944
Experimental Group-2	25	73,320	9,720	78,840	9,547
Total	74	73,149	10,122	78,216	11,080

A review of Table 4 identifies that while the average of the SAS pre-test scores of the control group is 72.042, this value changed to 72.667 in the post-test. Also, it was identified that while the SAS pre-test average of the Experimental group-1 was 74.040, a review of their post-test stated that it increased to 82.920. The SAS pre-test average of the Experimental group-1 had the value 73.320 and this value increased to 78.840 at the post-test. When the results were evaluated, it was found out that while at the end of the study there had almost been no change in the SAS scores of the control group, the SAS scores of the students in the Experimental group-1 and Experimental group-2 had increased. The highest increase occurred at the Experimental group-1.

Table 5 Results of the one-way analysis of variance carried out for the SAS pre-test scores of the control and experimental group students

Source of Variation	Sum of squares	df	Mean square	F	p
Between groups	50,007	2	25,003	0,239	0,788
Within groups	7429,358	71	104,639		
Total	7479,365	73			

According to Table 5, when the SAS data applied before the study are analyzed, it is specified that there is no meaningful difference between the attitudes of the control and experimental groups regarding the science and technology lesson ($p>0.05$). This result shows that before the study the attitudes of all groups regarding the science lesson were equal.

Table 6 Results of the one-way analysis of variance carried out for the SAS post-test scores of the control and experimental group students

Source of variation	Sum of squares	df	Mean square	F	p
Between groups	1302,007	2	651,004	6,034	0,004
Within groups	7660,533	71	107,895		
Total	8962,541	73			

According to Table 6, when the SAS data applied after the study are analyzed, it is specified that there is a meaningful difference between the attitudes of the control and experimental groups regarding the science and technology lesson ($p<0.05$). In order to find out between which groups this cumulative difference obtained from the one-way analysis of variance arose, Tukey HSD test from post hoc techniques based on the homogeneity of the variances was carried out and the results are displayed in Table 7 (levene's value= 1,254 and $p>0,05$).

Table 7 Tukey HSD test results carried out for the SAS post-test scores of the control and experimental groups' students

I	J	Mean difference (I-J)	p
Experimental Group-1	Control Group	10,253	0,003
Experimental Group-2	Control Group	6,173	0,101
Experimental Group-1	Experimental Group-2	4,080	0,352

According to the results in Table 7, while there is a meaningful difference between the SAS post-test scores of the control group and experimental group-1 students in favor of the experimental group-1 ($p<0.05$), there is no meaningful difference between the experimental group-2 and the control group students and the experimental group-1 and experimental group-2 students in terms of the post-test scores ($p>0.05$). The rather high score average that the experimental group-1 students obtained compared to the control group may imply that blended learning improves the attitude regarding the science course. Although the Experimental Group-2 students increased their scores regarding the attitude towards the science course, no meaningful difference was obtained according to the control group. However, although this increase in the scores does not create a meaningful difference, it shows that social media-supported learning impacts the attitude regarding the science course positively.

Findings for the 2nd hypothesis

The second hypothesis of the study is to specify whether there is a meaningful difference between the self-directed learning skills pre-test-post-test score averages of the primary 7th grade students in the science and technology class, to whom blended learning, social media-supported learning and face-to-face learning were applied.

Table 8 Arithmetic mean and standard deviation results regarding SDLSS pre-test-post-test scores of the control and experimental group students

		Pre-test		Post-test	
Boyutlar	N	$\bar{x}$	sd	$\bar{x}$	sd
Control Group	24	88,583	12,029	89,292	11,145
Experimental Group-1	25	89,200	11,026	100,240	11,674
Experimental Group-2	25	90,040	11,156	96,360	11,431
Total	74	89,284	11,262	95,378	12,145

A review of Table 8 shows that while the score average of the control group at the SDLSS pre-test was 88.583, this value was 89.292 in the post-test. The SDLSS pre-test average of the experimental group-1 was 89.200 and it was specified at the examination of the post-test scores that it had increased to 100.240. While the SDLSS pre-test average of the experimental grou-2 received a value of 90.040, this value reached 96.360 at the post-test. An evaluation of the results obtained shows that while there has been almost no change in the SDLSS scores of the control group, the SDLSS scores of the Experimental group-1 and Experimental group-2 students have increased.

Table 9 Results of the one-way analysis of variance carried out for the SDLSS pre-test scores of the control and experimental group students

Source of variation	Sum of squares	df	Mean square	F	p
Between groups	26,247	2	13,124	0,101	0,904
Within groups	9232,793	71	130,039		
Total	9259,041	73			

Table 9 shows that before the study there was no meaningful difference between self-directed learning skills of the control and experimental groups ($p>0.05$). According to this result, it can be postulated that before the study the self-directed learning skills of all groups were equal.

Table 10 Results of the one-way analysis of variance carried out for the SDLSS post-test scores of the control and experimental group students

Source of variation	Sum of squares	df	Mean square	F	p
Between groups	1504,127	2	752,064	5,764	0,005
Within groups	9263,278	71	130,469		
Total	10767,405	73			

According to Table 10, there is a meaningful difference between the self-directed learning skills of the control and experimental groups after the study ($p<0.05$). In order to find out between which groups this cumulative difference obtained from the one-way analysis of variance arose, Tukey HSD test from post hoc techniques based on the homogeneity of the variances was carried out and the results are displayed in Table 11 (levene's value = 0.462 and $p>0,05$).

Table 11 Tukey HSD test results carried out for the SDLSS post-test scores of the control and experimental groups' students

I	J	Mean difference (I-J)	p
Experimental Group-1	Control Group	10,948	0,004
Experimental Group-2	Control Group	7,068	0,084
Experimental Group-1	Experimental Group-2	3,880	0,457

According to the results in Table 11, while there is a meaningful difference between the SDLSS post-test scores of the control group and the experimental group-1 students in favor of the experimental group-1 ($p<0,05$), no meaningful difference has been observed between the experimental group-2 and control group students and the experimental group-1 and experimental group-2 students in terms of post-test scores ($p>0,05$). The rather high score average that the experimental group-1 students obtained compared to the control group may imply that

blended learning improves self-directed learning skills. Although the Experimental Group-2 students increased their scores regarding self-directed learning skills, no meaningful difference was obtained according to the control group. However, this increase in the scores shows that social media-supported learning impacts self-directed learning skills positively.

CONCLUSIONS

As a result, while blended learning increases the attitude towards the science course and the self-directed learning skills meaningfully compared to the control group, social media-supported learning does not create a meaningful difference compared to the control group although it impacts self-directed learning skills and the attitude towards the science course positively.

In this study it is observed explicitly that blended learning succeeds in changing the attitude towards the science class positively. This impact has come forward in other studies as well (El-Deghaidy & Nouby, 2008; Kirişcioğlu, 2009; Oh & Park, 2009; Korkmaz ve Karakuş, 2009). In his study on examining the effectiveness of blended learning in science laboratory lessons from different aspects, Kirişcioğlu (2009) determined that the perceptions of students towards the science laboratory lesson and regarding blended learning are positive.

There are also studies, in which differences in favor of traditional instruction in students' attitudes have been specified. In his doctoral thesis at North Texas University, Pearcy (2009) compares blended learning methodology to traditional face-to-face and web-based distance learning and investigates the impact on the academic performances of students, their attitudes towards the class and their level of satisfaction. It was specified that while the general level of satisfaction of students was rather high, there was a meaningful difference in their attitudes towards the lesson in favor of traditional instruction.

Although the scores of the social media-supported learning group for the attitudes towards the science lesson were higher than the attitude scores of the face-to-face learning group, statistically there was no meaningful change. However, using the social media with different methodologies in the science lesson may provide this positive change to create a meaningful difference.

According to the results of this study, blended learning improves self-directed learning skills of the students. It is believed that the meaningful difference created by blended learning in terms of self-directed learning skills arises from a better organized and comprehensive internet implementation and from effective use of the internet.

The suitability of both face-to-face activities and interactive activities over the web may have provided the improvement of these skills for the students in the blended learning group. It is also believed that the materials in the portal used by the blended learning group being at hand for the students to reach videos, visuals, resources or questions like a library, following students' performances on an electronic environment in a more organized way and taking the necessary measures, the organization of the resources providing the students to take notes on their own and giving them the opportunity to review the resources without time limitations improved the self-directed learning skills of this group.

The social media-supported learning group improved their self-directed learning skills less compared to the blended learning group and more compared to the face-to-face learning group. According to the personal observations of the teacher, it is believed that the lesser extent of improvement of the self-directed learning skills of the social media-supported learning group compared to the blended learning group arises from the facts that the social media environment is not a very well-organized environment, that the students show a greater interest to the friends contact feature of the social media, that the desired information can only be reached by a search in an environment organized restricted by time, which sometimes becomes boring.

When all the above are taken into consideration, using those social media tools which are more suitable for education can both create a difference in the attitude regarding the science class and can also improve self-directed learning skills. The establishment and use of social network sites used for education only such as Edmodo in recent years will help increase the significance of social media-supported learning. Blended learning environments and social media practices are needed for the students to reach information without any difficulty from the internet and education sites with virtual libraries and from videos and visuals sharing sites and to acquire the habit of using this information in their learning.

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