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Using Social Networking Sites for Teaching and Learning: Students' Involvement in and Acceptance of Facebook® as a Course Management System

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Abstract

This study investigates students' involvement in Facebook® as a course management system (CMS), Facebook acceptance, and the relationships between the two. The study used Facebook as a CMS in two freshman courses and employed mixed method as part of an action-research approach. Forty-two students participated in the study, and 12 of those students were selected for face-to-face interviews through maximum variation sampling. Quantitative data were collected through questionnaires and course Facebook page logs. Qualitative data were collected through the interviews. The quantitative data analysis consisted of descriptive statistics and correlation analyses. The findings indicate that the relationships between course Facebook page involvement and Facebook acceptance differed according to the course. The findings support that Facebook as a CMS has the potential to increase student involvement in discussions and out-of-class communication among instructors and students.

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Social networking sites (SNSs) such as Facebook® and Myspace® have become popular among students of all ages (Acquisti & Gross, 2006; Ajjan & Hartshorne, 2008; Cain, 2008; Deng & Tavares, 2013; Farmer, Bruckner, Cook, & Hearing, 2009; Hew & Cheung, 2012; Subrahmanyam, Reich, Waechter, & Espinoza, 2008), and they can provide workspaces to facilitate information sharing, communication, and social interaction among students and instructors (Bowman & Akcaoglu, 2014; Deng & Tavares, 2013; Jong, Lai, Hsia, Lin, & Liao, 2014; Junco, 2012; Khan, Wohn, & Ellison, 2014; Lampe, Wohn, Vitak, Ellison, & Wash, 2011; Pérez, Araiza, & Doerfer, 2013; Wang, Woo, Quek, Yang, & Liu, 2012; Wu, Hou, Hwang, & Liu, 2013). Researchers and academics are increasingly interested in the role of technology and SNSs in higher education (Boyd & Ellison, 2007; Hew, 2011; Junco, 2012). Dunlap and Lowenthal (2009) pointed out the importance of social process of learning, and how we can employ SNSs to provide space and opportunities for teaching and learning. As indicated by Carosu and Salaway (2008), the extent of adoption and perception of SNSs in academic purposes is not readily known, however.

Astin's Theory of Involvement

Another widely studied research area in higher education is student involvement (Sharkness & DeAngelo, 2011). According to Astin's theory (1984) of involvement, students learn more when they are involved in both the academic and social aspects of the educational experience. Astin defines student involvement as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 297) and declares that the quality and quantity of student involvement will influence the amount of student learning. He maintains that to achieve maximum student involvement and learning, instructors must be aware of how much time and energy they are devoting to the learning process.

Course Management Systems

To increase involvement in required out-of-class activities, a course management system (CMS) such as Moodle™ or Blackboard Mobile™ Learn can be used as a supplement to the traditional classroom curriculum; for example, as an electronic repository for course materials (Vovides, Sanchez-Alonso,

Mitropoulou, & Nickmand, 2007) and to present information, manage course materials, and collect and evaluate students' work (Deng & Tavares, 2013; Dutta, Roy, & Seetharaman, 2013; Escobar-Rodriguez & Monge-Lozano, 2012).

Some problems do exist with CMSs. Deng and Tavares (2013) indicate that one of the barriers limiting CMS use at universities is that students do not like the interface for navigation on Moodle and find it difficult to use. Moreover, Conde, García, Rodríguez-Conde, Alier, and García-Holgado (2014) state that learning is a lifelong process and CMSs limit students' learning to a specific period of time or a course. Therefore, there is a need for a nonformal environment that can be used for both institutional and personal purposes in the teaching and learning processes (Conde et al., 2014). SNSs such as Facebook, which are already part of most students' daily lives and do not limit learning to a specific period or course, may be a better option than CMSs. To determine whether using Facebook can solve the above problems of CMSs, there is a need to examine student involvement in Facebook as a CMS.

Communicative and interactive features do exist on CMSs, but they are mostly unused (Kvavik, Caruso, & Morgan, 2004; Malikowski, Steven, Thompson, & Theis, 2007; Martinho, Almeida, & Teixeira-Dias, 2014; Morgan, 2003; Yueh & Hsu, 2008). Bowman and Akcaoglu (2014) state that students do not use CMSs to communicate with their instructor and peers. Similarly, the results of Deng and Tavares (2013) show that students use Moodle to share resources rather than to interact. Moreover, for course-associated interactions such as discussion and chatting, students prefer Facebook to CMSs (Jong et al., 2014). It is true that CMSs tend to be more focused, lack personal interaction, and have less networking capacity than SNSs do (Brady, Holcomb, & Smith, 2010; Chen & Bryer, 2012), and thus, even if students and instructors use SNSs, some may not be willing to use a CMS (Dutton, Cheong, & Park, 2004) or they may think a CMS offers no opportunities for communication (Mazman & Usluel, 2010). Information systems (ISs) such as CMSs cannot be effective if they are not used (Mathieson, 1991); therefore, to determine whether an SNS would increase student engagement and extend learning beyond the boundaries of the classroom, the current study used Facebook as a CMS in two face-to-face (F2F) first-year university courses.

Researchers have conducted numerous studies to determine factors that influence SNS use, how students use SNSs, and other social uses of Facebook specifically. The majority of these studies, however, focus on usage differences between SNSs. Their involvement in and usage for academic purposes, and the relationship between students' SNS acceptance and SNS involvement in learning and teaching have not been studied (Bosch, 2009; Chen & Bryer, 2012). The current study aims to fill this gap.

Technology Acceptance Model and Theory of Planned Behavior

Many researchers explore how to predict and explain user behavior towards new technology with existing and new models and theories for technology acceptance (Cornell, Eining, & Hu, 2011; Escobar-Rodriguez & Monge-Lozano, 2012). Davis' (1989) Technology Acceptance Model (TAM) is one of the most powerful models for examining new technology acceptance (Ammenwerth, Iller, & Mahler, 2006; Chen, Sivo, Seilhamer, & Sugar, 2013; Fetscherin & Latteman, 2008; Gefen & Straub, 1997; Kültür, 2009; Lee, Kozar, & Larsen, 2003; Rosen & Sherman, 2006; Shen & Eder, 2008; Šumak, Hericko, & Pušnik, 2011). Teo (2012) explains that Ajzen's (1991) Theory of Planned Behavior (TPB) predicts a variety of intentions and behaviors and is an extension of Ajzen and Fishbein's Theory of Reasoned Actions (1980).

According to Davis' TAM, user acceptance of information technology is determined by two constructs: *perceived usefulness* and *perceived ease of use* (Davis, 1989; Lee et al., 2003; Quin, Kim, Tan, & Hsu, 2009; Rosen & Sherman, 2006). The former is defined as "the degree to which a person believes that using a particular system would enhance his/her job performance" (Davis, 1989, p. 320). Thus, technology with high perceived usefulness indicates that users believe in the existence of a positive use—performance relationship (Davis, 1989). The latter refers to "the degree to which the prospective user expects the target system to be free of effort" (Davis, 1989, p. 320). Davis (1989) claims that if one application is perceived to be easier to use than another, it is the one more likely to be accepted.

The TPB includes more constructs than TAM: *attitude toward use, facilitating conditions, subjective norm*, and *behavioral intention to use* (Teo, 2012). Attitude toward use is defined as "one's positive or negative feelings about performing a behavior such as using technology" (Teo, 2012, p. 5). Facilitating conditions refers to "factors in the environment that shape a person's perception of ease or difficulty of performing a task" (Teo, 2012, p. 7). Subjective norm is defined as "A person's perception that most people who are important to him or her think he [or she] should or should not perform the behavior in question" (Teo, 2012, p. 6). Finally, behavioral intention to use is described as "The strength of one's intention to perform a specified behavior" (Fishbein & Ajzen, 1975, p. 288).

Research Questions

Astin's involvement theory, TAM, and TPB provided the theoretical bases for this study, and the following questions guided the research:

- What are students' levels of SNS involvement, Facebook acceptance, and course Facebook page involvement?

- Is there a relationship between students' Facebook acceptance (*perceived ease of use, perceived usefulness, attitude toward use, subjective norm*, and *behavioral intention to use*) and students' involvement with the course Facebook pages (*time spent, number/type of posts*)?

Method

Design of the Study

This study employed action research (AR) with a mixed-design methodology, using quantitative and qualitative approaches (Tashakkori & Teddlie, 1998). Researchers use AR to solve problems and improve their research practices (Bogdan & Biklen, 2007; Corey, 1954; Kemmis, 2007; Mckay & Marshall, 2002).

In order to increase students' out-of-class involvement and solve the problems of the utilization of communicative and interactive features of CMSs, researchers employed AR. Figure 1 presents the AR approach used in this study, where the possibility of finding a solution for a real-world problem might initiate and form research interest and questions. Through informed action and reflection, the researcher determines suitable problem-solving methods and conducts his or her research accordingly (Mckay & Marshall, 2002).

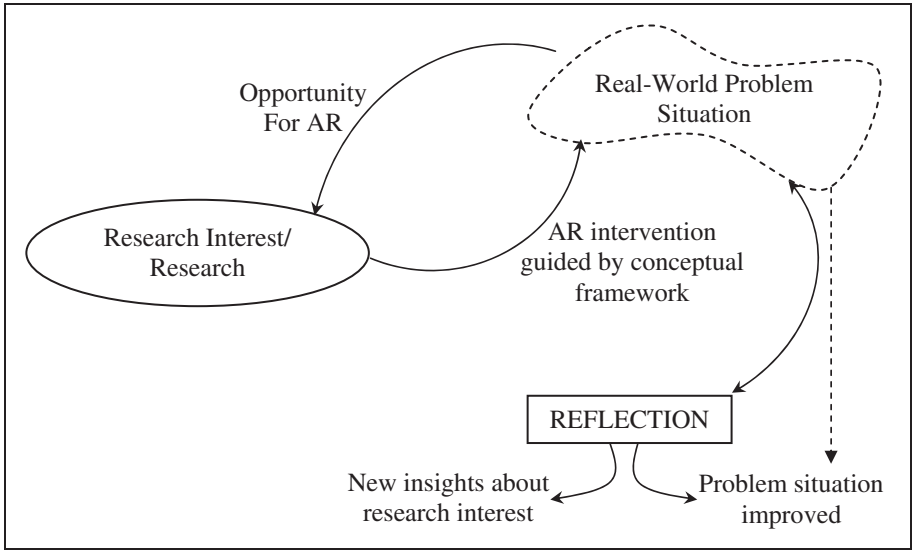

Figure 1. Approach to action research (Mckay & Marshall, 2002, p. 223).

For the mixed-method design used in this study, we analyzed the quantitative and qualitative data separately and compared and combined the findings for triangulation (Creswell & Plano-Clark, 2007).

Role of the Researcher

In the current study, one of the researchers was an insider. She has been an instructor since 1997 and has used CMSs such as Moodle, Blackboard, and METU Online (a CMS of Middle East Technical University in Ankara) as a student and as an instructor. Consistent with the literature (Kvavik et al., 2004; Mazman & Usluel, 2010; Morgan, 2003; Yueh & Hsu, 2008), as an instructor she observed that students did not use the communicative and interactive features of CMSs, which resulted in a lack of course involvement and interaction. To resolve this issue, she began to use Facebook, already in students' daily life and used mostly for communication purposes, as a CMS in her F2F courses.

Participants

Thirty-five first-year students from three sections of a private university's Introduction to Programming (IP) course and 29 first-year students from two sections of its Discrete Mathematics (DM) course participated in this study during the 2011 spring semester. Of the 64 students, 22 were enrolled in both classes, so only 42 students in total participated in the study. The courses were selected conveniently. The IP course encompassed 8 hours per week (4 hours of lectures and 4 hours of lab work), and the DM course involved 4 hours of lectures per week. In each course, 5% of a student's final grade was based on participation. In IP, the mark was based on in-class participation, and in DM, it was based on involvement in the course's Facebook pages. Through maximum variation sampling, 12 of the 42 students were selected for interviews to sample heterogeneity, maximize diversity relevant to student involvement in the course Facebook pages, and acquire a representative sample of participants. Table 1 presents the participant distribution according to the courses enrolled in.

Table 1. Distributions According to Enrolled Course(s).

Enrolled course	Participants	Interview participants
Only IP course	13	3
Only DM course	7	3
IP and DM courses	22	6
Total	42	12

Note. IP = introduction to programming; DM = discrete mathematics.

Data Collection and Instruments

Quantitative data were collected in three ways: from a demographic information and Facebook acceptance questionnaire, an involvement questionnaire, and course Facebook page logs toward the end of the study. The first questionnaire included 24 items: 7 were demographic questions (adapted from Kord, 2008; Kültür, 2009) and 17 were 5-point Likert-type items (adapted from Teo, 2012), measuring participants' Facebook acceptance levels about perceived usefulness (three items), perceived ease of use (three items), attitudes toward using (four items), facilitating conditions (three items), subjective norms (two items), and behavioral intention to use (two items). The internal consistencies in terms of Cronbach's alphas for these items were .83, .90, .87, .82, .80, and .70, respectively, and acceptable.

The second questionnaire, adapted from Kord (2008) and Astin (1984), aimed to determined participants' involvement in SNSs and course Facebook pages. For SNS involvement, its 22 questions included two yes/no questions, four open-ended questions, and six Likert-type items. For course Facebook page involvement, it included one yes/no question, four open-ended questions, and five Likert-type items. Students' course Facebook logs were also quantified to determine involvement through the number of comments, likes, shared videos, shared documents, discussions, and instructor's discussion posts.

Qualitative data were collected through 12 semistructured, F2F individual interviews with students with different levels of Facebook acceptance and involvement. The interview protocol was developed in accordance with the research questions and related literature (Kord, 2008; Kültür, 2009). Five instructional technology experts checked the questions for clarity and context specificity. After revisions, to determine whether the questions were clear and to test whether the desired depth of qualitative data could be collected, the protocol was piloted with 35 fourth-year students who used Facebook as a CMS in a Data Analysis course during the fall 2010 semester. The results indicated the questions were suitable for collecting qualitative data. The interview protocol was then reviewed by an expert in qualitative research. Based on that feedback, four more questions were added to allow more in-depth investigation. The final interview protocol was piloted with two students who had participated in the first pilot. After the second pilot, two more questions about CMS utilization were added. After all revisions, the protocol consisted of 29 questions investigating how students use SNSs (eight questions), use SNSs as a CMS (eight questions), use Moodle and Facebook as CMSs in an F2F course (nine questions), and how they compare courses that did not use a CMS with courses that did (four questions). The interviews (recorded with permission) were conducted at the end of the study. Each interview took approximately 20 minutes.

Data Analysis

We analyzed the quantitative data gathered through questionnaires and student logs using descriptive statistics and correlation analyses. We subjected the interview data to content analysis, identifying meaningful units based on the research questions and assigning descriptive (or thematic) codes to each unit. We then grouped the units into the categories of *Facebook involvement* and *Facebook acceptance* to identify the main themes in the interview data. All interview data were reexamined and restructured according to the specified themes. *Frequency of use* and *type of posts* were the main coding categories for *Facebook involvement*, and *attitude toward use, perceived usefulness, satisfaction*, and *Facebook versus course page Facebook acceptance* were the main categories for *Facebook acceptance*. The coded data were presented in relation to the results of the questionnaire data. The general trends identified in the questionnaire responses were explored in more detail within the context of the data provided by the interviewees. Intercoder reliability of the interviews was performed by a peer with coding experience, calculated using Miles and Huberman's (1994) formula, and deemed acceptable at .73.

Using Facebook as a CMS

During the course introduction, the instructor explained the course Facebook pages (which she had created prior to the semester) and the aim of using Facebook as a CMS. In the following 2 weeks, she reminded students to enroll on the Facebook pages to follow the activities necessary to complete outside the classroom. She used Facebook's *Info, Notification, Wall, Event*, and *Discussion* features for the course pages. The Info page gave general information about the course. Notifications helped follow students' activities and provide feedback to students. Course-related activities and examinations were announced using the Event feature, and the Discussion feature was used for discussing topics. The instructor used the Wall and Discussion features most frequently, aiming to increase students' interest and interaction and to share resources and announcements.

Results

We present the study results in the order of the research questions, with the quantitative and qualitative data for each part presented together. We provide the interview results in line with the general patterns that emerged. The findings for each course are provided separately because the participation marks differ.

Students' SNS Involvement, Facebook Acceptance, and Course Facebook Page Involvement Levels

SNS involvement. According to the questionnaire, 92.9% ($N = 39$) of participants were involved in SNSs. All participants who used SNSs indicated that Facebook was the most popular 95.2% and preferred SNS; the interview results confirm that interviewees did not vary much in their views about Facebook's popularity. All interviewees reported that they used Facebook and half the interviewees declared that they also used Twitter™. One interviewee declared that he uses more than three SNSs, including Facebook and Twitter. All interviewees indicated that they used Facebook more than any other SNS. The results showed that participants mostly used SNSs to stay connected with new and old friends. Participants' online friends averaged 315.

Facebook acceptance

Students Facebook acceptances were measured through 5-point Likert type items adopted from the theory of planned behavior items. The descriptive statistics for each item are presented in Table 2.

Overall mean scores and percentages for Facebook acceptance variables for the DM and IP courses are presented in Table 3. The overall mean of participants was at the agreed level on *perceived ease of use, facilitating conditions*, and *behavioral intention to use*, while the means were neutral on *perceived usefulness, attitudes toward use*, and *subjective norms*. Facebook acceptance of overall participants in DM and IP were similar except for the *facilitating condition* scale, where the mean score for IP is at the neutral level while that of DM was at the agreed level. The overall means ranged between 3.09 and 3.89 in DM and between 2.92 and 3.82 in IP. The lowest mean scores were for perceived usefulness ($M = 3.20$, $M = 2.92$) and subjective norm ($M = 3.09$, $M = 2.97$) in DM and IP, respectively. Technology acceptance variables were rank ordered and the Mann–Whitney *U*-test was used to compare the ranks for $n = 29$ students in DM and $n = 35$ in IP. The results indicate no significant difference between courses (see Table 3).

The interviews indicate different findings than the quantitative results for Facebook usefulness. Facebook was declared useful by all interviewees except one, who only started using Facebook with the DM course. However, that student did note that the Facebook course page was useful. All other interviewees claimed that Facebook is a new useful means of online communication that helps them stay in touch with their friends, particularly high school classmates.

> R1: I found my secondary school friend with the help of Facebook; it is a different communication environment to "see" each other in. It is useful in that sense.

Table 2. Descriptive Statistics of Facebook Acceptance Items.

Facebook acceptance scales	Items	DM, $N = 29$		IP, $N = 35$	
		M	*SD*	*M*	*SD*
Perceived usefulness	Using Facebook improves my work	2.97	0.91	2.71	0.96
	Using Facebook enhances my effectiveness	3.34	0.94	3.00	1.06
	Using Facebook increases my productivity	3.28	0.92	3.06	0.97
Perceived ease of use	My interaction with Facebook is clear and understandable	3.66	1.01	3.66	1.03
	I find it easy to get Facebook to do what I want it to do.	3.69	0.93	3.56	1.08
	I find Facebook easy to use	4.31	0.85	4.29	0.89
Attitudes toward use	Facebook makes life more interesting	3.52	0.99	3.43	1.10
	Working with Facebook is fun	3.41	1.02	3.43	1.07
	I like using Facebook	3.52	1.27	3.46	1.36
	I look forward to those aspects of my life that require me to use Facebook	3.07	0.75	3.09	0.89
Facilitating conditions	When I need to help to use Facebook, guidance is available to me.	3.52	0.79	3.29	0.75
	When I need to use Facebook, a specialized instruction is available to me.	3.66	0.86	3.49	0.78
	When I need to use Facebook, a specific person is available to provide assistance.	3.48	1.12	3.31	0.96
Subjective norm	People whose opinions I value encourage me to use Facebook.	3.03	0.94	2.91	0.98
	People who are important to me support me to use Facebook	3.14	1.19	3.03	1.10
Behavioral intention to use	I will use Facebook in the future.	3.97	0.94	3.86	0.97
	I plan to use Facebook often.	3.17	1.17	3.31	1.05

Note. IP = introduction to programming; DM = discrete mathematics.

Table 3. Descriptive Statistics for Facebook Acceptance.

		DM, $N = 29$		IP, $N = 35$		Mann–Whitney *U*-test	
	Number of items	*M*	*SD*	*M*	*SD*	*U*	Exact Sig (2-tailed)
Perceived usefulness	3	3.20	0.79	2.92	0.90	442.50	.38
Perceived ease of use	3	3.89	0.79	3.82	0.87	483.50	.90
Attitude toward use	4	3.38	0.87	3.35	0.95	494.50	.86
Facilitating conditions	3	3.55	0.79	3.36	0.70	438.00	.35
Subjective norm	2	3.09	0.97	2.97	0.95	465.50	.58
Behavioral intention to use	2	3.57	0.89	3.59	0.91	496.00	.88

Note. IP = introduction to programming; DM = discrete mathematics.

> R4: In terms of communication, Facebook is quite useful for me . . . Normally, in real life I am not as social as on Facebook. I feel more comfortable and I share more things on Facebook.
> R5: Facebook is different than phones; you can communicate with many people at the same time. In real life, it is difficult to get together with that many people.

All interviewees noted the usefulness of the course Facebook pages regarding:

- communication with the instructor, classmates, and students in different course sections,
- clarifying class topics,
- increasing their interest, and
- making them more active.

The following quotations illustrate the students' perspectives about the usefulness of course Facebook pages:

> R1: Without the course Facebook discussions, if we discussed the chessboard example in the lecture, most probably no one would understand it. I believe that with the visual aids on Facebook and the discussion questions, it was more meaningful . . . I believe that the course Facebook page was helpful for us . . . Some of my friends who were not interested in the course [at the beginning], liked, followed, and

viewed some shared resources. I saw them getting involved in the activities on the course Facebook page.
R2: With the help of the course Facebook page, I found friends from other sections and formed my project group members for the information technology course. The course Facebook page was helpful for getting to know people in your department.
R6: Following discussions helped me a lot.

As presented in Table 3, perceived ease of use mean scores ($M = 3.89$ in DM and $M = 3.82$ in IP) were the highest of all the variables of Facebook acceptance. The findings show that 65.5% of students in DM and 67.3% of students in IP agreed or strongly agreed that Facebook was easy to use. Only 9.2% of students in DM and 12.5% of students in IP did not find Facebook easy to use.

The overall mean score for *attitude toward use* was $M = 3.38$ in DM and $M = 3.35$ in IP. A big portion of students (43.1% in DM and 31.4% in IP) were neutral about their attitudes toward Facebook use. Similarly, the *facilitating conditions* findings ($M = 3.55$ in DM and $M = 3.36$ in IP) show that 40.2% students in DM and 41% students in IP were neutral about that variable.

The interview results support the quantitative results. Interviewees liked using Facebook and liked the course Facebook pages. Seven interviewees out of 12 claimed that they used Facebook for fun. They declared their interest in the course was positively affected by using Facebook for it. Six interviewees stated that some of their friends who were not interested in the course but had to take it became interested because of their interest in Facebook.

R1: When you were searching for an answer to a discussion question on Face, you would come across another question ... and then it would lead another one ... Sometimes you saw the connection with other course subjects and understood the relationship between subjects, which increased your interest in the course ...
R11: Since everyone was [already] on Face, our interest in the course increased.
R12: All of us are on Facebook, therefore the course Facebook page attracts more interest.

Interviewees were asked what motivated them to use Facebook, and the findings show that extrinsic motivation related to subjective norms was the major dimension of motivation.

R8: My close friend suggested ...; He always mentions Facebook.; [He is] always talking about the things that he saw and did on Facebook ...
R9: In general, due to my friends' usage [of it] and its popularity, I joined Facebook ...
R12: I opened a Facebook account for a discrete mathematics course in the previous semester. Actually, I only had an account because you wanted to use Facebook as a CMS in that course.

Table 4. Course Facebook Involvement Variables.

Facebook involvement variables	DM course ($N = 29$)			IP course ($N = 35$)		
	Range	*M*	*SD*	Range	*M*	*SD*
Course SNSs currently belonging to	0–15	2.29	2.57	0–15	2.27	2.56
Time spent per day (in minutes)	2–180	50.89	50.53	10–180	49.41	47.63
Number of likes	0–16	3.72	5.18	0–1	0.09	0.28
Number of posts (Video or PDF)	0–14	2.38	3.28	0–3	0.11	0.53
Number of comments	0–21	3.62	5.16	0–0	0.00	0.00
Number of discussion comments	0–13	1.52	2.75	0–8	0.37	1.50
Number of discussions involved in	0–6	0.79	1.32	0–2	0.11	0.40

Note. IP = introduction to programming; DM = discrete mathematics; SNS = social networking sites.

Regarding *behavioral intention to use*, more than half of students in both courses agreed or strongly agreed ($M = 3.57$ for DM and $M = 3.59$ for IP) that they used Facebook often and will continue to use it.

Course Facebook involvement

The data on the course Facebook involvement variables demonstrate that participants' involvement in the IP and DM Facebook pages were similar and took a considerable amount of time (see Table 4). Students spent an average of 49.41 minutes daily on Facebook for IP and 50.89 minutes for DM. This finding shows that the time commitment to the course Facebook pages was greater than the time students would spend attending classes per week if enrolled in a four-credit course. The number of discussion comments and the discussions students were involved in on both courses' Facebook pages were limited, however.

The topics and number of discussion posts per course (including the instructor's introductory message) are presented in Tables 5 and 6. The number of discussions opened by the instructor was fewer in IP ($f = 4$) than that in DM ($f = 6$) due to the lack of student participation. The total number of discussion subjects in DM ($f = 10$) was higher than in IP ($f = 5$). The number of responses on course Facebook pages differed according to the course. Participants were more active and involved in the DM discussions than in the IP ones.

Table 7 presents the descriptive statistics of the most-used and most-helpful parts of the course Facebook pages according to students' responses to the

Table 5. Discussion Subjects and Response Details of the DM Course.

Initiator	Discussion subject	Number of students involved	Number of posts by	
			Student	Instructor
Instructor	Propositional functions	3	4	2
	Logic	5	8	4
	Proofs and their uses	1	2	1
	Graph theory	2	4	4
	Full binary and spanning trees	2	12	1
	Why we learn discrete math	4	6	1
Student	Matrix	1	1	0
	Graph theory	1	5	0
	Algorithms	5	6	0
	Course Facebook page	2	2	1

Note. DM = discrete mathematics.

Table 6. Discussion Subjects and Response Details of the IP Course.

Initiator	Discussion subject	Number of students involved	Number of posts by	
			Student	Instructor
Instructor	Identifiers in C	0	0	1
	Helping a new programmer	1	5	1
	Call by reference and value	0	0	1
	Conditional statements	1	1	2
Student	Arrays	2	7	2

Note. IP = introduction to programming.

involvement questionnaire. Bold values in Table 7 represent the maximum percentages in the corresponding rows. Wall posts were deemed the most-used feature on both course pages, and Wall posts and Discussions were rated the most-helpful features of the course Facebook pages.

On the course Facebook pages, the Wall contained resources such as videos, document links, and web pages related to course topics. In the interviews, sharing and viewing videos, documents, and discussions were also referred to as the most-used and most-valued features of the course Facebook pages.

Table 7. Most-Used and Most-Helpful Parts.

$N = 28$ for DM $N = 31$ for IP	Course	Missing (%)	Discussions (%)	Wall post (%)	Events (%)	Other (%)
Which part of the course Facebook pages did you use most? (Check one)	DM	0.0	32.1	**50.0**	17.9	0.0
	IP	3.2	25.8	**54.8**	16.1	0.0
Which part of the course Facebook pages was most helpful for you? (Check one)	DM	0.0	**46.4**	**46.4**	7.1	0.0
	IP	0.0	41.9	**48.4**	9.7	0.0

Note. IP = introduction to programming; DM = discrete mathematics.
Bold values in the table represent the maximum percentages in the corresponding rows.

Activities involved in and types of posts are important reference points for defining the level of Facebook involvement, whether in one's personal profile or in the course pages. Sharing photos, which students do frequently on their personal Facebook pages, was not done at all on the course Facebook page. The following quotations illustrate students' views about the most-used and most-helpful part of course Facebook pages:

> R1: We shared videos related to course subjects. Those videos can be helpful for a student who did not ... concentrate on the lecture. Those videos make the subject understandable for them with visual aids like graphics, such as the $K_{3,3}$ chessboard discussion example. None of us could have understood the subject if we had discussed it in the lecture.
> R5: I believe the videos and discussions shared on the course Facebook page, parallel to the lecture notes, were useful with regular and active participation.
> R4: For example, in the DM course, if I have problems with a problem or a subject, I can solve the problem or understand the subject by viewing the shared video on the course Facebook page.

Relationships Between Facebook Acceptance and Course Facebook Involvement

The correlations between Facebook acceptance and course Facebook involvement in DM and IP were different. For DM, the findings indicate a significant correlation between Facebook acceptance and involvement for *perceived usefulness* and *number of likes* ($r = .52$, $n = 29$, $p < .01$, two tails), *number of discussion posts* ($r = .52$, $n = 29$, $p < .01$, two tails), and *number of discussion subjects involved* ($r = .54$, $n = 29$, $p < .01$, two tails) (see Table 8). The results also show significant relationships between *attitude toward use* and *number of likes* ($r = .47$, $n = 29$, $p < .01$, two tails). Table 8 shows the significant relationship between

Table 8. Relationships Between Facebook Acceptance and Course Facebook Involvement in the DM Course.

Involvement $N = 29$ acceptance		Number of likes	Number of posts	Number of comments	Number of discussion Posts	Number of subjects involved	Time spent on course Facebook pages
Perceived usefulness	Pearson correlation	.523**	.277	.341	.522**	.540**	.344
	Sig. (2-tailed)	.004	.146	.070	.004	.003	.073
Perceived ease of use	Pearson correlation	.285	−.080	.183	.216	.126	.108
	Sig. (2-tailed)	.134	.681	.341	.261	.515	.585
Attitude toward use	Pearson correlation	.472**	−.112	.089	−.108	−.030	.274
	Sig. (2-tailed)	.010	.562	.645	.579	.875	.159
Facilitating conditions	Pearson correlation	.487**	.219	.318	.414*	.352	.290
	Sig. (2-tailed)	.007	.254	.093	.025	.061	.134
Subjective norm	Pearson correlation	.568**	.224	.313	.282	.278	.380*
	Sig. (2-tailed)	.001	.242	.099	.138	.143	.046
Behavioral intention to Use	Pearson correlation	.606**	.271	.448*	.188	.240	.310
	Sig. (2-tailed)	.000	.155	.015	.329	.210	.109

Note. DM = discrete mathematics; Pearson correlation Sig. (2-tailed) *$p < .05$, **$p < .01$.

facilitating conditions and *number of likes* ($r = .49$, $n = 29$, $p < .01$, two tails) and between *number of discussion posts* ($r = .41$, $n = 29$, $p < .05$, two tails) in DM. The findings also show significant relationships between *subjective norm* and *number of likes* ($r = .57$, $n = 29$, $p < .05$, two tails) and *time spent on course Facebook pages* ($r = .38$, $n = 28$, $p < .05$, two tails). There is a significant relationship between *behavioral intention to use* and *number of likes* ($r = .61$, $n = 29$, $p < .01$, two tails) and *number of comments* ($r = .45$, $n = 29$, $p < .05$, two tails) in DM. However, there is no significant correlation between Facebook acceptance variables and course Facebook involvement variables in IP.

Discussion

Students' involvement and acceptance of Facebook as a CMS in an F2F course are the main focus of this action-research study. We attempted to determine whether Facebook as a CMS would be accepted by students and used effectively for course-related activities such as discussion and communication.

Students' Facebook Acceptance and Course Facebook Page Involvement

The quantitative and qualitative results of this study show that participants used course Facebook pages for communication purposes similar to how they use Facebook in their daily lives. This finding is parallel to those of Selwyn (2009) and Roblyer, McDaniel, Webb, Herman, & Witty (2010). In this study, all interviewees emphasized the usefulness of course Facebook pages for communicating with the instructor, their classmates, and students in different sections of the course. Because Facebook use is so common with students, course Facebook pages, if they exist, are readily available to communicate through. This result implies that despite the need to improve students' argument skills, using SNSs can increase out-of-class communication and interaction among students and instructors. The majority of students believed that using Facebook increased communication with their peers (students taking the course in the same semester) and their instructor. Students indicated that their communication with instructors from previous courses through Moodle was not successful; most of the time students either did not get timely responses to their emails or they did not get responses at all. The course instructor in this study increased her availability through course Facebook pages with immediate feedback and replies, which contrasts students' previous experiences with a CMS. Of course, such immediate feedback requires an instructor to access Facebook as much as the students do.

For the students in this study, the average time spent on course Facebook pages was greater than the time they would have spent attending classes per week if enrolled in a four-credit course. This finding confirms Astin's (1989)

postulation of investing physical and psychological energy into an object; the time spent by students on course Facebook pages can be considered a form of involvement, in which they expend time and effort developing out-of-class activities as part of the learning process.

The study results show differences between how participants used discussion applications on their personal Facebook pages and on course Facebook pages. Not all of the interviewees said they used the discussion feature on their personal Facebook profiles; however, according to the quantitative and qualitative data, the discussion part of course Facebook pages was used by more than 30% of participants and was cited as the most-helpful part of the course Facebook pages by more than 40% of students. The results of this study thus point to the chance of increased involvement in out-of-class discussions via course Facebook pages. Easy access may be the reason for student involvement in the discussions. Course Facebook pages also bring class discussions into the students' daily lives, which might be another reason for the increased involvement in discussions on course Facebook pages compared with those on other CMSs.

Relationship Between Facebook Acceptance and Involvement in Course Facebook Pages

The correlation between Facebook acceptance and course Facebook page involvement changed according to the course. For the IP course, there was no significant correlation while for the DM course, there were significant correlations between:

- Number of Likes and Perceived Usefulness, Attitude toward Use, Facilitating Conditions, Subjective Norm, Behavioral Intention to Use.
- Number of Discussion Posts and Perceived Usefulness, Facilitating Conditions
- Number of Involved Discussions and Perceived Usefulness
- Time Spent on Course Facebook page and Subjective Norm
- Number of Comments and Behavioral Intention to Use

The results also stated that the more favorable a student's *Attitude toward Use, Subjective Norm*, and *Behavioral Intention to Use*, the stronger a student's intentions to *like* the posts/sharings would be on the course Facebook pages. This result supports Ajzen (1991), who claims that intentions to perform behaviors of different kinds can be predicted with high accuracy from *Attitude toward Use, Subjective Norm*, and *Behavioral Intention to Use*.

The relationship between *Behavioral Intention to Use* and *Number of Likes* can be explained by Davis' (1989) technology acceptance model and by Ajzen's (1991) theory of planned behavior, because according to Teo (2012), *Perceived Usefulness, Perceived Ease of Use, Attitude toward Use, Facilitating Conditions*,

and *Subjective Norm* have significant influences on *Behavioral Intention to Use*. Teo (2012) stated that these five variables contributed to a 35% variance in *Behavioral Intention to Use*. The correlation between *Behavioral Intention to Use* and *Number of Likes* can be the result of that contribution, because in the current study all variables except *Perceived Ease of Use* were significantly correlated with *Number of Likes* in DM.

We sought to better understand Facebook use as a CMS in two different freshman courses. Twenty-two students (62.86% in IP and 75.86% in DM) took DM and IP courses, but their involvement patterns varied based on the course. However, the Mann–Whitney test results indicated no significant difference in students' Facebook acceptance between courses. The reasons for this difference might be due to how the courses were conducted. The IP course was practical (with lab hours) and a bonus was given for course participation. The DM course was theoretical, with a bonus given for participation in the course Facebook pages. Other reasons for this difference may include interest in the course subject, number of course hours, lab, assessment, number of weekly assignments, or the instructor's role. Regarding the last possibility, the instructor associated with the current study taught all sections of DM but taught only one section of IP.

Limitations of the Study

The results of the study must be interpreted within an understanding of the limitations. The subject of this study was limited to 42 freshman students during the 2011 spring semester. Their experiences and expectations may not reflect typical students enrolled in a state or private university in Turkey or in other countries. Therefore, the results may not be reliable if generalized beyond students enrolled in a similar situation.

The data were collected only from first-year university students, which might reflect a limitation in sampling. There were a few reasons underlying this limitation: Compared with universities in other developed countries, the rate of using an SNS as a CMS is not as clear and is lower in Turkish universities. Further, there are limited numbers of appropriate courses at the university level for SNS use, and the number of instructors who used or at least had tried to use an SNS as a CMS was limited during spring 2011.

Implications and Conclusions

As the study results imply, there are potential capabilities of SNSs that can be beneficial for instructors and students to create an online classroom community, and increase student–student and student–teacher interactions. However, practitioners should also work to promote active learning through SNSs and to test their effectiveness for educational purposes. Even though the findings of this

study should not be generalized, we make the following suggestions to increase student participation in out-of-class discussions on course Facebook pages:

- Begin a discussion during the lecture hour, and then let students further discuss the subject on the course Facebook page. During the discussion in the lecture, provide clues and hints about discussion topic to increase students' curiosity in the topic of the discussion.
- Emphasize to students that deep discussion of the subject results in better learning and performance. Encouraging students to feel free to make mistakes also results in higher involvement in the discussion. It is important to give both informative and directive feedback to students to increase the quality of discussions.

The findings of this study suggest that Facebook can be more than a social networking site. Though the results may not be generalizable, the study results signify that using an SNS (such as Facebook) as a CMS has the potential to increase out-of-class communication among instructors and students. Reflecting on the data collected, we see that the relationship between students' acceptance of and involvement in course Facebook pages is different depending on the course. A variety of reasons for these findings were discussed above, and as such, the use of SNSs as CMSs in teaching and learning needs further analysis. We conclude that more research is needed on how SNSs can be used effectively for teaching and learning purposes, and on how to support active, social, and engaging learning environments. The findings from this study underscore that using Facebook for academic purposes will continue to develop and evolve.

Future Research

Researchers who aim to contribute to understanding how we can benefit from students' involvement on Facebook may wish to examine the reason for involvement differences in different courses. Possible reasons for involvement variations in course Facebook pages may be related to (but not limited to) the course subject and the context, such as number of course hours, having a bonus, lab, assessment, and weekly assignments. Clearly, there is need for more research on utilizing Facebook in teaching and learning.

The instructor's role is another promising avenue for further studies:

- How does the instructor's guidance and presence affect the use of Facebook as a CMS?
- To what extent will the instructor's guidance in and preferences exhibited on the course Facebook page impact students' involvement?

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