THE EFFECT OF USING A FACEBOOK GROUP AS A LEARNING MANAGEMENT SYSTEM

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Abstract

Facebook is commonly used in the daily lives of higher-education students. Facebook groups are considered educational tools that can be used as learning management system (LMS) substitutes or supplements. However, the effect of using Facebook groups on learning in the computer engineering field has not been adequately compared with that of using other types of LMS and must be explored. The results of this study indicated that the participants in a Facebook group academically outperformed those using iCas and Moodle did. Moreover, users of the Facebook group held a more positive attitude toward learning than did users of the other two types of LMS, a more positive attitude toward interaction than did Moodle users, and higher technological self-efficacy and willingness to use LMSs as well as higher learning motivation compared with users of iCas. The participants' experience of adopting LMSs in their learning as well as constraints are described and discussed. The results are valuable for instructors seeking to adopt a Facebook group as their LMS.

Introduction

A learning management system (LMS) is software designed for educators to create and manage course sites for learning and teaching [1, 2]. Each LMS has its interface and slightly different features. However, most LMSs share the same functions including [1, 3, 4]:

1. Course content management and presentation: LMSs allow uploading learning resources such as text documents, multimedia files, and internet resources. The resources can be organized according to learning needs such as topics and learning schedule.

2. Interaction tools: LMSs provide communication tools such as announcement areas, discussion forums, and messages for individual and group interactions.

3. Tools for evaluating and managing learners: LMSs document learners' participation, grades, collaborative work, feedback, and managing learning activities.

Adopting a learning management system (LMS) in learning has become popular in higher education. Research has shown that using LMSs benefits teaching and learning in numerous ways. Appropriately designed LMSs provide an environment that enables learners to learn actively and facilitates interaction among learners and instructors [5, 6, 7]. In addition, a study proved that using LMSs increases student enrollment in distance education [8].

However, using existing commercial or free LMSs often engenders limitations on learning and teaching [9]. Commercial LMSs are typically costly, thus becoming a burden on institutions adopting and maintaining these systems. Instructors may not be able to create courses or discussion groups by themselves because these functions are typically available only to system administrators. When LMSs are free of charge, instructors must use technical knowledge to establish and develop these

systems. The resources in LMSs are often unavailable to students after they complete a course or after their graduation, as well as when the LMS is replaced [10].

Online social networking tools, in which the concept of Web 2.0 is embedded, have become popular in people's daily lives. People are inclined to develop social relationships with friends, classmates, colleagues, and family members by using social networking technologies such as Facebook, Twitter, Tumblr, and microblogging [11], [12], [13], [14]. The easy access and social ties developed using these social networking technologies facilitate learning, even outside class [15]. According to Facebook [16], in March 2014, over 1.28 billion active users interacted, shared files, and communicated in groups by using Facebook services. The penetration rate of Facebook in Taiwan (65%) is the highest in the world, and 15 million Taiwanese people per month actively used Facebook in the final quarter of 2013 [17]. Moreover, Facebook is free of charge and installation is not necessary for users. Its popularity, easy access, free of charge, and no installation required will benefit learners in that they don't need to login to another system for learning, learning contents will still be available after they finish the course, and instructors do not need technical knowledge to install an LMS [4]. Facebook groups are considered educational tools [18] that benefit interaction, learning, learning motivation, and class climate. These topics are discussed in the following subsections.

Facebook and Interaction

Research has shown that Facebook facilitates peer interaction by enabling students to share, reflect, and learn from each other. Moreover, the interaction process promotes critical thinking, thus improving students' learning performance [19, 20, 21, 22]. The interactions that occur in online discussions benefit learner-centered learning and provide an encouraging and supportive class climate in which students develop knowledge independently [23, 24].

Facebook and Learning

A previous study reported that students in a Chinese language learning course were satisfied with their Facebook group because it provided an environment in which they could share resources and comments from others, thus promoting learning [25]. Schroeder and Greenbowe [26] reported that people in Facebook groups addressed complex topics and provided detailed replies, and that discussions in Facebook groups promoted high-level thinking skills.

Facebook and Learning Motivation and Class Climate

Li and Pitt [27], Hweitt and Forte [28], and Mazer, Murphy, and Simonds [29, 30] remarked that Facebook groups increased student-faculty relationships and promoted positive attitudes toward courses and instructors. Using Facebook groups positively influenced student motivation, affective learning, and the classroom climate.

Facebook has increasingly influenced university students, because the usage rate on university campuses is over 90% per year [31, 32]. However, Facebook has not been widely used in higher education [33]. Although one study indicated that Facebook groups can be used as LMSs [7], the effect of Facebook groups on learning in the computer engineering field compared with that of other types of LMS, such as Moodle and LMSs developed by universities, remains limited. Kop [34] described using a Facebook group that was established and maintained by participants in Massive Open Online Courses (MOOCs) for self-organized learning, determining that some learners preferred the Moodle forum to Facebook because they could obtain more background information and ideas from other participants. However, the Facebook group was used only as a supplementary tool by some of the learners in the class. Additional experimental data on differences in learning outcomes between Moodle and Facebook must be collected. Moreover, using mobile social networking sites

in the education context has become crucial because of the rapid growth of mobile technologies [35, 36]. Mobile Facebook enables students to exchange learning resources easily and learn at any location [35, 37]. However, the learning effect of Facebook on mobile utilities has not been adequately compared with that of other types of LMS. In this study, a mobile Facebook group was compared with two types of LMS, namely iCas and Moodle, operated using mobile tools to determine whether Facebook groups can be used as LMSs according to students' academic performance, attitudes toward learning, interaction, learning motivation, and technological self-efficacy and willingness. Students' experience of adopting the mobile Facebook group is discussed.

Methodology

This was a quasi-experimental research study in which three freshman classes participated. The research was conducted in a Computer Architecture course held at a university in Taiwan. To determine whether a Facebook group can be used as an LMS, three types of LMS, a Facebook group, iCas, and Moodle were used in the study. A Facebook group is a learning group created on Facebook. According to previous literature [10], most students are concerned about their privacy and are unwilling to add unfamiliar people as their friends. In this study, the Facebook group was initially open to the public so that students were not required to become friends with unfamiliar people. The Family Educational Rights and Privacy Act (FERPA) is a Federal Law that protects students' education records. The students have the right to access their education records, amend the inaccurate or misleading records, and have some control on the disclosure of the records [38, 39]. The Facebook Group in this study was set to be private to group members. The learning resources and discussions can only be available to these members. Students' grade, schedules, class lists, and payroll information were not discussed or provided in the Facebook Group. Students were reminded to be careful about how they respond and avoid disclosing their education records before the treatment.

A Web 2.0 tool, Quibblo, was used to provide a practice quiz to the Facebook group. The instructor created quizzes on Quibblo and posted the link on the Facebook Wall. The learners received instant feedback and statistics on their learning performance after completing the quiz. iCas represents "Interactive Course Assistant System," an LMS developed by the university that features functions similar to those of LMSs developed by other schools. The system provides a platform on which users upload assignments, download learning resources, post and respond to messages, take practice quizzes, and use a bulletin board to announce class news. Moodle is a popular free LMS used in most schools in Taiwan that have not developed an LMS. The system provides similar functions, such as discussion forums, bulletin boards, practice quizzes, and file downloading and uploading. In this study, three classes were randomly chosen to be the Facebook group, iCas group, and Moodle group, and used a Facebook group, iCas, and Moodle, respectively, as LMSs. The students were invited to use their mobile devices to access the LMS assigned for the class. To ensure that every student had access to mobile technology, a 7–in. ASUS tablet PC was made available for the campus and home use of students who did not have a mobile device during the experiment. The students could access the Facebook group and Moodle by using the Facebook and Moodle Mobile applications, respectively, on tablet PCs. Although no Android or iOS versions of iCas are available, the students could still access the system on tablet PCs by using Internet browsers such as Chrome and Firefox. All three classes were taught by the same instructor using the same content. Because the course was a freshman course, all participants had limited experience in using LMSs.

To evaluate the three key functions in LMSs, the instructor uploaded learning resources and learners uploaded assignments in formats such as Word, Powerpoint, pdf, jpg files and web

addresses on the group Walls in Facebook, Topic Outline page in Moodle and Learning Materials page in iCas for students to read. All participants were required to read class announcements and respond to weekly discussion questions as well as other students' postings for class interaction in Events in Facebook, Forums in Moodle, and Discussions in iCas. As for assessing learners, students' participation in weekly discussions was graded. Quibllo was used for practice quizzes in the Facebook and Quizzes in Moodle and iCas.

Seven discussion activities, two polls, seven practice quizzes, seven assignments, and 18 learning resource files formatted as Word, Powerpoint, pdf, and jpg files were created or provided on each LMS. The treatment was conducted for 7 weeks. The participants were required to take a pretest before the treatment and a comprehensive quiz after the treatment to determine whether learning outcomes and satisfaction differed significantly among the groups using different LMSs. The quiz comprised 15 questions, namely eight multiple-choice questions, four cloze questions, and three essay questions. All questions were highly related to the course content. The quiz was provided by the instructor and reviewed by content experts.

The LMS Use Questionnaire was employed to investigate students' attitudes toward using the three types of LMS in the class. The questionnaire was administered at the end of the study and consisted of 24 items rated on a 5-point Likert scale (i.e., *strongly disagree*, *disagree*, *neither agree nor disagree*, *agree*, and *strongly agree*). Five items measured attitudes toward learning using different types of LMS; seven items measured students' attitudes toward interaction using different types of LMS; six items measured technological self-efficacy and willingness to use LMSs; and six items measured learning motivation when using different types of LMS.

The first 24 items were subjected to principal component analysis to determine the validity of the questionnaire. Four factors were yielded by conducting factor analysis. Factor 1 consisted of Items 1 to 4 and 15, and was named "Attitudes toward learning using different types of LMS." Factor 2 comprised Items 5 to 10 and 16, and was named "Attitudes toward interaction using different types of LMS." Factor 3 consisted of Items 11 to 14, 17, and 18, and was called "Technological self-efficacy and willingness to use LMSs." Factor 4 consisted of Items 19 to 24 and was called "Learning motivation when using different types of LMS." The four factors accounted for 66.21% of the total variance. All ratings of students' attitudes toward learning, attitudes toward interaction, technological self-efficacy and willingness, and learning motivation obtained from the questionnaire were judged to be fairly reliable based on respective internal consistency reliability coefficients of 0.866, 0.925, 0.771, and 0.888.

Interviews regarding students' experiences of using their respective LMSs in the class were conducted at the end of the study. The purpose of the interviews was to determine students' attitudes toward using LMSs and recommendations for improving the LMSs. The interviews were conducted face-to-face on campus after the 7-week treatment. Ten students in each LMS group were randomly chosen, and each interviewee signed a consent form prepared by a researcher prior to the video interview. The interviews were video recorded and transcribed. Each student was coded using an abbreviation and a number; for example, "fb 1" represented the first student on the list in the Facebook group. "iCas" represented iCas, and "mo" represented Moodle. Quantitative data were quiz scores and the results of the LMS Use Questionnaire. Qualitative data were collected from the interviews.

The purpose of this study was to determine whether Facebook groups can be used as LMSs by ascertaining whether the academic outcomes and preferences of students using different LMSs in class differ; investigating how Facebook group integration affects students' attitudes toward learning, interaction, technological self-efficacy, and learning

motivation; and exploring students' experience of using a Facebook group in class. Therefore, three research questions were constructed:

1. Is there a significant difference in quiz scores among students using different LMSs (Facebook group, iCas, and Moodle)? This question was answered by subjecting the quiz scores to an ANCOVA.

2. Is there a significant difference in the attitudes toward learning, attitudes toward interaction, technological self-efficacy, and motivation of students using different LMSs (Facebook group, iCas, and Moodle)? This question was answered by subjecting the data collected from the questionnaire to an ANOVA.

3. What are students' experience and attitudes toward using different LMSs (Facebook group/iCas/Moodle) in their learning? This question was answered descriptively using interview data.

Results

Differences in Academic Performance Among Learning Management Systems

To answer Research Question 1, an analysis of covariance (ANCOVA) was conducted to examine the pretest and posttest scores. The homogeneity of the regression was assessed, and the F-test results regarding the product terms for each LMS and the pretest scores did not violate the assumption of homogeneity for the regression ($F = 1.22$, $p > 0.05$). Therefore, an interaction effect did not exist and we could safely assess the effects of different types of LMS on achievement, controlling the pretest score. The results of the F test indicated that different types of LMS affected participants' learning scores ($F = 8.74$, $p < .05$). A post hoc analysis (least significant difference method) was performed to facilitate further comparison. The results indicated that the mean score of the Facebook group ($M = 80.93$, $s = 8.86$) was

significantly higher than the mean scores of the iCas group ($M = 73.74$, $s = 11.67$, $p = .013$) and the Moodle group ($M = 69.05$, $s = 9.64$, $p < .01$). The data are shown in Table 1.

Table 1: Scores of the Post-test.

LMSs	Mean	Std. Deviation	N
Facebook	80.93	8.86	67
iCas	73.74	11.67	54
Moodle	69.05	9.64	50
Total	74.15	12.63	171

Attitudes Towards Different Learning Management Systems

An ANOVA was conducted to answer Research Question 2. The LMS Use Questionnaire was used and comprises four dimensions: (a) attitudes toward learning using different types of LMS; (b) attitudes toward interaction using different types of LMS; (c) Technological self-efficacy and willingness to use LMSs; and (d) learning motivation when using different types of LMS.

Attitudes Toward Learning When Using Different Learning Management Systems.

A composite score from Items 1–4 and 15 was used to determine differences in the effects of the LMSs on improvements in the students' understanding of the course content. The composite scores ranged between 5 and 25. Statistically significant differences among LMSs in improvement of the students' understanding of the course content were observed ($F_{2,168} = 9.742$, $p < .01$). The data were further analyzed using Scheffe's post hoc test, and the results indicated that the scores of students in the Facebook group ($M = 20.25$, $s = 3.73$) were significantly higher than those of the students in the Moodle group ($M = 18.26$, $s = 3.68$, $p = .01$) and the iCas group ($M = 17.48$, $s = 3.35$, $p < .01$). In addition, no significant differences were observed between the Moodle

group and the iCas group. The results are listed in Table 2.

Table 2: Attitude towards learning in LMSs.

LMSs	Mean	Std. Deviation	N
Facebook	20.2537	3.73494	67
iCas	17.4815	3.35194	54
Moodle	18.2600	3.68012	50
Total	18.7953	3.78063	171

Attitude Towards Interaction Using Different Learning Management Systems.

A composite score from Items 5 to 10 and 16 was used to determine differences in the effects of the three LMSs on improvement of the students' interaction. The composite scores ranged between 7 and 35. A statistically significant difference among the LMSs in improvement of the students' interaction was observed ($F_{2,168} = 4.024$, $p < .05$). The data were further analyzed using Scheffe's post hoc test, and the results indicated that the scores of the students in the Facebook group ($M = 26.40$, $s = 4.86$) were significantly higher than those of students in the Moodle group ($M = 24.12$, $s = 4.32$, $p = .035$). Moreover, no difference between the iCas group ($M = 24.57$, $s = 4.77$) and the Moodle group was observed. The results are listed in Table 3.

Table 3: Attitude towards interaction in LMSs.

LMSs	Mean	Std. Deviation	N
Facebook	26.4030	4.85879	67
iCas	24.5741	4.76862	54
Moodle	24.1200	4.31722	50
Total	25.1579	4.76058	171

Technological Self-efficacy and Willingness to Use Learning Management Systems.

A composite score from Items 11–14 and 17–18 was used to determine the technological self-efficacy and class climate in Facebook. The composite score ranged between 6 and 30. A statistically significant difference among students using different LMSs in technological self-efficacy and class climate was observed ($F_{2,168} = 4.472$, $p < .05$). The data were further analyzed using Scheffe's post hoc test, and the results indicated that the scores of students in the Facebook group ($M = 23.88$, $s = 4.50$) were significantly higher than those of students in the iCas group ($M = 21.67$, $s = 4.01$, $p = .02$). In addition, no significant differences were observed between the Moodle group ($M = 22.18$, $s = 4.29$) and the iCas group. The results are shown in Table 4.

Table 4: Technology self-efficacy and willingness to use LMSs.

LMSs	Mean	Std. Deviation	N
Facebook	23.8806	4.49755	67
iCas	21.6667	4.00942	54
Moodle	22.1800	4.29375	50
Total	22.6842	4.37570	171

Learning Motivation of Students Using Different Learning Management Systems.

A composite score from Items 19–24 was used to determine differences in the learning motivation of students using different types of LMS. The composite score ranged between 6 and 30. A statistically significant difference in learning motivation was observed among students using different LMSs ($F_{2,168} = 6.812$, $p < .05$). The data were further analyzed using Scheffe's post hoc test, and the results indicated that the scores of the students in the Facebook group ($M = 23.01$, $s = 4.87$) were significantly higher than those of the students in the iCas group ($M = 19.22$, $s = 3.62$, $p = .001$). In addition, no significant differences were observed between the Moodle group ($M = 20.83$, $s = 4.29$) and the iCas group. The results are listed in Table 5.

Table 5: Learning motivation in LMSs.

LMSs	Mean	Std. Deviation	N
Facebook	23.0149	4.86637	67
iCas	19.2222	3.62208	54
Moodle	20.9800	3.60549	50
Total	20.8304	4.29095	171

Learning Experience and Attitudes Toward Learning Management Systems

To answer Research Question 3, qualitative data were collected by administering interviews to the students at the end of 7 weeks of study. A total of 30 students, with 10 students in each LMS group, participated in face-to-face interviews conducted on campus. The interviewees in each LMS group were randomly chosen. The common themes from students' comments during the interviews and main themes in each LMS group are discussed in the following subsections.

Facebook Group: Easy but Unthreaded Discussions.

Students felt that Facebook provided a simple environment in which they could upload and edit their messages. A student (Fb 3) mentioned that "the layout of the Facebook group is clear to me and I can easily find the course materials, wall, and discussion area. It is convenient for me to learn from others' postings and their assignments." Using Facebook groups to interact with others is common among students and is a convenient approach that they can use to learn. One student (fb 7) stated, "I use Facebook almost daily and, if any new message regarding the class is posted, it automatically appears on the Facebook group wall. I do not need to log into another system or remember another Web site to participate in the class." Conversely, students identified some drawbacks to using Facebook groups. The most commonly reported disadvantage was that messages cannot be threaded under a discussion topic. A student (fb 4) expressed that "the messages are

unthreaded, and it is difficult to find and read related messages, especially when there are too many messages. Tagging the person that I responded to enables easy organization." Distraction was another disadvantage of the Facebook group. Because Facebook was developed for social purposes, students may be distracted, reading news, playing games, and chatting with others instead of learning. A student (fb 6) said, "I felt that I spent a lot of time reading messages and watching videos and pictures not related to the class. There were too many things that distracted me from learning." Although the Facebook group was open to the public at the beginning of the study to protect users' privacy, some students expressed concern that their personal information might be exposed to unfamiliar people. A student (fb 1) said, "I do not feel that participating in the Facebook group is safe," indicating that students must be taught how the Facebook group is operated to protect them.

iCas Group: Learning from Modeling Despite Technical Problems.

Most students agreed that they learned by modeling the posts of their classmates. A student (iCas 10) said, "I learned a lot from others when they shared their experiences and resources." In addition, most students felt that their interaction with others improved. A student (iCas 4) mentioned that "I felt that I engaged in more interaction with others in the system, and I felt comfortable in this learning environment. Learning with others benefits me!" Furthermore, most students felt that downloading and uploading files was easy and that participating in discussions was convenient. A student (iCas 2) said, "I could easily download the materials from iCas, share resources with others, and discuss topics with other classmates." However, some users encountered technical problems when using iCas. Most participants mentioned that they logged into the system only when they were required to do so and that they did not view iCas often. A student (iCas 9) said, "I did not use iCas every day. Because I used the system only

when necessary, sometimes, I forgot to participate in discussions." Moreover, some students observed that not all Internet browsers support all functions in iCas. A student (iCas 3) said, "I cannot download files when using the Android embedded browser; this is very inconvenient." Moreover, most students complained about the default font size in iCas. A student (iCas 8) said, "The font size of the message is only 6 points and is difficult to read." Finally, the system automatically logs the user out when the system is idle for a period of time. Some students felt that this was inconvenient because they must log in again after they finish reading materials or online resources. A student (iCas 5) said, "it bothers me when the system asks me to log in several times after I read."

Moodle: Learning from Others in Discussions but Not Used Often.

Although some students spent a substantial amount of time becoming familiar with the interface, most students agreed that Moodle provides a simple and convenient interface through which to learn and participate in discussions. A student (Mo 8) said, "I initially took some time becoming used to Moodle, but, in general, it is easy to use." Most students felt that they learned from their peers through group discussions. A student (Mo 4) said, "I learned from the process of posting messages and reflecting on others' messages. I also learned from the experiences that others shared." However, some students complained that the interface is too plain and based mainly on text. A student (Mo 1) said, "I do not like the interface. It looks too dull and serious, so I am not motivated to use the system very often." Finally, Moodle was only used for the class examined in this study; therefore, students used the system only when they were required to complete assignments. A student (Mo 10) said, "I used the system only when I was required to do so. It is inconvenient and I did not check the system when I did not have to."

Discussion

The purpose of this study was to investigate the effect of using a Facebook group as an LMS and compare this effect to that of other types of LMS. The results of this study confirmed that Facebook groups are potentially more suited to higher education than other commonly used LMSs. The learning scores of the Facebook group were significantly higher than those of the iCas and Moodle groups. The academic performance of participants who used different types of LMS significantly differed.

Moreover, participants in the Facebook group exhibited a more positive attitude toward learning than did those in the iCas and Moodle groups. The participants in the Facebook group exhibited a higher level of interaction than those in the Moodle group, a higher level of technological self-efficacy than those in the iCas group, and a higher level of motivation to learn than those in the iCas group. The results of the questionnaire were consistent with the data collected from the interviews. The participants in the Facebook group remarked that using Facebook provides an easy and convenient environment in which they can share resources and discuss topics with others. Moreover, the participants commonly used Facebook in their daily lives; therefore, they agreed that Facebook enables social links to be improved easily because an additional system specifically for learning is not required. This may explain why the Facebook group exhibited a more positive attitude toward learning than did the iCas and Moodle groups and greater interaction than did the Moodle group. Because of the technical problems of the iCas system, such as incompatibility with internet browsers and a small default font size, the Facebook group exhibited a higher level of technological self-efficacy, greater willingness to use the Facebook group as their LMS, and higher learning motivation than did the iCas group.

According to the students, Facebook has become part of college students' lives and provides a simple, convenient, easy, and user–

friendly learning environment. However, the unthreaded messages inconvenienced the participants [40]; thus, they tagged the person to whom they were responding to improve the organization of discussions. Moreover, the number of participants in the Facebook group should be limited to ensure that the class size is manageable.

In addition, the participants were concerned about distraction. The participants easily spent too much time reading messages and watching videos unrelated to the course. This finding is consistent with that of previous research [41], and necessary regulation is required.

Privacy is another problem for Facebook group users. Although all participants were not required to add classmates as friends in the Facebook group, some participants still worried that their personal information and course activities might be exposed to unfamiliar people. This study confirms that privacy is a critical concern when adopting a Facebook group as an LMS [10]. Sufficient explanation and communication with participants prior to adopting a Facebook group is thus necessary. One limitation of this study is that it focused mainly on college students using Facebook to learn Computer Architecture. Similar studies can be conducted to examine the effects of using a Facebook group on learners of different levels and subject areas and to compare with different types of LMS. Since Facebook is not mainly designed for education purposes, there are more powerful LMSs such as Canvas that provides more management functions such as grading app, annual public security audit, uptime guarantee, and automated peak load management [42].

Acknowledgement

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