



THE EFFECTS OF SOCIAL NETWORKING SITES IN DISTANCE LEARNING ON LEARNERS' ACADEMIC ACHIEVEMENTS

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Abstract

The general aim of this study is to determine the effects of learning management systems supported by social networking sites on learners' academic achievements in distance education. The study group consisted of 75 undergraduate students from a state university in eastern Turkey. The data for the study, in which an experimental research design was used, were collected through an achievement test, which consisted of 40 multiple-choice questions. Within the scope of the research, a learning management system and a social networking site were utilized in a distance education course. As a result of the research, it was seen that social network supported distance learning activities created a more positive effect on the achievements of the learners than the distance learning activities. Also, it was determined that social network supported distance education activities were more effective in the acquisition of behaviours at the knowledge level of the cognitive domain than activities in other groups; however, the groups were not different from each other in relation to the acquisition of behaviours at the comprehension level of the cognitive domain. In this context, it was concluded that the learning management systems used in distance education should be supported by social networking sites to increase the academic achievement of learners.

Keywords: Distance learning, social networking sites, learning management systems, Blackboard.

Introduction

The number of distance education courses is increasing at a unique speed and the number of learners registering for on online courses is increasing daily. Most higher education institutions prefer learning management systems (LMSs), such as WebCT, Moodle and Blackboard, which have been designed especially for educational purposes in distance education (Lane, 2008; Petrovic et al., 2014). LMSs provide useful tools, such as content areas, assessment, discussion platforms, forums, blogs and calendar that can be used to create interactive environments for learners and instructors. However, LMSs are inadequate, especially in regard to social interactions in educational contexts.

A natural social network exists in any LMS in which the chief actors are instructors, learners and learning sources (Cuéllar, Delgado & Pegalajar, 2011). However, it is a pity that the structure of LMSs, which is generally not flexible and pedagogically over-structured (Brady, Holcomb & Smith, 2010), limits teaching creativity, interactions and the methods used to prepare content by instructors who have just began to discover the use of these instruments. For this reason, most LMSs are generally used with a focus on uploading content, such as PowerPoint slides, notes and images (Mott, 2010). In addition, despite the rapid increase in the use of LMSs, it has taken a long time for the instructors to internalize the use of more complicated and interactional components,

such as chat and discussion boards, designed to improve cooperation among learners. As such, these aspects are rarely used (Morgan, 2003; Lane, 2008).

Moreover, learners need more autonomy, socio-experimental learning and connectivity in LMSs. Although LMSs provide learners with the freedom to attend to the course they have chosen themselves, they cannot meet the needs of learners in specific ways, such as by providing helpful tools for social interactions or personal profiles (Meishar-Tal, Kurtz & Pieterse, 2012; McLoughlin & Lee, 2007). According to Brady, Holcomb and Smith (2010), as opposed to social networking sites (SNSs), LMSs tend to be excessively structured and fail to provide the individual participation and network capacity provided by SNSs. For example, an instructor using a LMS can post a question on an online discussion board and each learner can send a response. However, this activity does not allow the learners to interact in real-time manner. Therefore, LMSs are not able to provide an adequate level of learner participation, communication, satisfaction and motivation (Aghili et al., 2014; Thoms & Eryılmaz, 2014; Meishar-Tal, Kurtz & Pieterse, 2012; Rozac et al., 2012).

Finally, it has been stated that learners rarely enter LMSs unless they need the information stored within them or they have an assignment that needs to be completed. In contrast, they spend most of their time on SNSs voluntarily (Benson, 2008). These factors make some learners and instructors reluctant to use LMSs (Aghili et al., 2014; Divall & Kirwin, 2012; Schroeder & Greenbowe, 2009).

In addition, several studies have focused on web communities similar to the ones in SNSs (Cuéllar, Delgado & Pegalajar, 2011). These studies have stated that distance education activities are much more successful when web communities are formed (DeSchryver et al., 2009) as they foster an online social presence among the learners (Anderson, 2005). Due to this reason, SNSs have attracted the attention of educators. Recent research has shown that these platforms could be used in overcoming the limitations of LMSs (Aghili et al., 2014; Tess, 2013; Veletsianos, Kimmons & French, 2013; Veletsianos & Navarrete, 2012).

The popularity of SNSs, such as Facebook, MySpace, Friendster, LinkedIn and LiveJournal, have increased over time (Boyd & Ellison, 2007; Lester & Perini, 2010) and these platforms have a strong effect on the lives of millions of students (Thompson, 2007). Due to the number of the SNS users, it has recently been discussed as to whether educators should use these networks as a means of communicating with their students (Grant, 2008; New Media Consortium and ELI, 2008).

Furthermore, it has been determined that these networks provide students with a social setting regardless of physical distance and that those students who spend more time on these networks have more communication with their schoolmates (Higher Education Research Institute, 2007). As very few distance learners are able to meet their classmates and instructors in an informal setting within the LMSs, they are unable to create a strong sense of community within the course. Having a strong sense of community within a course increases their willingness to cooperate and impacts the success of the course (Rozac et al., 2012; Holcomb, Brady & Smith, 2010). For this purpose, the use of SNSs that include elements that provide the formation of a cooperative learning environment and that support educational activities would provide important advantages for distance education, such as student participation (Lee & McLoughlin, 2010; Naveh et al., 2010), student engagement (Aghili et al., 2014; Hoffman, 2009), motivation, personal interaction, collaboration and the effects of the learning environment on emotional properties (Veletsianos, Kimmons & French, 2013; Veletsianos & Navarrete, 2012; Greenhow, Robelia & Hughes, 2009). When the contributions of SNSs on education and the increasing popularity of SNSs are considered, combining these technologies is seen as a logical method by which to increasing the

quality of online teaching and learning (Petrovic et al., 2014; Thoms & Eryılmaz, 2014; Razali et al., 2013; Iahad et al., 2012; Rozac et al., 2012; Brady, Holcomb & Smith, 2010; Bartlett-Bragg, 2006). It should be noted, however, that the true effect of SNSs on students' achievements in educational contexts is not clearly stated in the literature (Kirschner & Karpinski, 2010).

In this study, we aim to determine the effect of social network supported distance education activities on student achievement. Within this framework, we aimed to reveal whether significant differences exist between SNS supported distance education activities, distance education activities and face-to-face learning activities in terms of student achievement.

Method

The model of the study

In this study, a true experimental design was used. In line with the research aim, two experimental and one control groups were formed. These groups and their characteristics are listed below:

- Experiment-I group: the group that participates in the distance education course,
- Experiment-II group: the group that participates in the distance education course and uses a social networking site, and
- Control group: the group that participates in face-to-face education.

Population and sample

The study was carried out during the 2011-2012 spring term at a state university in eastern Turkey. The population of the study consisted of 101 third year undergraduate students who were enrolled the Special Teaching Methods II (STMII) course in the Department of Computer Education and Instructional Technologies (CEIT). A total of 75 students (experiment-I=25, experiment-II=25, control=25) were chosen as the sample for the study.

We used five sets of criteria when defining the experiment and control groups and when determining the sample group: 1) frequency of using SNSs, 2) achievement scores from the Teaching Methods (TM) course, 3) achievement scores from the Special Teaching Methods I (STMI) course, 4) grade point averages (GPAs) and 5) pretest scores. In addition, whether the students had the opportunity to access the Internet at home and in which environment they wished to participate in the activities was taken into consideration. In order to ensure objectivity, primarily the second, third, fourth and fifth criteria were evaluated using a cluster analysis.

A non-hierarchical cluster analysis and a k-means cluster, which is used frequently in this method, were used. According to the k-means cluster, in which a cluster number is determined beforehand, the individuals and objects that have similar properties to each other were summed altogether. In the analysis conducted, 42 students were in the first cluster and 59 students were in the second cluster. It was formerly planned that the magnitude of the sample group should be 25 in each group and should be 75 in total. Therefore, because the initial number of members was higher, the second cluster which included 59 students with similar characteristics had to be included in the sample group. Then, in order to complete the number of members, distance measurements that are frequently used in evaluating similarities in clusters were used. In the measurement of the cluster analysis similarities, distance, commonness and correlation measurements are especially used. If the similarity is high, then it shows that the two members of the group are close to each other in terms of the properties that they have. If the similarity is low, then it shows that they are not close to each other. The concept of distance is the reverse of the concept of similarity (Hair et al., 2006). In this way, for the study to be conducted and to be able

to form groups with a sufficient magnitude, 16 students who were in the first group, but close to the second group were added to the sample group.

After determining who would be included in the sample, the students were assigned to the experimental and control groups. At this stage, *'whether the students had access to the Internet in their homes'* was the most important criterion to place the students in the groups. According to the data collected from the initial information form related to this criterion, most of the students, 85% (N=64), had Internet access at their homes and only 11 students do not have Internet access at their homes. These 11 students were placed in the control group since they could not participate in the distance education and social network activities. The second criterion was *'What kind of application did the student want to participate in'*. It was found on the initial information form that 19 students preferred face-to-face learning, whereas 36 preferred distance education and 20 preferred both distance education and social network environments. It was tried to include these 19 students, who preferred face-to-face learning, in the control group; however, five of them had already been included in the control group as they did not have internet access at home. The remaining 14 students were chosen to assign to the control group as well. In conclusion, 25 students who could not access the Internet at home and wanted to participate in a face-to-face learning environment were assigned to the control group.

The decision as to which students would be assigned to the experiment-I group, which would participate in distance education activities supported by SNSs, and the experiment-II group, which would participate only in distance education activities, was made via random assignment. However, some of the group members had characteristics that may potentially damage the randomization even though each of the students was statistically similar. For this reason, it was beneficial to analyze the impartiality of groups in terms of the defined criteria. The analyses performed within this framework are presented below.

In determining randomization, the students' frequency of using SNSs was analyzed. Based on the information obtained from the initial information form, it was seen that 56% (N=42) of the students used SNSs every day, whereas 36% (N=27) used SNSs a couple of times a week, 3% (N=2) used them once a week and 5% (N=4) used them rarely. Accordingly, it was seen that majority of the participant students use SNSs every day. The means and standard deviations of the students in the experiment and control groups as they were related to the determined criteria are presented in Table 1.

Table 1: Means and standard deviations related to criteria

	Groups	N		SD
Frequency of using SNSs	Experiment-I	25	1.72	0.89
	Experiment-II	25	1.40	0.86
	Control	25	1.76	1.12
TPM course achievement scores	Experiment-I	25	59.64	6.92
	Experiment-II	25	59.12	7.90
	Control	25	55.22	5.95
STM course achievement scores	Experiment-I	25	68.68	8.26
	Experiment-II	25	68.38	7.53
	Control	25	72.53	8.11
GPAs	Experiment-I	25	2.51	0.39
	Experiment-II	25	2.54	0.41
	Control	25	2.54	0.37
Pretest scores	Experiment-I	25	22.32	5.39
	Experiment-II	25	23.36	5.08
	Control	25	22.92	4.68

Based on the information found in Table 1, it can be seen that the frequency of using the SNSs for the experiment and control groups' are as follows: mean scores [experiment-I (\bar{x} =1.72), experiment-II (\bar{x} =1.40), control (\bar{x} =1.76)], achievement scores of the TM course [experiment-I (\bar{x} =59.64), experiment-II (\bar{x} =59.12), control (\bar{x} =55.22)], achievement scores of the STMI course [experiment-I (\bar{x} =68.68), experiment-II (\bar{x} =68.38), control (\bar{x} =72.53)], academic success means [experiment-I (\bar{x} =2.51), experiment-II (\bar{x} =2.54), control (\bar{x} =2.54)] and means related to the pre-test scores [experiment-I (\bar{x} =22.32), experiment-II (\bar{x} =23.36), control (\bar{x} =22.92)]. All of these scores were very close to each other. A one-way variance analysis was performed in order to determine whether statistically significant differences existed between the groups with respect to the defined criteria. The results are given in Table 2.

Table 2: Variance analysis results related to the criteria

		Sum of Squares	df	Mean of Squares	F	p	
Frequency of using SNSs	Between groups	1.947	2	.973	1.037	.360	Levene=.659 p=.521
	Within groups	67.600	72	.939			
	Total	69.547	74				
TPM course achievement scores	Between groups	291.478	2	145.739	2.996	.056	Levene=1.588 p=.811
	Within groups	3502.702	72	48.649			
	Total	3794.180	74				
STM course achievement scores	Between groups	268.592	2	134.296	2.111	.129	Levene=.116 p=.891
	Within groups	4579.818	72	63.609			
	Total	4848.410	74				
GPAs	Between groups	.011	2	.005	.034	.967	Levene=.116 p=.891
	Within groups	11.386	72	.158			
	Total	11.397	74				
Pretest scores	Between groups	13.627	2	6.813	.266	.767	Levene=.366 p=.695
	Within groups	1847.040	72	25.653			
	Total	1860.667	74				

As can be seen in Table 2, no statistically significant differences exist with respect to the frequency of using social networks [$F=1.037$; $p<.05$; $p=0.360$], TPM course achievement scores [$F=2,996$; $p=0,056$], STMI course achievement scores [$F=2.111$; $p<.05$; $p=0.129$], GPAs [$F=.034$; $p=.967$] and pre-test scores [$F=0.266$; $p<.05$; $p=0.767$]. Accordingly, it could be stated that the students have similar characteristics in terms of all of these criteria.

In conclusion, it was determined that the characteristics of the students assigned to the experiment-I, experiment-II and control groups did not differ significantly with respect to the frequency of using SNSs, the TPM and STMI courses achievement scores, GPAs and pre-test scores. Thus, it could be stated that it was randomly attained when forming the experiment and control groups.

Data collection instruments

Two types of data collection instruments were used to collect the data. The first type, the initial information form, was used to determine which students would be assigned to what groups. The second type was an achievement test developed by the researchers in line with the objectives of the "Project-based Learning, Case Study Method and Programmed Instruction" units of the "Special Teaching Methods II" course. Also, validity and reliability calculations of the test were made.

The achievement test was used for two purposes: as a pre-test in order to determine the students' prior knowledge before beginning the experiment and as post-test in order to determine the learned behaviours of the students after completing the experiment. Before beginning this study, an achievement test consisting of 51 questions was prepared. In order to determine the content validity of the test, the views of six experts were taken into consideration. The experts evaluated the suitability of the test in terms of language, assessment and evaluation principles, content and acquisition of the subjects, and distribution according to the subject and student characteristics. After receiving the feedback and suggestions from the experts, a test containing 44 questions was prepared. All of the questions were multiple-choice questions and the score value for each question was determined to be 1. In order to facilitate the data collection process, the questions were uploaded to an online questionnaire system. As a result of the behaviour analysis performed, which benefitted from expert opinions, a table of specifications for the questions also was formed.

In order to evaluate the validity and reliability of the achievement test, a pilot study was conducted. The pilot study was administered to 190 students in CEIT departments at different universities. All of these students had previously taken STMI and STMII courses. Two of the completed tests were considered invalid. As such, the validity and reliability tests were carried out on the remaining 188 tests. Within the scope of the pilot study, the students came from five universities, namely Kırşehir Ahi Evran University (N=20), İnönü University (N=26), Erzincan University (N=22), Karadeniz Technical University (N=27) and Fırat University (N=93), due to students having an opportunity to use the Internet lab needed for the implementation of the online achievement test and the convenience for the researchers to access these universities.

After the tests were completed, the obtained data were subjected to an item analysis. Four items with discrimination indexes equal to or lower than .19 were removed from the test, whereas four items were not removed from the test in order to avoid breaking the content validity of the test and they were reassessed along with those items with discrimination indexes between .20 and .29.

On the test, the item difficulty ranged between .23 and .78. Accordingly, it can be stated that both difficult and easy items were present on the test. The average difficulty of the test was determined to be .53. When a test has an average difficulty index of .50, the test is considered to be of

medium difficulty. In order to calculate the reliability of the internal consistency of the test, the Kuder Richardson-20 (KR-20) value was calculated. The reliability coefficient and standard deviation of the test were found to be .78 and 6.08, respectively. These analyses showed that the achievement test developed was reliable. The initial information form was created to be used in cluster analysis and to obtain more detailed information about students. In addition, Fırat University Student Affairs Automation was used to obtain students' course achievement scores and GPAs. **Implementation process**

Before the study was implemented, 14 weeks of preparatory work was carried out. During the preparation process, the instructional content was determined and then a table of specifications was created in order to establish content validity. Next, the appropriate platforms were chosen and designed for the implementation process and the students were enrolled in these platforms. After that, an achievement test was developed and its pilot study, validity and reliability analyses were carried out. Finally, orientation training was provided to the students for three weeks during their 'Learning Content Management Systems' course. During the orientation training, the students were given information about how to use the social networking site and learning management system used in the study. Presentations and resources were developed by the researcher and shared with the students within the three weeks for a total orientation time of over 12 hours.

It was decided to use Ning for the social networking activities and CourseSites by Blackboard as the LMS. Ning is a social networking site used for educational purposes (Figure 1) and was preferred due to its ability to provide a special area for the course that allowed for the processing of activities. Although commercial SNSs are popular, SNSs that contain educational activities provide instructors with opportunities to form a strong communal feeling among the learners and foster the building [of] a new knowledgeable and cooperative mindset that shall be a leader for personal interactions (New Media Consortium and ELI, 2007). CourseSites is a free software to be used with distance learning courses. It provides an easy communication tool for the students and instructors via chatting platforms. It also provides free virtual classroom support, which makes it possible to use the system in the students' native language.



Figure 1. Ning homepage

The study was carried out over a four week period. In the traditional face-to-face environment, lectures were used. Presentations, which were prepared by the first author of the study, about problem-based learning, the case study method and programmed instructions were used during

the teaching process. The researchers also tried to ensure the active participation of the students by asking questions about the topics. The face-to-face lectures were given for three hours per week.

In the distance learning environment, CourseSites' videoconference technology was used for the synchronous audio and video transmission of the course. The course was transmitted once a week for three hours. The transmission time was determined before the course occurred and announced to the students. The first author presented the course using a videoconference. Student participation was ensured due to the designated chat area. In addition, the students were given permission to use the whiteboard, use camera or audio and share links and documents during the course. CourseSites was also used to distribute the course documents; improve the learner-learner, learner-instructor and learner-content interaction via the discussion boards, forums and e-mail interactions; and increase student participation using the learning activities and assignments.

In the social network supported distance education, the students participated in the distance education course and also used the social networking site synchronously and asynchronously for four weeks. In the social networking process, the students were asked to edit their profiles; share documents, pictures and links on the topic of the week; use the network's blog, wiki and notes functions; participate in and create discussions; and complete the course tasks and assignments given by the researcher.

In an attempt to create a sense of community among the students, they were encouraged to personalize their profile page. In addition, the students were asked to participate in weekly reading activities and discussions on the SNS. The researcher followed these events, and if necessary, gave feedback immediately.

Analysis of the data

In the analysis of the data obtained from the pilot study, evaluations of the item difficulty; discrimination indexes of the test items; standard deviation, variance, mean, median and average difficulty of the test; and KR-20 reliability coefficient were conducted. The following statistical processes were performed in order to examine the research data: frequency, percentage, arithmetic mean, standard deviation, independent sample t-test, paired sample t-test and one-way ANOVA. Also, a one-sample Kolmogorov-Smirnov Z test (K-S test) was used in order to determine whether the distribution of the all data was normal. It was determined that the distribution of the data were normal.

Findings

Findings related to pre-test and post-test scores

According to the K-S test used to establish whether the pre-tests and post-tests of the students showed a normal distribution, it was determined that the experiment-I pre-test ($K=.511$, $p=.957$) and post-test ($K=1.079$, $p=.195$), experiment-II pre-test ($K=.751$, $p=.626$) and post-test ($K=.555$, $p=.917$), and control group pre-test ($K=.689$, $p=.730$) and post-test ($K=.481$, $p=.975$) showed normal distribution. Accordingly, when comparing the pre-test and post-test scores, it was decided to use paired sample t-test.

Table 3: Results of paired sample t-test on pretest and posttest scores

Groups		N	SD	df	t	P
Experiment-I	Pretest	25	22.32	24	-2.405*	.024
	Posttest	25	25.40			

Experiment-II	Pretest	25	23.36	5.08	24	-6.057*	.000
	Posttest	25	29.48	4.44			
Control	Pretest	25	22.92	4.68	24	-4.703*	.000
	Posttest	25	27.44	4.87			

*p<.05

According to Table 3, – a significant difference was found to exist between the pre-test and post-test scores for the groups. While the pre-test arithmetic mean of experiment-I group was =22.32, the post-test arithmetic mean was calculated to be =25.40 [$t_{(24)}=-2.405$, $p=.024$]. Similarly, while the pre-test academic mean of the students' in experiment-II group was =23.36, it improved to =29.48 [$t_{(24)}=-6.057$, $p=.000$]. The arithmetic mean for the control group was calculated as =22.92 for the pre-test and =27.44 for the post-test [$t_{(24)}=-4.703$, $p=.000$]. Therefore, it appears that each group improved in regard to their post-test scores. As such, it appears that distance education, distance education supported by an SNS and traditional, face-to-face learning all had positive effects on the success rates of the students.

Findings related to the post-test scores

Table 4: Results of one way ANOVA on posttest scores

	Sum of Squares	df	Mean of Squares	F	p	Significant Difference
Between groups	208.080	2	104.040	3.160*	.048	Experiment-I- Experiment-II
Within groups	2370.400	72	32.922			
Total	2578.480	74				
Levene=2.606		p=.081				

*p<.05

When the data within Table 4 is analyzed, it shows that significant difference exist among the post-test scores [$F=3.160$; $p<.05$; $p=0.048$]. A Scheffe test was conducted in order to determine between which groups differences exist. As a result of the test, it was determined that the differences existed between the experiment-I and experiment-II groups and that the differences were in favour of the experiment-II group. This information revealed that the students who participated in distance education activities supported by the SNS ($=29.48$) were more successful than the students who merely participated in the distance education activities ($=25.40$). Therefore, it can be assumed that using distance education activities supported by SNSs improves the students' success rate more than only using distance education activities.

Findings related to gain scores

As stated above, the findings showed that significant differences existed among the post-test scores in favour of the experiment-II group. However, gain scores yield significant results on to what extent students' progress in a given period in terms of academic achievement. For this reason, the gain scores of the students in each of the three groups were evaluated by subtracting their pre-tests scores from their post-tests scores. The K-S test demonstrated that the achievement scores of the experimental-I ($K=.663$, $p=.771$), experimental-II ($K=.487$, $p=.972$) and control groups ($K=.933$, $p=.349$) were normally distributed. Therefore, a one-way ANOVA was used to compare the achievement scores of these three groups.

Table 5: Results of one way ANOVA on gain scores

	Sum of Squares	df	Mean of Squares	F	p
Between groups	115.627	2	57.813	1.935	.152

Within groups	2150.720	72	29.871		
Total	2266.347	74			
Levene=.321		p=.726			

Table 5 showed that no significant differences existed between the groups in terms of their achievement scores [F=1.935; p<.05; p=0.152]. However, instead of using the gain scores to conduct the evaluation, it was determined that using the arithmetic means of the gain scores would provide us with healthier results. In addition, as given in the analysis of the post-test scores of the groups above, it is beneficial to take into consideration the arithmetic means of the gain scores when a significant difference exists among the post-tests of the groups. Accordingly, the arithmetic means of the gain scores were calculated as =3.08 for experiment-I, =6.12 (S=5.05) for experiment-II and =4.52 (S=4.80) for the control. When the experiment-I, experiment-II and control groups were compared in terms of the arithmetic means of the gain scores, it was found that a difference exists in favour of experiment-II. This information shows that the academic achievement levels of the students in the experiment-II group improved more than the academic achievement levels of the students in the other groups. Therefore, it can be assumed that using distance education and SNSs together improves the likelihood of student success more than using only distance education or face-to-face learning environments.

Findings related to the knowledge-level post-test scores

The K-S test indicated that the experiment-I (K=.831, p=.494), experiment-II (K=.603, p=.860) and control groups' (K=.567, p=.905) knowledge-level post-test scores showed a normal distribution. As such, in order to determine the knowledge-level post-test scores of each of the groups, a one-way ANOVA was performed.

Table 6: Results of one way ANOVA on knowledge-level posttest scores

	Sum of Squares	df	Mean of Squares	F	p	Significant Difference
Between groups	96.320	2	48.160	5.560*	.006	Experiment-I- Experiment-II
Within groups	623.600	72	8.661			
Total	719.920	74				
Levene=3.930		p=.240				

*p<.05

As can be seen by Table 6, a significant difference existed among the cognitive domain's knowledge-level post-tests scores [F=5.560; p<.05; p=0.006]. In order to determine between which groups a difference existed, the Scheffe test was conducted. The results showed that the difference existed between the experiment-I and experiment-II groups and was in favour of the experiment-II group. This information showed that the students who participated in distance education activities supported by a SNS (=14.32) were more successful than the students who participated in only the distance education activities (=11.60) in terms of the information level questions in the achievement test. According to this information, it can be assumed that distance education activities supported by SNSs are more effective than only using distance education activities in terms of improving behaviours in the knowledge level of the cognitive domain.

Findings related to the comprehension-level post-test scores

According to the K-S test, the experiment-I (K=1.065, p=.207), experiment-II (K=.743, p=.639) and control groups' (K=.743, p=.639) comprehension-level post-test scores showed a normal distribution. Accordingly, a one-way ANOVA was used to compare the comprehension-level post-test scores.

Table 7: Results of one way ANOVA on comprehension-level posttest scores

	Sum of Squares	df	Mean of Squares	F	P
Between groups	18.747	2	9.373	1.214	.303
Within groups	556.000	72	7.722		
Total	574.747	74			
Levene=1.640		p=.201			

According to the data presented in Table 7, no significant differences existed among the post-tests scores of the groups in terms of the comprehension level of the cognitive domain [F=1.214; $p < .05$; $p = 0.303$]. Therefore, it can be assumed that distance education activities supported by SNSs, distance education activities and face-to-face learning environments have the same effect on the students' ability to gain behaviours at the comprehension level of the cognitive domain.

In addition, analyzing the pre-test and post-test scores in terms of the knowledge and conception level achievement scores of each of the three groups in the cognitive domain might be beneficial in terms of determining the effect of the performed activities. For that purpose, a paired sample t-test was performed.

Table 8: Results of paired samples t-test on knowledge and comprehension levels pretest and posttest scores

Groups	N		SD	df	t	p
Experiment-I Group (Knowledge)						
Pretest	25	10.120	2.3151	24	-2.310*	.030
Posttest	25	11.600	3.7305			
Experiment-I Group (Comprehension)						
Pretest	25	10.120	3.1927	24	-1.622	.118
Posttest	25	11.120	3.4559			
Experiment-II Group (Knowledge)						
Pretest	25	11.680	2.6096	24	-5.431*	.000
Posttest	25	14.320	2,0960			
Experiment-II Group (Comprehension)						
Pretest	25	10.000	2.7537	24	-3.601*	.001
Posttest	25	12.200	2.5000			
Control Group (Knowledge)						
Pretest	25	11.520	1.8956	24	-3.792*	.001
Posttest	25	13.440	2.7700			
Control Group (Comprehension)						
Pretest	25	9.440	2.9450	24	-2.344*	.028
Posttest	25	11.160	2.2301			

* $p < .05$

Based on the data in Table 8, it can be seen that the groups are differentiated in terms of the knowledge-level expressed in the pre-tests and post-tests. With regard to this finding, it could be concluded that practices performed as part of the study in all the three groups were influential in the acquisition of behaviours belonging to the knowledge level of the cognitive domain. When the pre-test and post-test scores of the conception level were analyzed, it can be seen that the experiment-II and control groups were differentiated in terms of the pre-test and post-test results, but that the pre-test and post-tests results of the experiment-I group were not differentiated from each other. Therefore, it could be concluded that distance education with social network support and face-to-face learning are influential in the acquisition of behaviours

belonging to the comprehension level of the cognitive domain, whereas only distance education practices are not.

Results and discussion

In this study, it was determined that distance education activities supported by SNSs and face-to-face learning environments had positive impacts on student achievement. In addition, it was determined that distance education activities supported by SNSs were more influential on student achievement than distance education activities that were not supported by SNSs. Moreover, it was determined, through comparisons made among the research groups following the activities that significant differences did not emerge between the groups' achievement scores. However, when the achievement scores' arithmetic means were taken into consideration, it was observed that distance education activities supported by SNSs improved student achievement more than the other options. This finding has not been shown in previous studies (Feuer, 2009). However, previous research has indicated that students will achieve more successful when their distance education activities (Despotovic-Zrakic, 2011) are connected to web communities (DeSchryver et al., 2009). In addition, it can be seen that distance education activities supported by SNSs and face-to-face learning environments were not differentiated from each other in terms of improvements in regard to the students' success. The above results indicate that using SNSs in distance education can improve the success of the students. Additionally, it was noteworthy that no differentiation existed between the distance education activities and face-to-face learning environments in terms of improving the success of the students. This situation strongly represents the positive effects on distance education activities.

When comparing the results from the three groups, it was determined that the activities undertaken by the groups during the study were effective in regard to acquisition of behaviours at the knowledge level of the cognitive domain, but that the distance education applications that were supported by SNSs were more influential than those distance education applications not supported by SNSs. However, it cannot be said that face-to-face learning environments, distance education activities supported by SNSs and distance education activities are similar or that one is better than the other in terms of developing behaviours at the comprehension level of the cognitive domain. Instead, the results showed that the distance education activities supported by SNSs and face-to-face learning environments were more effective than distance education activities not supported by SNSs in terms of acquisition of behaviours at the comprehension level of the cognitive domain.

When the study's findings are evaluated, it can be seen that supporting LMSs with SNSs is important in terms of utilizing the advantages of both technologies. The results indicated that LMSs developed using the properties of SNSs provide greater advantages in regard to facilitating learning (Cuéllar, Delgado & Pegalajar, 2011). It has been emphasized that supporting LMSs used frequently by universities with popular SNSs would significantly improve student learning (Petrovic et al., 2014; Razali et al., 2013; Iahad et al., 2012; Despotovic-Zrakic, 2011; Brady, Holcomb & Smith, 2010; Holcomb, Brady & Smith, 2010; Smith, 2009; Noesgaard, 2008). For this reason, the utilization of these two applications by which LMSs are supported by SNSs, especially at higher education institutions, is regarded as important to increasing the learners' achievement in distance education.

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