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The Impact of Blended Learning and Social Media-Supported Learning on the Academic Success and Motivation of the Students 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' academic success and motivation in Science Education. This research, in which the mixed pattern method is used as research model, 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 Years. The study groups of the research were; the control group (CG) taught by using the face to face learning, experimental group-1 (EG1) received blended learning model and experimental group-2 (EG2) received social networking supported learning model. Academic success test (AST) and motivation scale for learning science (MSFLS) were used to determine the effects of blended learning and social media supported learning to the students' successes and motivations in science learning. Besides, a semi-structured interview form was applied to experimental group about the methods and the practices. Quantitative data were analyzed by One-Way Anova in SPSS 17 Statistic Program. Descriptive statistical methods were used to analyze the qualitative data. As a result, while blended learning increase academic success and motivation in a meaningful way compared to face-to-face learning; social media supported learning has a positive impact on academic success and motivation, although this change didn't make a significant difference compared with the face-to-face learning. There was also no significant difference between academic success and motivation between blended learning and social media supported learning. The results of qualitative analysis carried out for student interviews are aligned with the quantitative results.

Keywords

Blended learning
Social media supported learning
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Introduction

As technology progresses very rapidly in the 21st century, it brings along very significant opportunities in the field of education. The education system that needs to reflect the changes in all the sub-systems making up the society quickly is in an attempt to use the technologies based on the computer and the internet extensively and effectively (Clark & Mayer, 2016; Garrison & Kanuka, 2004; Katz & Kim, 2016; Moore, 2013). Technology affects learning and teaching methodologies positively and makes out new learning models. Two of these learning models are blended learning and social media-supported learning. Also, instead of using a single learning model, implementing multi-learning models in a blended way in the 21st century, making effective use of the internet, of portals providing education-related content, and of social media has become a necessity. Science education is one of the disciplines that is affected the most by these developments.

Raising 21st century individuals in the classrooms, where traditional face-to-face learning is implemented, is becoming more and more difficult. The reason is that traditional face-to-face methods do not offer activities to direct students to think and to research and opportunities to use knowledge, to solve problems, in brief, to re-structure knowledge are not provided; thus, students graduate with the superficial information they memorize (Akınoğlu & Tandoğan, 2007; Akınoğlu, 2013; Bybee, 2000; Lederman, 2004). Therefore, these deficiencies of face-to-face learning affect science education negatively as well.

With the development of technology and the the rise of the internet, the increase in accessibility of information has brought the possibility that the face-to-face learning environment will decline due to some shortcomings. Some universities, institutions and researchers have designed web-based learning environments and have implemented programs that only train with web-based learning and investigate the effectiveness of the environment (Driscoll, 2002; Graham, Henrie, & Gibbons, 2014; Osguthorpe & Graham, 2003; Picciano, Dziuban, & Graham, 2013; Singh, 2003). Studies in the literature have shown that web-based learning also have some disadvantages. Therefore, web-based learning has begun to be used in conjunction with the face-to-face learning model, resulting in a blended learning model (Driscoll, 2002; Osguthorpe & Graham, 2003; Singh, 2003).

Blended Learning a term that refers blended, mixed and hybrid learning in national and international literature (Cabı, 2009; Dağ, 2011; Driscoll, 2002; Garnham & Kaleta, 2002; Graham, 2006; Graham, Allen, & Ure, 2003; Graham et al., 2014; Katz & Kim, 2016; Osguthorpe & Graham, 2003; Singh & Reed, 2001; Wilson & Smilanich, 2005). Blended learning can be defined as a learning model that takes advantage of both face-to-face and web-based learning.

Wilson and Smilanich (2005, p. 13) have pointed out that no methodology offered singly cannot be ideal for educational forms as the learning styles of different people require different learning methodologies. Therefore, blended learning provides the user to find the most suitable learning style identified according to his/her learning needs.

Blended learning has many advantages. These are as follows: (i) providing flexibility and convenience in the learning environment (Akgündüz & Akınoğlu, 2016; Carman, 2002; Osguthorpe & Graham, 2003), (ii) increase in the learning level and success (Ceylan & Elitok Kesici, 2017; Dağ, 2011; Rovai & Jordan, 2004; Sarıtepeci & Çakır, 2015; Özerbaş & Benli, 2015; Uluyol & Karadeniz, 2009; Uzun & Şentürk, 2010), (iii) increase in the retention level of knowledge (Collis, 2003; Uluyol & Karadeniz, 2009; Uzun & Şentürk, 2010), (iv) increase in the interest in learning (Akgündüz & Akınoğlu, 2016; Balaman & Tüysüz, 2011; Finch, 2008; Karaman, Özen, Yıldırım, & Kaban, 2009; Lilje & Peat, 2007; Rovai & Jordan, 2004; Uluyol & Karadeniz, 2009), (v) increase in motivation for learning (Altun, Gülbahar, & Madran, 2008; Balaman & Tüysüz, 2011; Dağ, 2011), (vi) interaction (Akgündüz & Akınoğlu, 2016; Altun et al., 2008; Carman, 2002; Çırak, 2017; Osguthorpe & Graham, 2003; Sarıtepeci & Çakır, 2015; Singh & Reed, 2001) and (vii) cost efficiency (Osguthorpe & Graham, 2003).

In addition to the above advantages, Osguthorpe and Graham (2003) have stated that blended learning provides benefits such as pedagogical enhancement, increasing access to knowledge, providing social interaction, helping the learners to learn at their own pace and to control this process, reduce the cost and the convenience to review and correct. With blended learning practices students can take part in the learning environment from their homes and can share recorded knowledge content without any time or place limitations.

Rapid development of technology and the Web have brought together alternatives and more effective learning models such as blended learning as well as social media supported learning.

As the technologies that provide interaction and communication between users and that allow sharing videos and pictures emerged after the 2005s, called Web 2.0 (O'Reilly, 2007), social media sites such as Facebook, Youtube etc. have been established. A tremendous change has been experienced in many social network sites and their popularity has increased. Also, the time that users spend in the social networks, to which many people from different age groups subscribe, has displayed a major increase during the time between the emerging of the social networks and the current day (Gülbahar, Kalelioğlu, & Madran, 2010).

There are various types of social media. To exemplify these types, Facebook as a social network, Vikipedi as a Wiki, Twitter as a micro blog, Youtube for video sharing, Flickr for photograph sharing, Google as a collaboration tool, Linkedin as a job network, Slideshare for slide sharing and Mashable as a blog could be given. Social network sites such as Twitter and Facebook provide that friends communicate with each other and even with the friends of their friends easily and that they access the information or learning they are interested in over the relevant network. On the other hand, social media can enrich teaching, increase the success of learners, and benefit educational institutions by supporting teaching and assessment processes (Ajjan & Hartshorne, 2008; Jones, Blackey, Fitzgibbon, & Chew, 2010; Junco, 2012). It can also positively influence students' motivation and attitude toward the lesson (Ajjan & Hartshorne, 2008; Moradabadi, Gharehshiran, & Amrai, 2012). Besides the face-to-face teaching in the classroom, social media-supported learning can be implemented through the interaction and collaboration of teachers and students over the social media sites outside class by sharing knowledge and visuals.

The Importance and Purpose of Research

Yenice, Saydam, and Telli (2012) state that one of the fundamental aims of science is to support the development of the cognitive area of learners as well as the developments in the affective area. Motivation, which is one of the affective characteristics, appears as an important factor in the success and learning of students (Dede & Yaman, 2008; Freedman, 1997; Kuyper, Van der Werf, & Lubbers, 2000; Lee & Brophy, 1996; Martin, 2001; Wolters, 1999). Ertem (2006) defines motivation, which is considered as an important element of the success of the students, as "the internal situation which leads to the emergence of human behaviors and directs the behaviors" in general terms. Many scientists who study the relation of motivation and success have developed various theories. Some of these are the theories of Keller, Maslow and Likert (Dede & Yaman, 2008). Academic success and motivation can be influenced by various learning environments and models. It is thought that blended learning and social media supported learning that emerged with the development of technology will become more and more important in science education. Therefore, there is a need to investigate the effects of blended learning and social media supported learning models on academic achievement and motivation that students will be more likely to use in science education, change their motivation for lessons, and thus affect success.

Noteworthy studies worldwide regarding blended learning started from 2001 on and continued progressively from 2006 onwards. Along with the technological developments and the use of the internet more effectively in education, the implementation of blended learning at primary and middle school levels is of crucial importance. The first studies in the world regarding using the social media in education started by the transfer from Web 1.0 to Web 2.0 from the 2005s and continues increasingly in recent years. When the literature is examined, it is found out that blended learning and social media supported learning are used in a limited context in science education and middle school levels and these

learning models are mostly used in higher education. On the other hand, the current research contributes to how blended and social media supported learning can be used in a middle school science class. It is believed that this study will contribute to the area in terms of using blended learning and social media in science education. In this study it is aimed that both blended learning and social media-supported learning in science education are considered quantitatively and qualitatively to contribute to the field. In order to reach this target, it is aimed to test the impact of blended learning and social media-supported learning on the academic success and motivation of the students quasi-experimentally and in addition, to put forward the student opinions regarding blended learning (BL) and social media-supported learning (SMSL) in science education.

Answers to the following research questions have been sought in accordance with the aims of the study:

1. Is there a significant difference among the post-test scores of the students who applied BL, SMSL and FFL in science education, considering the academic achievement pre-test scores?
2. Is there a significant difference among the post-test scores of the students who applied BL, SMSL and FFL in science education, considering the motivation pre-test scores?
3. What are the opinions of the students on BL and SMSL applications?

Method

The Research Model

In this study explanatory mixed pattern has been used. In explanatory mixed method research quantitative data are collected and then qualitative data are gathered to support the quantitative data (Creswell & Plano Clark, 2011). Mixed pattern is defined as a research process, in which quantitative and qualitative research methodologies are used together, providing work for multi-targets, facilitating approaching more than one situation or environment. Also it is defined as a process that is not only a simple combination of quantitative and qualitative methodologies, but one, where the strong aspects of these methods support each other (Bogdan & Biklen, 1998; Creswell, 2008; Fırat, Kabakçı Yurdakul, & Ersoy, 2014; Johnson & Christensen, 2004; Onwuegbuzie & Leech, 2006; Tashakkori & Teddlie, 1998).

The quantitative part of the study consisted of a semi-experimental and the qualitative part was constructed of semi-structured interviews with the students of BL and SMSL groups. The pattern of the research used in the study is displayed in Table 1.

Table 1. Research Design

	Learning Model	Pre-Tests	Post-Tests
Control Group (CG)	FFL	AST, MSFLS	AST, MSFLS
Experimental Group-1 (EG1)	BL	AST, MSFLS	AST, MSFLS, SSIF
Experimental Group-2 (EG2)	SMSL	AST, MSFLS	AST, MSFLS, SSIF

AST: *Academic Success Test*
MSFLS: *Motivation Scale for Learning Science*
SSIF: *Semi-Structured Interview Form*

As can be seen in Table 1, control and experimental groups were formed and FFL was used in CG and BL in EG1, SMSL in EG2.

The Study Group

The study group of the research was comprised of a total of 74 students in the 7th grade of a state school. Since this study was a semi-experimental design, the selection of subjects was not random (Creswell, 2008). Hence, Study Groups Selection Form was used to determine the CG, EG1 and EG2 classes (computer using level, internet facilities, internet use frequency, Facebook and YouTube use frequency data). Based on semi-experimental design principles, it is assumed that students in the experimental and control groups are similarly affected by factors other than variables.

While EG1 and EG2 have a high use level of accessing and using internet, the internet use level at the CG group is lower. For this reason, the classes with high internet access and usage level were designated as EG1 and EG2, while the lower class was designated as CG. The social media use level was examined at the groups with high internet use level and the group with the high social media use formed EG2. The group with a lower social media use compared to EG2 was determined as EG1 as access to internet at home is higher.

The distribution of the groups is displayed in Table 2.

Table 2. The Distribution of the Groups According to the Gender

Gender	CG	EG1	EG2	Total
Female	13	15	14	42
Male	11	10	11	32
Total	24	25	25	74

Data Collection Tools

Quantitative and Qualitative Data collection tools have been used for data collection.

Quantitative Data Collection Tools:

1. Academic Success Test (AST): A multiple choice AST comprising of 30 questions has been used in order to assess the success of the students in the unit "The Systems in Our Body". The AST was prepared by researchers in line with the aims and student learning outcomes of the unit "The Systems in Our Body" in the primary school grade seven Science and Technology Lesson Curriculum.

The questions in the AST were prepared by researchers through examining the previous researches, the screening tests used in various educational sites and the examinations carried out by the Ministry of Education. A specifications table was formed while preparing the AST and the questions were distributed in a balanced way according to the subtitles and outcomes (APP. 2).

The opinions of 2 lecturers working at the science education teacher training departments of state universities, 3 Science and Technology teachers with professional experiences between 8 and 13 years and an assessment and evaluation expert were obtained in order to provide content validity. The scientific appropriateness of the questions was considered through the expert opinion and a pilot study with 30 students in another class of the school was carried out.

The AST results used in the study were evaluated over the number of questions. The students were evaluated according to the correct number of questions they answered. At the academic success test, the blank and wrong answers were evaluated as 0 point and correct answers as 1 point. Item analysis was carried out on SPSS 17 program with the data obtained from the test and difficulty and distinctiveness indices were calculated. Also the KR-20 value was calculated. At the end of the pilot study the AST comprising of 54 questions was reduced to 30 questions and was finalized. As a result of the evaluation of the pilot success test and in line with the data obtained from the students, the median difficulty of the success test of 30 questions was found to be 0,404, the median distinctiveness to be 0,392 and the reliability (KR-20).

2. Motivation Scale for Learning Science (MSFLS): In the study "MSFLS" was used to collect data. This scale was developed by Dede and Yaman (2008), comprises of 23 items. It is likert scale type of 5 and its options are between "I definitely agree" and "I definitely do not agree:1".

The lowest point to be obtained from the scale is 23 and the highest is 115. Following the changes on the scale, it was applied on 421 primary school level II students. A scale comprising of 23 items has been developed in this way. The reliability coefficient of the scale (Cronbach Alfa) was found to be 0,80 (Dede & Yaman, 2008, p. 19). When the researchers did the study, the reliability coefficient of the scale (Cronbach Alpha) was calculated as 0.91, which can be considered as a factor to ensure the reliability of the scale.

3. Semi-Structured Interview Form (SSIF): As the qualitative data collection tool, the semi-structured interview form (SSIF) was applied to a total of 30 students randomly at the end of the study, of whom 15 students were from EG1 and 15 from EG2. The gender distribution of the interviewed students is 9 females and 6 males in EG1 and 10 females and 5 males in EG2. The interview questions were prepared by a researcher in the form of 5 open-ended questions. The opinions of 2 lecturers were sought regarding the face validity of the semi-structured interview questions. In the semi-structured interviews, the students stated their opinions on the questions they were asked in handwriting. The opinions in the forms filled by handwriting were compiled into a report.

Data Collection

The practices during this study continued for a total of 32 hours (8 weeks). The AST and MSFLS were applied on all groups as pre-test in two class periods in the first week at the school and as post-test in two class periods in the last week. The application times of the tests were not considered in the implementation period of the study.

CG (FFL) Practices: In the CG the activities were actualized according to the outcomes in the unit "The Systems in Our Body" and were applied face-to-face in line with the constructivist learning approach. In the CG all classes were started in line with the recommendations in the primary seventh grade science and technology lesson teacher's book. The previous knowledge testing and curiosity arousing stages, the discovery stage, explanation, extension and evaluation stages were applied in weekly 4 periods, keeping in line with the 5E cycle lesson plan in the teacher's book. Methods of question – answer, discussion, group work, problem solving etc. were used in classes and the course book, student workbook, posters and laboratory materials were used as resources. The appropriate unit activities in the course book and student workbook were selected and applied. At the end of each class homework from the course book and student workbook was given for the students to come well-prepared to the next class. The homework was checked and evaluated in the next lesson.

EG1 (Blended Learning) Practices: In EG1 the activities were actualized according to the outcomes in the unit "The Systems in Our Body" and applied weekly for 4 hours as 2 hours of face-to-face and 2 hours of internet support in line with the 2005 science and technology program and the constructivist learning approach with face-to-face and internet supported learning methodologies in a blended way.

In this group two classes of the weekly 4 hours science and technology lesson were scheduled for face-to-face learning and the other two for internet-supported activities. The face-to-face learning activities were carried out in the same way as the other groups and some face-to-face activities were carried out at the same time with web based activities. Some web based activities were carried out in the technology class individually or in groups. Besides the course book, student work book, posters and laboratory materials as sources, a virtual classroom application (education portal) was used. The unit activities in the course book and student work book, the animations, videos, interactive activities and screening tests in the portal and suitable presentations, videos and pictures in other sites were selected and used.

In this group a virtual classroom was formed on the educational portal before the study and students were provided to register to this virtual classroom. The researcher selected the interactive animations and videos in this portal outside class and prepared homework for the students to come prepared to the topics in the next class and this homework was sent to the virtual classroom. Also, homework comprising of screening tests and solved questions were prepared over the virtual classroom in order to evaluate the student outcomes in the previous lesson and sent back to the students. It was followed up daily whether the students received the homework and worked on it. The percentage for completion of the homework was also followed up and relevant outcomes were emphasized. The students' scores, answers and correct answers in the screening tests were followed up outcomes-based from the system and any subject that was not understood well was repeated briefly in the next class and homework on it was given.

EG2 (Social Media-Supported Learning) Practices: In EG2 the activities were actualized according to the outcomes in the unit "The Systems in Our Body" and applied weekly for 4 hours in line with the 2005 science and technology program and the constructivist learning approach with face-to-face and outside class social-media supported learning methodologies. Unlike the blended learning group, no internet was used in the class.

Face-to-face learning was practiced with question – answer, discussion, group work, problem solving methods and course book, student workbook, posters and laboratory materials were used as resources. Suitable activities on the unit in the course book and student workbook were selected and used.

In EG2 a Facebook page was opened and the students subscribed to the page from their own Facebook accounts. They entered the page at times outside class that they specified to follow up what the teacher shared and took notes according to teacher directions. The notes were checked and evaluated in the next class. On the Facebook page it was provided that students also shared videos, visuals, questions, documents, presentations and educational games and had interactions with each other. They asked other students and the teacher about topics they did not understand and also answered questions.

Besides the Facebook page, other social media tools such as YouTube, Slideshare, Dailymotion, and Flickr were used. Videos over YouTube, presentations and pdf files with notes over Slideshare, photographs and pictures related to the lesson over Flickr were shared. The resources in these sites were announced to the students on the Facebook page and shared with them. The students interpreted what they learned in the resources they shared and a discussion platform was formed. The teacher checked what the students shared and interpreted constantly and gave them feedback.

Data Analysis

The analysis of the quantitative data was made on the SPSS 17 program. The significance level (p) was accepted as 0.05 in the analysis of the data. The meaningfulness (p) values stated were higher than 0.05, which shows that the pre-test data of the students in the control and experimental groups had normal distribution. Therefore, inter-group data were evaluated with one-way analysis of variance (Anova) from parametric tests. Also, the post hoc techniques Tukey HSD and Games Howell were used in order to determine the group, from which the intergroup difference arises.

The semi-structured interview forms were evaluated by descriptive analysis technique. The data obtained according to this approach are summarized and interpreted as to the themes specified previously. The data can be organized according to the themes put forward by the research questions or presented considering the questions used in the interview and observation processes. In this type of analysis, the researcher can accommodate direct quotations frequently and clearly in order to reflect the opinions of the individuals s/he interviewed or observed. Also in this type of analysis the essential aim is to present the findings obtained in summary and as interpretation to the reader (Creswell, 2008; Yıldırım & Şimşek, 2006). The answers in the interview forms have been analyzed at 4 stages with descriptive analysis technique. Firstly, in order to form a thematic framework for each question, the answers of all students to the questions were read. At the next stage answers and some quotes to be used directly were selected according to the thematic framework. At the evaluation stage of the student interview form percentage evaluation could not be carried out as the answers of the students stated more than one outcome and only the frequency values were given. Frequency distribution was made by specifying the number of students numerically answering the themes. The findings were interpreted according to the frequency distribution.

In this research, it is explained how the results are achieved by defining the data in detail. More than one researcher participated in the analysis process to ensure internal validity (Creswell & Miller, 2000). The data collection process was performed by two researchers, and the same data were independently compared after being analyzed by two researchers. The consistency between the two researchers' coding was found to be sufficient. The method of investigating to provide external validity is described in detail. Glesne and Peshkin (1992) pointed out that data obtained in qualitative research are shared with experts in qualitative research and that the reliability of retrieving feedback is increased (Yıldırım, 2010). Therefore, the study was shared with a faculty of education academics and feedback was obtained.

Results

Findings Regarding the First Research Question

The first question of the research aims to determine whether there is a meaningful difference between the AST pre-test – post-test points' averages of the students in primary school 7th grade science and technology lesson, for whom blended learning, social media-supported learning and face-to-face learning were applied.

Table 3. Arithmetic Median and Standard Deviation Results of the CG and EG Students regarding Their AST Pre- and Post-Test Points

		Pre-Test		Post-Test	
Groups	**N**	$\bar{x}$	**sd**	$\bar{x}$	**sd**
CG	24	11,708	4,704	15,792	6,290
EG1	25	12,280	5,653	20,440	5,874
EG2	25	11,480	3,949	18,080	6,211
Total	74	11,824	4,767	18,135	6,334

When Table 3 is examined, it is observed that while the point average of the control group from the AST pre-test is 11,708, this value changed to 15,792 in the post-test. The AST pre-test average of the EG1 is 12,28 and the post-test points average increased to 20,440. The AST pre-test average of EG2 is 11,480 and this value reaches 18.080 in the post-test. When the results are evaluated, it is observed that at the end of the study the AST point increase of the control group was lower compared to EG1 and EG2 AST points. While the highest point increase was at EG1, the EG2 students also actualized a rather high point increase.

Table 4. Results of One-way Analysis of Variance for AST Pre-Test Points of KG and EG Students

Source of Variation	**Sum of squares**	**df**	**Mean square**	**F**	**p**
Between groups	8,478	2	4,239	0,182	
Within groups	1650,238	71	23,243		0,834
Total	1658,716	73			

According to Table 4 it is observed that when the AST data applied before the study are analyzed, there is no meaningful difference between the success levels of the control and experimental groups ($p>0.05$). Therefore, it has been accepted that before the study the previous knowledge of the students in the control and experimental groups was equal.

Table 5. Results of One-way Analysis of Variance for AST Post-Test Points of CG and EG Students

Source of Variation	Sum of squares	df	Mean square	F	p
Between groups	264,690	2	132,345	3,527	
Within groups	2663,958	71	37,521		0,035
Total	2928,649	73			

According to Table 5, it is observed that when the AST data applied after the study are analyzed, there is a meaningful difference between the success levels of the control and experimental groups ($p<0.05$). According to the AST results applied after the study, the blended learning and social media-supported learning group received higher points than the face-to-face learning group. EG1, for which blended learning was applied, had the highest point. EG2, where social media-supported learning was carried out, had higher performance than the CG with face-to-face learning; however, its success point was lower than EG1 with blended learning.

In order to find out the source of this cumulative difference between groups obtained from one-way variance analysis, firstly the homogeneity of the variances was examined and it was specified that the variances were homogenous (Levene's test= 0,128 and $p>0.05$). The Tukey HSD test as a post hoc technique based on the homogeneity of variances was carried out and the results are displayed in Table 6.

Table 6. Tukey HSD Test Results for AST Post-test Points of the CG and EG Students

Groups		Mean difference (I-J)	p
CG	EG1	-4,648	0,026
	EG2	-2,288	0,396
EG1	CG	4,648	0,026
	EG2	2,360	0,366
EG2	CG	2,288	0,396
	EG1	-2,360	0,366

For paired comparison of the AST of the students receiving classes with different teaching methods, the Tukey HSD test from supplementary calculations was carried out. According to the results in Table 6, there was a meaningful difference ($p<0.05$) at the academic success post-test points of the CG and EG1 groups in favor of EG1. There was no meaningful difference at the academic success post-test points of the CG and EG2 students ($p>0.05$). No meaningful difference was observed between the academic success post-test of EG1 and EG2 students ($p>0.05$). This shows that the EG1 students, for whom blended learning was applied, increased their academic success points in a meaningful way compared to the control group, the EG2 groups, for whom social media-supported learning was applied, increased their academic success considerably, but that this increase is not meaningful.

Findings Regarding the Second Research Question

The second research question aims to determine whether there is a meaningful difference between the MSFLS pre-test – post-test points' averages of the students in primary school 7th grade science and technology lesson, for whom blended learning, social media-supported learning and face-to-face learning were applied.

Table 7. Arithmetic Median and Standard Deviation Results of the CG and EG Students regarding Their MSFLS Pre- and Post-Test Points

		Pre-Test		Post-Test	
Groups	**N**	$\bar{x}$	**sd**	$\bar{x}$	**sd**
CG	24	89,708	16,596	90,500	14,488
EG1	25	91,120	9,748	99,240	6,132
EG2	25	89,480	17,462	95,080	11,975
Total	74	90,108	14,792	95,000	11,767

As displayed in Table 7, while the point average of the control group from the MSFLS pre-test is 89,708, this value was 90.500 in the post-test. The pre-test average of EG1 in MSFLS is 91,120 and the post-test points display that it increased to 99,240. The MSFLS pre-test average of EG2 is 89,480 and this value is 95.080 in the post-test. An evaluation of the results obtained shows that while there was almost no change in the MSFLS points of the control group, the MSFLS points of EG1 and EG2 students increased.

Table 8. Results of One-way Analysis of Variance for MSFLS Pre-Test Points of CG and EG Students

Source of Variation	**Sum of squares**	**df**	**Mean square**	**F**	**p**
Between groups	39,297	2	19,648	0,088	0,916
Within groups	15933,838	71	224,420		
Total	15973,135	73			

As shown in Table 8, an analysis of the MSFLS data before the study displays that there is no meaningful difference between the motivation for learning science of the control and experimental groups ($p>0.05$). Therefore, it has been considered that the pre-motivation for learning science of the students in the Control and Experimental Groups before the study was equal.

Table 9. Results of One-way Analysis of Variance for MSFLS Post-Test Points of CG and EG Students

Source of Variation	**Sum of squares**	**df**	**Mean square**	**F**	**p**
Between groups	935,600	2	467,800	3,621	0,032
Within groups	9172,400	71	129,189		
Total	10108,000	73			

As shown in Table 9, an analysis of the MSFLS data applied after the study displays that there is a meaningful difference between the motivation of the control and experimental groups for learning science ($p<0.05$). According to the MSFLS results applied after the study, it is observed that the EG1 group, for which blended learning was applied and the EG2, for which social media-supported learning was applied, received higher points compared to the control group, for which face-to-face learning was applied and that post-motivation was higher. EG1 with blended learning had the highest motivation point average. EG2, for which social media-supported learning was applied, had a higher motivation level compared to the control group with face-to-face learning; however, motivation was lower than EG1 with blended learning.

In order to find out the source of this cumulative difference between groups obtained from one-way variance analysis, firstly the homogeneity of the variances was examined and it was specified that the variances were not homogenous (Levene's test= 5,188 and $p>0.05$). The Games - Howell test as a post hoc technique used at non-homogenous variances was carried out and the results are displayed in Table 10.

Table 10. Games Howell Test Results Carried out for the MSFLS Post-test Points of CG and EG Students

Groups		Mean difference (I-J)	p
CG	EG1	-8,740	0,027
	EG2	-4,580	0,457
EG1	CG	8,740	0,027
	EG2	4,160	0,282
EG2	CG	4,580	0,457
	EG1	-4,160	0,282

For paired comparison of the MSFLS Post-test points of the students receiving classes with different teaching methods, the Games-Howell test from among supplementary calculations was carried out. According to the results in Table 10, there was a meaningful difference ($p<0.05$) between the CG and EG1 students' post-test points for motivation for learning science in favor of EG1. There was no meaningful difference of the CG and EG2 students' motivation for learning science post-test points ($p>0.05$). No meaningful difference was observed between the post-test points for motivation for learning science of EG1 and EG2 students ($p>0.05$). This shows that the EG1 students, for whom blended learning was applied, increased their MSFLS points in a meaningful way, the EG2 groups, for whom social media-supported learning was applied, increased their MSFLS points considerably, but that this increase is not meaningful compared to the control group.

Findings Regarding Third Research Question
Qualitative Research Findings of EG1 (Blended Learning) Students
The benefits of the Blended Learning

Table 11. EG1 Interview Form 1. Question Findings

Codes	Frequencies
Academic success, better learning	9
Motivation	7
Attitude	7
Self-Learning	6

According to Table 11, it is observed that the blended learning practices used in the science and technology lesson "The Systems in Our Body" unit increased the academic success of the students and had positive impacts on their motivation for learning science. Below are the students' opinions:

"It was beneficial for me. It motivated me. It increased my success. Our lessons were fun. This increased my motivation. It also enabled to retain the information for longer time." (1. Student)

"We learn by doing all the experiments we can do in science and technology lessons that we need to learn. We also learn by ourselves. We repeat what we have learned in school. We are learning ourselves first with the assignments given. With the notes we receive, we make what we learn permanently. We repeat what we have learned so that full learning takes place." (2. Student)

"Science and technology lesson provided me with the motivation to study more so I received higher marks. Thanks to these courses, I started enjoying science more, which pushed me to study harder." (5. Student)

The Conveniences of the Blended Learning

Table 12. EG1 Interview Form 2. Question Findings

Codes	Frequencies
Academic success, better understanding	7
Supporting the science lesson	4
Preparation and practice for the exams better	4
More fun science lesson, increase motivation	2
Active participation the science lesson	1

According to Table 12, the students stated that blended learning provided conveniences for being successful, supporting the science lesson for better comprehension, increasing motivation for the science lesson, learning the lesson with more fun and receiving better grades from the examinations by preparing and practicing for the exams better. Below are the students' opinions:

"I retain the topic very efficiently as we learn visually and by listening. In addition, practicing the lesson in the class makes it much better and complete." (3. Student)

"I started to practice more because of the classroom activities and the assignments" (4. Student)

"The convenience he provided helped me with my exams. It provided great support for my courses. "(10. Student)

The Difficulties in the Implementation of the Blended Learning

Table 13. EG1 Interview Form 3. Question Findings

Codes	Frequencies
The problems to access internet and education portal	5
No difficulty	4
The difficulties in the activities	3
Completing homework on time and as expected	2
Lack of opportunity of asking question and interaction	1

According to Table 13, it is observed that the students had sometimes problems to access internet, they could not find time to access internet, some had difficulties in the activities, they could not interact with each other and with the teacher, and also they had problems with the errors on the internet site or the server. It is found out from the answers that some students did not encounter any difficulties. Below are the students' opinions:

"Sometimes there was an internet failure. There were errors on the site. Therefore, I could not use the site on some days." (1. Student)

"I have difficulty understanding the information and not being able to ask if I have a responsibility" (8. Student)

"Sometimes I was not able to do interactive activities, so I was having difficulties." (9. Student)

The Attitude Toward the Blended Learning

Table 14. EG1 Interview Form 4. Question Findings

Codes	Frequencies
Academic success, better understanding, permanent learning	6
Supporting the lesson and examinations	5
Fun, Motivated for the lesson	3
Negative statement: The lesson should be made in class, lack of opportunity of asking question	2
Self-improvement	1

According to Table 14, the students wanted the implementation to continue as blended learning increased success, lead to better understanding and comprehension, motivated for the lesson, supported examinations and was fun. Below are the students' opinions:

"This type of class is both a lot of fun and it also enables me to have more interest in the lesson." (11. Student)

"It motivated me for my lessons and made me more successful." (1. Student)

"I can look at the subject which I have a difficult time to understand, I can solve the exams." (Student 12)

The Opinions regarding the Application of the Blended Learning Activities

Table 15. EG1 Interview Form 4. Question Findings

Codes	Frequencies
Enjoyable, nice	10
Better understanding and learning	6
Usefulness	2
Time saving	1

According to Table 15 it has been determined that the opinions on the section taught over the educational portal outside class that makes up the web-based section of blended learning, this type of learning provides better learning, better comprehension and fun at the activities. Below are the students' opinions:

"I liked these activities very much, they were a lot of fun. I can comprehend things better with fun. Animations and other similar things were very colorful." (11. Student)

"I think it's useful to take homework out of school time. Because it is not a waste of time. "(2. Student)

"Very good work, for example, I believe I now have a good understanding in the subject of human body." (3. Student)

EG2 (Social Media-Supported Learning) Qualitative Research Findings
The Benefits of the Social Media-Supported Learning

Table 16. EG2 Interview Form 1. Question Findings

Codes	Frequencies
Academic success, better learning	14
Motivation	6
Attitude	5
Self-Learning	5

According to Table 16, it is observed that social media-supported learning increased the students' academic success, that it changed their motivation for learning science and their attitude towards the science lesson and that it also had a positive impact in terms of self-learning skills. Below are the students' opinions:

"My classroom performance increased as I used the social media outside class. I started participating more in lessons. My exam grades got better. I started having more voice in classes. I also started answering more questions in the exams." (8. Student)

"Participation in the course has helped me to understand the issues I do not understand about science and technology. My knowledge on science has increased. The lesson I thought so hard before is now easy. I got higher grades on the exams. The science and technology course has become more fun to me. "(1. Student)

"I learned more fun lessons for the social media. I was more productive than science and technology lessons and my exam grades were improved and I was not worried about my ability to enter the classroom and helped me to feel more peaceful. "(3. Student)

The Conveniences of the Social Media-Supported Learning

Table 17. EG2 Interview Form 2. Question Findings

Codes	Frequencies
Carrying out the activities with fun, reinforcing the topics at any time	10
Preparation for the exams and studying	5
Asking each other questions, interacting with each other and exchanging ideas	4
Doing their homework, finding resources for homework	3
The ability of using the internet and social media	2
Lesson participation increase	1

According to Table 17 it has been determined that social media-supported learning provides conveniences for answering test questions, carrying out the activities with fun, having fun, reinforcing the topics, asking each other questions, interacting with each other and exchanging ideas, studying and revising with fun when they like and doing their homework. Below are the students' opinions:

"When we have an exam, I have the opportunity to just open the Facebook page and watch the video whenever and wherever I like and make comments. There is the convenience of watching the videos of the topics we did at school on the Facebook page for lesson review." (10. Student)

"I can easily do homework. I can ask questions to my friends and teachers. I had the opportunity to share my ideas and had a page I could work on in my exams."(9. Student)

"I am working with help, I can find the answers to questions that I do not know immediately, and I do not have difficulties with questions and now I like science lessons more." (2. Student)

The Difficulties in the Implementation of the Social Media-Supported Learning

Table 18. EG2 Interview Form 3. Question Findings

Codes	Frequencies
Difficulties in accessing the internet on time if any	5
Problems with finding resources to sharing them	4
Deciding whether their sharing was accurate and reliable	4
Not loading web pages	2
To comment back and forth	2
No problem	1

According to Table 18, it has been determined that students had problems with finding resources to share and in sharing, that some had difficulties in accessing internet on time or accessing internet at all and therefore were behind in the lesson and also that they had problems with deciding whether their sharing was accurate and reliable. Below are the students' opinions:

"Sometimes I could not access the internet and could not learn some things for that day. I could not do the homework given by the teacher if there was any." (3. Student)

"I doubted if some of the resources were right. And in some cases I had to search for new sources. "(5. Student)

"I can not access Facebook when we have some important exams or assignments. My other friends commented until I wrote a video comment there. The difficulty I had with it was that I did not always have the time to go to the Facebook page. "(10. Student)

The Attitude toward the Social Media-Supported Learning

Table 19. EG2 Interview Form 4. Question Findings

Codes	Frequencies
Academic success, better learning and easy learning	8
Enjoyable learning, motivation and attitude	7
Studying, research, repetition	5
Sharing information continuously	2
Active participation in lessons	1

According to Table 19 the students wanted to continue learning with social media because it increased success, it encouraged studying better, it facilitated studying, it was fun, it impacted the perspective on the lesson positively and it motivated for the lesson. Below are the students' opinions:

"It is a lot of fun. It contributes to my classes and my mind was reinforced. I participated more in classes and it was very beneficial for me." (1. Student)

"It has been very good to me because I could spent some leisure time in social media. I would really like the social media be utilized more effectively in all the other courses. "(3. Student)

"The Facebook page we use made a contribution to us and made learning fun." (10. Student)

Additional Requirements for the Social Media-Supported Learning Activities

Table 20. EG2 Interview Form 5. Question Findings

Codes	Frequencies
Comprehensive and organized web sites	8
More experiments	3
Video conversation with teachers	2
Sharing music	2
Using social media at school	1
Using the other social media tools	1
More Tests	1

According to Table 20 the students wanted additional practices such as a more comprehensive and better organized internet site to support the lesson, more experiments and video talk with the teacher. Below are the students' opinions:

"A site that explains the activities to us through video and specific screening tests with topic titles would be very good." (11. Student)

"I would like to have a face-to-face interaction with the teacher (maybe via the video-chat) and wish to pose questions that I can possibly have a difficult time to understand. " (4. Student)

"I would like to design a new website and keep the side updated with recent information" (5. Student.

Discussion, Conclusion and Suggestions

As a result, it was observed that blended learning increased academic success and motivation for learning science meaningfully compared to face-to-face learning and that although social media-supported learning impacted academic success and motivation for learning science positively, it did not create a meaningful difference compared to face-to-face learning. On the other hand, there was no significant difference in terms of academic success and motivation between blended learning and social media supported learning.

In the literature, studies focused on improving the success of the blended learning and ensuring it to learn permanently (Balaman & Tüysüz, 2011; Collis, 2003; Ceylan & Elitok Kesici, 2017; Dağ, 2011; Rovai & Jordan, 2004; Sarıtepeci & Çakır, 2015; Özerbaş & Benli, 2015; Uluyol & Karadeniz, 2009; Uzun & Şentürk, 2010). As in quantitative data, blended learning according to student views offers advantages such as augmenting success, better understanding, motivating and making the lesson fun. These results support the research in the literature (Balaman & Tüysüz, 2011; Dağ, 2011; Dziuban, Hartman, & Moskal, 2004; Eng, Lim, Hiong, & Yong, 2007; Kirişçioğlu, 2009; Lilje & Peat, 2007; Lin, 2008; Pearcy, 2009; Uluyol & Karadeniz, 2008, 2009; Yaman & Graf, 2010; Yılmaz, 2009). It is believed that while implementing blended learning, using a comprehensive learning portal along with face-to-face learning, using all information, visuals, interactive activities outside class for homework, having the tests and homework done in a particular period of time, following student performance constantly and using great many videos, visuals etc. in the lesson along with the internet statistically provided the group with blended learning to have a higher and more meaningful success.

According to both qualitative and quantitative data, the motivation for learning science of the blended learning group students increased at a rather high level and it was determined that the students were happy to be in this kind of an environment. The study of Eng et al. (2007) supports this view as well. It is also generally pointed out in the literature that student motivation increases with blended learning and the students enjoy the environment more (Çolakoğlu, 2009; Dziuban & Moskal, 2001; Kistow, 2011; Yılmaz, 2009). The advantageous aspects of blended learning provided the students to adopt this model generated motivation for the lesson to be taught in this way. In spite of all these advantages, some disadvantages regarding the web part of blended learning are encountered such as the occasional difficulties in accessing internet, server errors, not being able to interact with the teacher and not being able to find time outside class. These disadvantages cause problems for the students such as their not being able to do the activities, write the exams and the homework on time.

Although the social media-supported learning group did not increase its AST post-test points meaningfully compared to the face-to-face learning group, there was a considerable increase in their success point averages and using social media made positive contributions to the students' success. According to some researches, the social networks used in social media-supported practices increases students' success and reinforces their learning (Ajjan & Hartshorne, 2008; Junco, 2012). These positive effects, which were also seen in this study, did not cause a significant increase.

Although the motivation for learning science of the social media-supported learning group did not increase quantitatively in a meaningful way, it is observed that there has been a considerably higher point increase compared to the face-to-face learning group. We encounter this increase in the motivation of the students in this group at the student interviews as well. Similarly to the results of this study, (Ajjan & Hartshorne, 2008; Moradabadi et al., 2012) it is pointed out that tools such as blog, wiki, podcast and social networks increase the lesson satisfaction and lesson motivation of the students.

It is evident that social media-supported learning has many advantages like blended learning. These are that it is fun and enjoyable, that it supports reinforcement for the topics that it provides

opportunities for the students to interact with each other, to ask each other questions, to exchange ideas and to do their homework. Due to all these advantages the students pointed out that they wanted to continue social media-supported learning. Some disadvantages of social media-supported learning that have been determined are that there are questions on the reliability of the sources, there are problems to access internet and students cannot find time. These problems caused the students not to be able to carry out the activities shared over social media on time and thus, decreased the impact of social media. It is also believed that the realization of sharing on Facebook used for social media only happened through areas such as timeline or walls and this was an obstacle for an effective learning environment.

Social networks do not offer a learning model on their own; however, they can be used as a supporting tool to provide better learning and to increase motivation. Along with the increase of the significance of the use of social media in education, social media sites are established worldwide for educational purposes solely and they are becoming widespread. It is believed that increase in success and motivation can be provided with the use of these social media sites that serve educational purposes only.

The current study was conducted within "Systems in Our Body" as a curricular unit. In the study group of blended learning, one content portal was performed; a four-hour lecture was maintained through face-to-face lecturing for its two hours, and remaining two hours was dedicated to web-supported procedures. For the social-media-supported study group, Youtube, Slideshare, Dailymotion, Flickr were used in addition to Facebook that was mostly used and considered. The current study had been limited in terms of use of "Systems in Our Body" as a curricular unit**,** computer using levels, facilities of having internet, internet usages, and frequencies of accessing Facebook and Youtube for both of the student groups who are involved in experimental and control group. It is assumed that the uncontrolled variables have equal effects on all three groups, the study group responds objectively and sincerely to the questions in the data collection tools, and the only difference between the experimental and control groups were the applied teaching methods. In order for a social media supported learning to be successful, other social media tools can be utilized effectively, a comprehensive educational social networking site can be created, and communication and interaction with the teacher can be achieved. It may also be more useful to integrate a regular and comprehensive internet site, which is also used for blended learning, with social media tools. This research which was carried out at the 7th grade level can also be carried out in other levels and units. Moreover, the time spent on the face-to-face part of the blended learning can change at different rates.

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Appendix 1. Semi-Structured Interview Questions

EG1

1- Do you think that the science and technology class supported with the educational portal and classroom activities (experiment, activity etc.) provided benefits for you? If yes, in what terms were these benefits? Please explain.

2- What were the benefits that learning the science and technology lesson supported with internet, the educational portal and classroom activities (experiment, activity etc.)?

3- What were the difficulties you encountered while you were learning the Science and Technology lesson supported with the internet, Education Portal and classroom activities (experiment, activity etc.)?

4- Would you like to continue to learn the Science and Technology lesson supported with the internet, Education Portal and classroom activities (experiment, activity etc.)? Why?

5- What are your opinions on the activities carried out over the educational portal (homework, examinations, and other lesson resources) outside class?

EG2

1- Do you think that the science and technology lesson that we had using social media outside class (Facebook page, YouTube, Google etc.) was beneficial for you? If yes, in what terms were these benefits? Please explain.

2- What were the conveniences learning the Science and Technology lesson supported with social media (Facebook page, YouTube, Google etc.) provided for you?

3- What were the difficulties you encountered while you were learning the Science and Technology lesson supported with social media (Facebook page, YouTube, Google etc.)?

4- Would you like to continue to learn the Science and Technology lesson supported with social media (Facebook page, YouTube, Google etc.)? Why?

5- What other activities would you like to have in the Science and Technology lesson in addition to the social media (Facebook page, YouTube, Google etc.) practices?