



To Facebook or Not to Facebook: A Comparative Study

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Abstract:

The aim of this study was to compare the effectiveness of different learning environments between interactive Facebook instructional method and non-Facebook instructional method for undergraduate students. Study design used a pretest-posttest control group experimental design. Sample of this study was college students who enrolled in the Department of Applied Foreign Languages at the National Formosa University between September 2011-June 2012. The experimental group (n=134) received the interactive Facebook instructional method, and the control group students (n=57) received the non-Facebook instructional method. Independent samples t-tests, Pearson's correlation coefficient, and a linear regression were performed. Content analyses of samples of Facebook communication exchanges were also conducted. The statistical results showed that the participants in the experimental group increased their grades and engagement. The results were encouraging as the students perceived higher engagement in interactive Facebook instructional method than did participants who received non-Facebook instructional method. It concludes that the usage of Facebook acts as an important tool to assist students in achieving better grades, higher engagement, and greater satisfaction with the university learning experience.

Key words: engagement learning, Facebook, social network, Web 2.0

1. Introduction

Due to a dramatic increase in the use of Information Communication and Technology (ICT) in everyday life, there

has been interest in implementing these technologies in the learning process. Although e-learning platforms have been implemented in university teaching and learning settings throughout the world, instructional methods, techniques, and educational software tools do not always keep pace with developments in ICT. Social media activity, such as social networking, has become an integral part of college students' lives (Cotten 2008). The communication features of such social networking sites (SNSs) as Facebook (FB), Twitter, and Myspace have great potential for use in education. Social media far from being a fad are becoming ubiquitous.

The artifacts of Web 2.0 penetrate one's life in current society more thoroughly with the availability of broadband services. Web 2.0 enables users to influence the functions and features of the Internet in the process of navigating and exploring this Web of knowledge. In particular, there is a focus on collaboration and communication among Internet users, people, and organizations of similar interests (Wang et al., 2010). Web 2.0 artifacts, new social networking tools have been developed to enhance user involvement and engagement in the Web environment. Based on Downes (2005), the Web has become a platform in which users can create and share content in a virtual community. In other words, Web 2.0 characteristics have clearly afforded new possibilities for user involvement in the Internet. Web 2.0 artifacts, such as SNSs, can be used in education to enhance both formal and informal teaching and learning environments and encourage students to network and share resources with one another (Ajjan and Hartshorne 2008; Alexander 2006; Boulos and Wheeler 2007; Chen et al. 2009; Ellison et al. 2007; Evans et al. 2010). However others (Zoghbi-Manrique-de-Lara 2012; Pychyl 2008) debate that these Internet behaviors are negatively associated with student organization's effectiveness and reached a new level of time wasting.

1.1 Purpose of the study

Therefore, the purpose of this study is to compare and analyze the effectiveness of different learning environments between FB interaction instruction and non-FB interaction instruction for the college Advanced English courses. The argument developed here is that FB can be used as an effective education

tool to enhance student learning engagement and learning outcomes. This study was designed to provide insight into how students' perceived effectiveness of FB learning environment impacted their learning engagement and how having had to use FB impacted their academic achievement. The objective is to investigate if FB is a useful and interactive learning environment that (1) could enhance student learning engagement and/or strengthen relationship among students themselves and between student and faculty, and student and institution, (2) could improve student learning outcomes. This research would enable educators and researchers to identify and comprehend how SNSs such as FB could merge students' social and academic lives and accordingly contribute to academic learning.

1.2 Social Network Sites and Facebook

Socializing via the Internet has been widely used, and it has become an increasingly important part of college students' daily lives (Boyd & Ellison 2008; Cotten 2008; Gemmill & Peterson 2006). To date, the existence of hundreds of SNSs (Table 1) is consistent with the modern views of the deeply social nature of human mentality and the importance of support communication between users (Alexander 2006; Franklin & van Harmelen 2007).

SNSs are the latest online communication tool that feature functional practices for individuals, all of which are related to user engagement (Boyd and Ellison 2008). SNS can be defined as "Web-based services that allow individuals to: (1) constructing a public or semi-public profile within a bounded system, (2) articulating a list of other users with whom they share a connection and (3) viewing and traverse their list of connections and those made by others within the system" (Boyd & Ellison 2008, 211).

Table 1: Major SNSs and their launch dates

Name	Active User Accounts	Launch Date	Referral Traffic Ranking
Facebook	845+ million	02/2004	1
Qzone	536+ million	02/1999	
Twitter	380+ million	03/2008	4
Windows Live	330+ million	11/2005	
TencentWeibo	310 million	04/2010	
Habbo	230 million	08/2000	
Skype	200 million	08/2003	
Vkontakte	167+ million	10/2006	
Badoo	121+ million	11/2006	
Beno	117 million	07/2005	
LinkedIn	100+ million	05/2003	6
Google +	100 million	06/2011	3
Pinterest	< 100 million	03/2010	2
Reddit	< 100 million	06/2008	5

Note: The information was updated in January 2012.

Source from Wikipedia (2012), "List of virtual communities with more than 100 million users".

With social networking activities becoming the predominant Web 2.0 application, FB created by Mark Zuckerberg in 2004 is the most popular SNS and the largest proportion of overall Internet traffic. Similar to other virtual communities on SNSs, FB enables users to either interact with people whom they already know offline or meet new people online. FB is described as "... an online directory that connects people through social networks at colleges and universities" (Zuckerberg 2005, 1). In addition, FB provides opportunities for sharing social and emotional support, information resources and bonds with other people who work, study, and live around them (Cheung et al, 2011; Eyadat & Eyadat 2010). More importantly, in April 2012, Microsoft Corp. and FB announced a definitive patent agreement (Microsoft 2012). This agreement opened the door for FB to allow users to attach/upload various types of files, such as Microsoft-Word, Excel, and PowerPoint files to their FB private pages which represented another significant step in expanding FB's features, for learning and knowledge sharing in the classroom context. Kirkpatrick (2010) describes FB as "a technological powerhouse with unprecedented influence across modern life, both public and private" (15).

The empowerment can affect social change in a variety of contexts, ranging from allowing users to organize a groundswell protest in Columbia (Kirkpatrick 2010) to motivating users to exercise (Neporent 2011). FB reports 526 million daily active users with 200,000 new subscribers per day

and 125 billion friend connection. Currently, *facebook.com* is one of the most popular SNSs in Asia, an estimated 212 million Asian users (McCarra 2012). Despite the worldwide spread of FB users, it has been banned in several countries including China, Iran, and Pakistan. In addition, a fair amount of FB daily activity worldwide is comprised of application use. The current statistics include:

- over 3.2 billion likes and comments generated,
- over 300 million photos uploaded,
- over 70 languages available (Facebook, 2012), indicating that FB is tightly integrated into the daily lives of its users.

1.3 SNSs and Student Engagement

In the context of student learning, Astin (1984) defined engagement as “the amount of physical and psychological energy that the students devote to the academic experience” (297). Today, engagement refers to the amount of time and effort that students spend on educational activities that are related to college academic work (Kuh 2009). Chickering and Gamson (1987) offer 7 principles for improving undergraduate education based on research on exemplary teaching and learning in colleges and universities. All of these principles are related to student engagement as follows.

Seven principles of improving engagement:

- Encourages contact between students and faculty.
- Develops reciprocity and cooperation among students.
- Encourages active learning.
- Provides prompt feedback.
- Emphasizes time on task.
- Communicates high expectations.
- Respects diverse talents and ways of learning.

Chickering and Ehrmann (1996) further advocate examples of how technology can help implement the 7 principles. Implementing these 7 principles has a direct influence on learners’ engagement (Kuh 2009). In addition, in a study from the National Survey of Student Engagement (NSSE), Chen et

al. (2010) found a significant relationship between the use of educational technology and student engagement. Studies that focused on specific relationships between social media and engagement (Astin 1984; Heiberger and Harper 2008) also found a positive correlation between the use of SNSs and the engagement of college students. Surely, such powerful media can prove useful in education as well as life in general (Dyrud 2011).

1.4 Facebook and Interaction

Interaction is an essential element in any learning environment that is a necessary and fundamental process for knowledge acquisition and cognitive and physical development (Barker 1994). Furthermore, interaction directly influences learners' learning (Hirumi 2002; Woo & Reeves 2007). Interaction is defined as "a dialogue or discourse...between two or more participants and objects which occurs synchronously and/or asynchronously mediated by response or feedback and interfaced by technology" (Muirhead & Juwah 2004, 13). Scholarly studies of FB (Hewitt & Forte 2006; Mazer et al. 2007; Tuncay & Uzunboylu 2010) reveal a significant relationship between the use of FB among college-age respondents and higher motivation to learn, more effective learning and classroom climate, and improved faculty-student relationships. FB serves as a means for instructors to connect, befriend, and communicate with students to extend the communicative activities of the traditional physical classroom to a virtual form. Godwin-Jones (2008) claimed that FB is a tool and platform "that enhances communication and human interaction and can potentially be harnessed for language learning" (7).

2. Material and methods

2.1 Sample

Convenient purposeful sampling procedures were used. The study participants included students in three university classes from the Applied Foreign Languages (AFL) program and the Business Administration (BA) program in Taiwan. Two of the classes were assigned to the experimental group and one to the control group. The basic information of the participants is

shown in Table 2. Students from both groups were asked to complete a pre- and post-test. Of the 193 questionnaires that were distributed, 190 took the pre-test survey and 189 were valid, yielding a response rate of 97.92%. There was no significant difference between the groups in terms of participation rates. At the end of the study, the total 130 out of 134 (97.01%) in the experimental group and 57 (96.61%) in the control group completed the post-test survey. Again, there was no significant difference between the groups in participation rate, yielding an overall response rate of 96.89%. Therefore, participants from two classes in the experimental group were then combined for further data analysis. All of the participants (100%) were full-time undergraduates in the age range 20-24. None of participants reported that he/she did not have a FB account prior to the start of the course.

Table 2: Basic information of the participants

Group	Experimental	Control
Number of students	Class A: 65 Class B: 69	Class C: 57
Mean age	20.8	19.5
Gender proportion	109 girls 25 boys	30 girls 27 boys

2.2 Research Design

A pretest-posttest control group experimental design was used in this study. The participants in both the experimental (interactive FB instructional methods) and the control (traditional interaction instructional method) groups were pretested immediately before the 2-semester (10 months) treatment. During the study period, each group received a 2-hour a week face-to-face classroom lecture and was provided with the same textbooks and similar materials. Both teachers of the experimental and control groups had almost the same qualifications and experience. Because the purpose of this study was to examine whether interactive FB instructional methods did or did not foster learning engagement and/or enhance academic grades, the participants in both groups were post-tested at the end of the study.

2.3 Instructional Methods

Both groups received instruction according to the 7 principles for improving engagement in higher education (Chickering & Gamson 1987) hoping to foster learning engagement, including the following characteristics. The only differences between groups were the last 3 characteristics, including grouping, coaching and monitoring, and immediate feedback.

- **Class presentation:** Based on the course objectives, the teacher lectured to the entire class and aroused their interest in a discussion to help all the students understand the importance of the course content and context.
- **In-class quizzes:** All students were asked to take 12 in-class offline quizzes during the 10-month treatment. The quizzes were conducted individually, with no notes, textbooks, or peer help allowed. Each student was responsible for his/her own learning.
- **Individual improvement scores:** Each student's average score for the previous exams/quizzes served as the basic score. The score for the current quiz minus the basic score was the index of learning progress. All teams added all team members' index numbers and calculated the average score as their cumulative group score. A higher cumulative group score indicated better academic performance for that group.
- **Classroom demonstration:** All teams were asked to orally present their group projects in class along with an MS-PowerPoint slideshow. The class voted for 2 outstanding projects out of all the group presentations.
- **Team recognition:** Members with a higher team score and those with outstanding projects received rewards and public praise. In addition, members who had made significant progress were rewarded and praised individually. Award titles and award certificates were presented in class.
- **Grouping:**
 - a. In the experimental group, teachers grouped the entire class to the FB course group. After the face-to-face lecture, all students asked the instructor and/or other students' questions to clarify facts on the FB course sites. The students also participated in a discussion about new,

relevant content information. Furthermore, on each FB course site, students were divided into heterogeneous groups. According to their previous academic average grades, the team members were included in high-, mid-, or low-competence groups. Through the private page, students collaborated with other students on a shared project. During the process of group learning on the FB sites, every team tried to compete with one another to get a higher score. All team members helped each other to achieve their common goal.

b. In the control group, the teacher grouped the entire class into heterogeneous groups in class. According to the previous academic average grades, the team members were mixed with high-, mid-, and low-competence groups. Throughout the academic year, the students were required to work in groups. During the class hours, the instructors initiated class activities and encouraged students to work in groups. All team members were encouraged to help each other in class discussion.

➤ Coaching and monitoring:

- In the experimental group, teachers served as a coach on FB sites and monitored each individual's learning progress between classes.
- In the control group, teacher served as a coach monitoring each individual's learning progress in class.

➤ Immediate feedback:

- In the experimental group, students received instant feedback on FB sites and received prompt responses from the teachers after regular classes.
- In the control group, the instructors attempted to reply to the students' emails within 24 hours.

2.4 Instrument Reliability and Validity

The instrument consisted of three sections: demographics, student engagement, and the frequency of FB activities. The items in the first and last sections were designed to collect

information regarding participant demographics and the frequency of engagement in FB activities. The items in the second section were adapted from the questionnaire of the NSSE investigating engagement. The NSSE is the most well-known and widely used college student engagement questionnaire for educational contexts (Chen et al. 2010). For use in this study, the scale was modified and left 40 items suitable. Additionally, through principle component analysis of factor analysis, factors with an eigenvalue larger than 1 and items with a factor loading larger than .5 were selected. Factor analysis was conducted 5 times and 14 items were deleted. Finally, three factors including “student-faculty interactions”, “student-student interactions”, and “student-institution interactions” were extracted, and the accumulated variance explained was 43.27%. Therefore, the validity of the scale was conducted. The analysis result presented the Cronbach’s α reliability of each subscale ranged from .45 to .89. Seven subscales include:

- teacher caring qualities (TC),
- teacher trustworthiness qualities (TT),
- teacher-student relationship (TQ),
- cooperative student learning (CL),
- active learning (AL),
- student-student relationship (SQ), and
- student-institution relationship (SI).

Table 3 shows the Cronbach’s α reliability for all the subscales along with the number of items under each of the subscales, and Table 4 shows a list of sample items under each of the subscales. The three-page questionnaire was pre-tested on a group of 10 undergraduate students to ensure that the questions would be understood and interpreted correctly by the target sample. After the pre-test scale was compiled, three experts in e-learning were invited to review the scale. Based on the suggestions provided, the scale was modified to obtain expert validity.

Table 3: Descriptive statistics of student-faculty, student-student, and student-institution relationships and items reliability

Abbrev.	Scales & Subscales	Overall		Reliability
		Mean	SD	(# of items)
	<i>Student-Faculty</i>			.717 (11)
TC	Teacher Caring Qualities	3.669	.714	.810 (4)
TT	Teacher Trustworthiness	3.656	.749	.890 (5)
TQ	Teacher-Student Relationship	4.077	.633	.451 (2)
	<i>Student-Student</i>			.746 (11)
CL	Cooperation Student Learning	4.360	.563	.832 (5)
AL	Active Learning	4.235	.636	.785 (4)
SQ	Student-Student Relationship	4.446	.560	.620 (2)
	<i>Student-Institution</i>			.740 (4)
SI	Student-Institution Relationship	3.577	.715	.740 (4)

Table 4: List of sample items

Subscales	Sample items
TC	My teacher cares about students.
TT	I felt like I can talk anything with my teacher.
TQ	I find my teacher overall supportive.
CL	I believe working with my classmates could be somewhat beneficial for my school work.
AL	I put a lot of effort in discussing school work with the classmates.
SQ	I find my classmates overall supportive.
SI	I feel getting connected with the university.

The qualitative data were used to support and giving meaning to the quantitative data analysis. For the presentation of each student's excerpts, each student was coded S1, S2, S2... S130. The FB wall posts, comments from the respondents were cited as they were expressed or stated by the students and identified by their respective codes. Some excerpts may contain more than one theme/principle.

2.5 Analyses

The research analysis focused on the following research questions.

- What effects do interactive FB instructional methods and traditional interaction instructional methods have on student learning engagement in terms of fostering interactions and relationships with teachers, other students, and the institution? Seven subscales of learning engagement include teacher caring qualities,

teacher trustworthiness qualities, teacher-student relationship, cooperative student learning, active learning, student-student relationship, and student-institution relationship.

- What effects do interactive FB instructional methods and traditional interaction instructional methods have on the academic grades of students?
- Is there a relationship between grades and the frequency of engaging in FB activities? How does the frequency of FB use affect the academic grades of students?

Both quantitative and qualitative research techniques were used together. Regarding the quantitative aspect of the study, survey model was applied. Independent-samples t-tests were used to determine whether significant differences existed between groups in terms of grades and learning engagements. Pearson's correlation coefficient was used to measure the relationships between interactive FB instructional methods and grades and between traditional interaction instructional methods and grades. A linear regression was also performed to analyze the predictors of student grades. Regarding the qualitative aspect of the study, analyses of FB communication exchanges and email exchanges from the both groups were conducted.

2.6 Procedure

All of the participants understood that they were completing the research instrument voluntarily. The detailed procedure was as follows. The participants in both the experimental (interactive FB instructional method) and control (traditional interaction non-FB instructional method) groups were pretested immediately before the 2-semester treatment. During the second week of the first semester, the participants in the experimental group (n=134, 2 classes) were introduced to the FB SNSs and received an hour-long training session on how to use FB. The control group did not participate in such a session. During the training session, all students in the experimental group were asked to send a welcome post, share a link, post a

reply, like one's comment, and send a private message. The control group received the in-class interaction instructions, including in-class discussion, group demonstration, after-class counseling (6 office hours per week), and email communication exchange. The experimental group received interactive FB instructional methods through the FB course sites. The FB activities in the experimental group were as follows.

The instructors created a private group particularly for the class. All members could only join with the approval of the instructors. This was to ensure that only the members see posts. Only within the private group, students can be able to upload or attach academic files, such as Microsoft-Word, -Excel, -PowerPoint, and PDF files. Each student was instructed to access FB at their convenience between classes. The instructor announced that the class-related content will be uploaded to this space constantly. The students were encouraged to follow each other and reply to other students' posts. The students were instructed to work in groups together to share ideas, initiate and develop a project, and participate in a discussion on FB. Students were informed of the option of creating a private page for their project team which was only accessible to group members. Private pages were organized by the students with little interaction with the instructors.

Two FB course sites were administered and managed independently by two of the authors. Each week, the teachers attached a discussion question to the FB course regarding the following week's subject. The students were asked to answer to the discussion questions using various sources and respond other students' comments. The students used the like feature when they agreed or liked others' comments. The purpose of this process was to encourage students to come to class prepared. Both the interactions on FB and in the classroom settings synchronized with one another. The instructor asked some particular students who had interesting thoughts on FB to lead the discussion in the classroom.

Between classes, instructors offered help regarding each week's course material and provided answers if needed. The students continue their discussion regarding the group projects and course content. The purpose of this feature was to extend class discussion beyond the classroom setting. The students were required to upload their group projects and to share audio

and video links on the course FB sites. Students commented on what they liked and disliked about each submission. The purpose of this feature was to encourage students to exchange information and share accomplishments with other group members. The instructors provided online office hours and respond to questions using FB's communication features.

The instructors responded to any questions posted on the comment wall, in online chats, or in private messages. To receive private messages, the instructors kept their personal account active.

The purpose of this process was to enhance students' understanding of course concepts and lecture content and provide shy students with an opportunity to ask their questions online. Students understood that via FB course, they communicated for classroom assignments or through instructors' personal account, they could communicate with the instructor on a personal level. This procedure was to ensure that both active and passive students were given equal importance to participate their learning. The instructors regularly posted information about academic enrichment opportunities on campus and links to off-campus academic contest opportunities. The instructors provided encouragement and assistance via online communication. The instructors also constantly posted current IT news and other relevant real world activities. The purpose of this process was to maintain students' interest and subsequently gain a better understanding of the subject matter. The instructors and other students periodically provided emotional support when students posted about like being upset, sad, worried or frustrated. In addition to commenting, the instructors also indicated their support using the like feature. FB was used for the online communication of class reminders, including assignment due dates, exam dates, or location changes.

The control group received the same course materials and in-class instructions as the experimental group, except the communication tool used after class. Email exchanges were replaced FB for the online communication between classes with the instructors. The qualitative data collected from both FB communication exchanges in the experimental group and email exchanges in the control group were analyzed. For students in both groups, same amount of quizzes were administered during

regular class hours. All the students were supervised by the teachers for each quiz and given the same amount of time to complete their quizzes. At the end of the study, the students in both the experimental (n=130) and control (n=57) groups were post-tested during the final week of the second semester.

3. RESULTS

SNSs features in this study enhanced the quality of learning environment (Figure 1). The findings were then discussed in the order of the research questions.

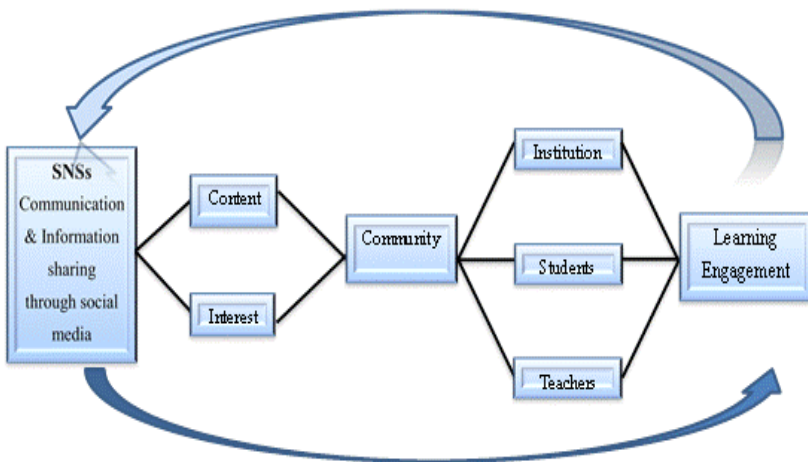


Figure 1: Learning engagement versus SNSs

3.1 Interactive FB Instructional Methods vs. Traditional Interaction Instructional Methods

Research Question 1: What effects do interactive FB instructional methods and traditional interaction instructional methods have on student learning engagement in terms of fostering interactions and relationships with teachers, other students, and the institution? To examine the effect of interactive FB instructional methods and traditional interaction instructional methods on learning engagement including 7 variables, pretest and posttest results between and within the two groups were analyzed.

3.1.1 t-Test 1: Pretest Results Between Two Groups

The independent sample *t*-test was conducted on the pretest results to ascertain whether there were significant differences in student learning engagement between the two groups. For the 7 variables of interactions and relationships with teachers, other students, and the institution, no significant difference was observed between the two groups before the treatment. Thus, it could be interpreted that before the experiment, there were no pre-existing differences in the aspect of student learning engagement by group with $F(1, 185.62) = 2.331, p = .129$.

3.1.2 t-test 2: Posttest Results Between Two Groups

The independent sample *t*-test was conducted on the posttest results to understand whether there were significant differences in student learning engagement between the groups. As shown in Table 5, significant differences existed between the two groups in the constructs of TT, TQ, CL, AL, SQ, and SI.

Table 5: Posttest results between two groups

Variable	Group	n	\bar{X}	SD	t-value	p-value
TC	Experimental	128	3.669	.510	1.731	.086
	Control	57	3.395	1.026		
TT	Experimental	130	3.656	.561	4.690*	.000
	Control	57	3.063	.507		
TQ	Experimental	130	4.080	.400	10.641*	.000
	Control	57	2.894	.588		
CL	Experimental	130	4.360	.316	2.033*	.044
	Control	57	4.175	.418		
AL	Experimental	129	4.234	.404	3.604*	.000
	Control	57	3.794	.715		
SQ	Experimental	130	4.452	.313	4.361*	.000
	Control	57	3.912	.786		
SI	Experimental	130	3.584	.512	10.587*	.000
	Control	57	2.334	.554		

Note: * < .05

3.1.3 t-test 3: Pretest And Posttest Results Of The Experimental Group

The paired sample *t*-test was conducted on the pretest and posttest results of the experimental group to verify the growth of the group in student learning engagement. With missing values excluded, 128 subjects were selected for the paired sample *t*-test. The result is shown in Table 6.

Table 6: Pretest and posttest results of the experimental group

Variable	Group	n	$\bar{\chi}$	SD	t-value	p-value
TC	Pretest	128	2.677	.664	8.730*	.002
	Posttest	128	3.669	.510		
TT	Pretest	128	3.028	.692	5.895*	.000
	Posttest	128	3.656	.561		
TQ	Pretest	128	2.892	.562	12.269*	.000
	Posttest	128	4.080	.400		
CL	Pretest	128	4.062	.577	2.843*	.000
	Posttest	128	4.360	.316		
AL	Pretest	128	3.681	.785	4.760*	.000
	Posttest	128	4.234	.404		
SQ	Pretest	128	3.846	.775	4.931*	.000
	Posttest	128	4.452	.313		
SI	Pretest	128	2.412	.644	10.762*	.000
	Posttest	128	3.584	.512		

Note: * < .05

As shown above, after the experimental treatment, the experimental group presented significant growth in student learning engagement in terms of fostering interactions and relationships with teachers, other students, and the institution, containing all 7 variables.

3.1.4 t-test 4: Pretest And Posttest Results Of The Control Group

The paired sample *t*-test was conducted on the pretest and posttest results of the control group to verify the growth of the group in student learning engagement (Table 7).

Table 7: Pretest and posttest results of the control group

Variable	Group	n	$\bar{\chi}$	SD	p-value
TC	Pretest	57	3.425	.968	.825
	Posttest	57	3.394	1.026	
TT	Pretest	57	2.912	.557	.062
	Posttest	57	3.063	.507	
TQ	Pretest	57	2.756	.588	.092
	Posttest	57	2.895	.418	
CL	Pretest	57	4.070	.439	.053
	Posttest	57	4.175	.418	
AL	Pretest	57	3.754	.715	.679
	Posttest	57	3.794	.440	
SQ	Pretest	57	3.842	.702	.159
	Posttest	57	3.912	.786	
SI	Pretest	57	2.355	.528	.470
	Posttest	57	2.337	.554	

Note: * < .05

As shown above, the control group treated with the traditional lecturing instruction presented no significant growth in all the variables of student learning engagement, including TC, TT, TQ, CL, AL, SQ, and SI. It can be interpreted if teachers' instructional methods are similar and there is no significant difference in student's quality, the traditional teaching method without integrating technology is unable to effectively strengthen student's learning engagement in today's society.

3.2 Interaction Instructional Methods vs. Grades

Research question 2: What effects do interactive FB instructional methods and traditional interaction instructional methods have on the academic grades of students? For these analyses, a mixed effects ANOVA model was conducted in the experimental group. The dependent variable was semester grades of students. The semester grades of the experimental group were significantly higher than those of the control group with $F(1, 128)=6.641, p=.001$. A statistically significant difference ($t=1.914, p=.05$) was found for grades between students in the experimental group who had a mean of 71.25 (SD= 7.265) and students in the control group who had a mean of 68.54 (SD=9.909).

To detect if there is a relationship between particular variables of the interactive FB instructional methods and student grades in the experimental group, a correlation matrix test was conducted. The results show that student grades were moderately correlated with cooperative student learning. aring teacher qualities were substantially correlated with teacher trustworthiness. Active learning was weakly correlated with all of the variables related to teacher interactions and relationships but substantially correlated with cooperative student learning and the quality of student-student relationships. The linear regression in the experimental group showed that the amount of time spent on FB ($F_{(7, 125)}=5.848, p< .01$) and the amount of time spent on co-curricular activities ($F_{(7, 126)}=.6558, p< .001$) were significant predictors of student grades, and teacher caring was a significant predictor of the amount of time spent on co-curricular on campus ($F_{(6, 124)}=3.478, p= .05$). Together, grades and the amount of time spent on co-curricular activities accounted for 27.7%, 41.8%,

21.9% of the variance in the amount of time spent on FB, the amount of time spent on co-curricular activities on campus, and interactive FB instructional methods, respectively.

Both amount of time spent on FB and the amount of time spent on co-curricular on campus significantly explained the variance in grades. Inally, interactive FB instructional methods and teacher caring significantly explained the variance in the amount of time spent on co-curricular activities on campus.

3.3 Frequency of Activities vs. Grades

Research Question 3: Is there a relationship between grades and the frequency of engaging in FB activities? How does the frequency of FB use affect the academic grades of students? The previous research question concluded that encouraging the use of FB for educationally relevant purpose has a positive effect on grades, then, how the frequency of FB use affect the academic grades was examined. To examine this relationship, the authors calculated Pearson's r in the experimental group. The results indicate a moderate association between initiating projects and grades (Pearson's $r=.348$, $p<.001$). In contrast, playing games (Pearson's $r=-.228$, $p=.01$) and spending time using non-game applications (Pearson $r=-.207$, $p=.01$) are negatively associated with grades. In other words, students who play games or use non-game applications on FB are more likely to have lower grades.

Students in the experimental group actively participated in building dialogue and commenting on each other's postings during the 10-month period (September 2011-June 2012). On average, each student wrote 2.21 wall posts (or approximately 2 postings per week). The most commonly used feature was the comment feature (87% of all content), which allows active participation in group discussion among the students and between students and instructors. In addition, the majority of the students used the "like" feature most of the time. The total number of FB posts is summarized in Table: 8. Wall posts included text, images, videos, and links/tags to external resources. There were a total of 297 wall postings and 2,057 comments every month, on average. Every comment obtained 5.38 likes, on average. At peak use (during midterms and finals), the pages had 2,497 wall text posts, 13,666 comments,

and 75,492 likes. Examination periods were associated with higher use. In addition to the text-only postings, there were a total of 468 image and video tags. Once a member posted his or her group project presentation video to other students, the students began to have lengthy conversations by commenting on each other’s responses. This interaction led to many lively conversations and active engagement among the group members.

Table 8: Total number of FB postings every month (2 FB course groups, 134 members total)

Wall posts & comments	Sept.	Oct.	Nov. (Midterm)	Dec.	Jan. (Final)	Feb.	Mar.	April (Midterm)	May	June (Final)
Text only	96	163	382	124	406	110	158	427	148	483
Text & images	4	12	16	28	28	46	18	24	18	25
Text & videos	2	12	48	15	52	3	6	50	8	53
Comments	472	970	3,011	1,200	3,204	310	1,730	3,542	2,220	3,909
Likes	1,994	2,905	9,243	2,112	8,790	860	3,112	10,023	2,998	11,436

Linear regression was also used to test the causal relationship between grades and FB activities. Among 20 FB activities in the experimental group, initiating a project ($\beta = .758, p < .001$), uploading videos ($\beta = .613, p = .05$), and tagging videos ($\beta = .623, p = .05$) were positive predictors of grade, whereas playing games ($\beta = -.242, p < .001$) and using non-game applications ($\beta = -.025, p < .001$) were negative predictors of grades. Initiating projects was the strongest predictor of overall grades with a β of $.758 (p < .001)$. Playing games was the strongest negative predictor of overall grades with a β of $-.242 (p < .001)$.

3.4 Analysis of Communication Exchanges

3.4.1 Experimental Group: FB Communication Exchanges

To gain a better understanding of the students’ experience of interactive FB instructional methods, a review of the qualitative data generated during this study was examined. The purpose of this section is to discuss how FB can enhance students’ learning engagement and promote learning interaction. In addition to the 7 subscales of learning

engagement, 7 principles for improving engagement proposed by Chickering and Gamson (1987) were used for the qualitative data analysis (see Table: 9 for examples of excerpts). The 7 subscales of learning engagement and the 7 principles may be combined in the excerpts.

Table 9: Sample schema to arrange and organize

Example excerpts (student)	Analyses	Variables/Principles
I'd say we can start literature review now. How about I start with the policy part, and Alison can go ahead to gather some information about some children educational activities. (S110)	Develop cooperation among students.	Principle 2 Variable CL
Allow me to send u a private message here. I've some problems now and I'd like to talk to u. (S34)	The opportunity to communicate with the instructor in between classes.	Principle 1 Variable TT
... I feel so comfortable talkin 2 u here. Tnx so much 4 listening. (S72)	Encourage contact between student and faculty.	
... understood. Thanks, Dr. (instructor). Now, I can continue our project. (S89)	Receive instant feedback from instructor.	Principle 4
I need ur help for my upcoming presentation. Anyone can give me some ideas of teaching children literature. (S22)	The students put efforts to understand the course materials and learn the new concepts. Encourage active learning	Principle 3 Variable AL

The Quality of Interaction and Relationships between Students and Faculty

The majority of the students had positive responses to the FB interactions. Most users felt satisfied with FB as a supplemental communication tool to connect them with the instructors in a worry-free virtual learning community. The teachers provided caring (TC) to the students. In addition, the teachers offered intrinsic rewards to the students for their achievements.

“Do the group work to get every vocabulary’s synonyms. Collect the work and combine them into one page note or two. Then, print it out for everyone. Once you know how to effectively do the team work in your study group, you will save a plenty of time. Study hard! You can do it!” (30 likes) (Principle 6)

“Good news! You guys did a very good job on your midterm exam. I am here to tell you that you guys broke the record. You hit the highest average among the classes ever! I can see all of you actually worked so hard. Very proud of you, every one of YOU. You all make a lot of progress this semester. Way to go! (52 likes)

FB allowed both the students and the teachers to expand conversations in ways that would not have been practical during the limited class time. S72 stated, “I can also ask the teacher some stupid questions here. I’d feel super embarrassed to ask these kinds of silly questions if I go to the teacher’s office” (42 likes). Similarly, S13, S34, S44, and S69 delivered their thanks to the teacher for solving their problems immediately (Principle 4). The instructor called on a teammate to complete an answer when the students were stuck. S35 commented, “Our teacher is here? My! We’d better come up with something smart!” In this respect, it can be said that the instructor’s participation in the students’ group discussion influenced the students’ learning motivation. In other words, when the students knew their discussion was monitored by the instructor, they were more motivated to contribute. Enhancing their learning motivation was a byproduct of this study.

Instructors also gained trust (TT) from students. Through FB’s private message feature, students had the opportunity to send a private message to the instructor to talk about personal issues. S13 said, “Thanks, Dr. (name of instructor). I am so glad I can talk about it out loud. Thanks for spending your time listening to my long story” (Principle 1). S69 said, “very helpful chatting with you” (Principle 1). Similarly, when S96 expressed his new discovery from talking to the instructor, he received 45 likes on this comment, suggesting that many of his peers had similar opinions or agreed with him. In addition, the students were surprisingly comfortable with expressing their thoughts on FB. Photo tagging was a fun experience in this study. Students (S21, S45, S76, S88, S101, S120) tagged their pictures on the site and suggested that their instructor try. They showed a very close relationship (TQ). S88 said, “... just never thought that I can be chatting to a teacher over FB ☺”.

One particularly noteworthy finding was that the instructor received significant emotional support and encouragement from the students, which was unexpected. FB forged interpersonal relationships and enhanced the bond between students and faculty. The students maintained close connections and built strong relationships with their teachers. The students freely expressed their opinions about their

instructors, which rarely occurs in the real world. A sample conversation is below.

“Faculty: ... Being frustrated...

S10: You are the best teacher ever. Students nowadays really have a hard time understanding the meaning of “Appreciation”. @Faculty, we love you. (8 likes)

Faculty: @S10 Being touched. Thanks for your encouragement. (32 likes)

S24: @Student10 Who did this to our (faculty’s name)? Let’s go beat her up. (childish, haha, kidding)

S33: Let’s give (faculty’s name) a big Love hug.

S10: @Student33 Right, let’s give her a big Love hug. (22 likes)

S42: Pretty, don’t be sad. You still have us. We are here for you. (36 likes)

S5: Ignore those nonsense kids. (2 likes)

S69: Dear Pretty, cheer up. Don’t take it so hard. She just did not cherish the time for being with you. It’s ok cuz you have our backs. (24 likes)

Faculty: @S33, @S42, @S5, @S69 Thanks a lot. You are just always there.

S72: No doubt, you are a GREAT TEACHER! :D (36 likes)

S18: Dear (faculty’s name), I am here for you. Don’t be sad!! You know, because of you, I found my value. Cheer up☺

S9: I totally understand what you feel. Believe me, that student will find out your true meaning one day. And she will eventually feel thankful. Do remember you are the best!! (32 likes)

(... more than 20 comments posted after here)

Faculty: Thank you for all the support. Because of you, my world is warm. You are so grown up! You are actually the best. (45 likes)”

The Quality of Interaction and Relationships among Students

The high volume of communication among students showed that they interacted closely with one another and participated

in their learning discussion. Most of the students had good experiences of cooperative learning (CL) with their peers. They wrote on FB that it was “highly efficiency working together” (S110), “we are a nice team” (S109), “easy to follow the project progress” (S84), and “thanks for giving me lots of tips” (S90). CL was a good way to promote student-student interactions (Slavin 1995). S70 reported, “FB is an excellent tool. I was able to get lots of helpful information instantly from you”. S21 said “I’ve answered the questions”. The students said that this cooperative learning was excellent because it allowed them to perform the following activities:

- gather information from all members (S79) (Principle 2 & 3);
- share their answers and contribute to their own learning with other members (S82);
- explain what their group has done (S21) (Principle 7);
- upload .doc and .pdf files to FB (S15) (Principle 2);
- meet deadlines and learn time management skills (S19) (Principle 5);
- work with peers from different backgrounds (S72) (Principle 7);
- form study groups and work together.

Because the students discussed and shared information online, their active learning (AL) level may have increased toward the group’s common goal. S6, for instance, said that providing individual input to complete the group project has now made him actively pursue learning the course materials. When answering peer questions, R24 attempted to understand the posted question, whereas S72 posted questions to FB to clarify her understanding of what she learned in the class (Principles 2 & 3). Students took the initiative to find answers. This process reinforces students’ overall active learning. S62 and S73 claimed that they learned “a lot from reading the posts” (Principle 2) and “from reading the answer”, respectively.

S4 demonstrated her active learning by noting that learning requires effort, which, in her case, involved looking up the course materials before offering suggestions and answers to

her peers. Many of the students felt that they benefitted from working together on FB in the following ways:

- discovering new learning (S2, S24, S45, S89, S92, S101, S121);
- learning new knowledge through friends' discussions on FB (S2, S92, S114);
- trying the new study approach learned from FB (S2, S45);
- having a better understanding of how to prepare for the class (S67, S72).

These benefits involve a cycle of quality interactions and relationships among the students (SQ). When posting a comment or a reply to a comment, S23, S56, and S18 felt that they were connected and supportive. Students sometimes posted personal comments and uploaded their own photos that were not relevant to the course materials. They felt a “sense of belonging” through their engagement in this FB group. Through FB, the students felt free to express themselves and to receive emotional support from others. For example, S14 said that FB guides her to interact with her friends; S90 uses FB every day to connect with peers; and S81 searches for support on FB. S9 and S118 claim that as a result of their communication on FB, they now feel that they are in the same family. These findings suggest that FB is a “powerful learning tool that is not only built [on] synchronous and asynchronous technologies that has transformed learning but also extend[s] the reach of those communicative tools” (Blattner & Fiori 2009, 19).

Negative Findings

The students' primary activities on FB included updating their personal status, sharing photos, and playing online games. S100 and S101 reported that they spent too much time on FB chatting with peers about their personal social life. Similarly, S41 and S71 felt that that they could not stop themselves from playing online games or FB apps once they turned on the computer. S109 added that he spent too much time making comments on FB without sufficient time for exam preparation.

Consequently, these students were distracted from school work, indicating that they had poor management skills. This finding is consistent with Kirschner and Karpinski's (2010) finding that FB users reported a lower mean GPA than non-users. In addition, S3 complained that he did not have Internet access at home; therefore, it was difficult to discuss the group project online. S27 added, "I actually prefer to meet in person. I cannot express in words. I'm just so poor at writing. Face2Face would be better." In this respect, it could be stated that the use of FB as a supplemental communication tool was not effective.

3.4.2 Control Group: Email Communication Exchanges

In the control group, students were given an option to send emails to communicate with the instructors outside of class. This study found that students did not communicate frequently with their instructors. The instructors received only 7 email messages from the students. Of these 7 messages, 3 were regarding arrangements for make-up exams, 2 were regarding assignment requirements and rubrics, and 2 were regarding problem-solving skills. All of these email messages were in a formal writing format. The instructors replied to all emails within 24 hours. Although the students received feedback from the instructors within 24 hours, they did not frequently contact the instructors outside of class.

Conclusions and Discussion

In this study, the pretest-posttest experimental design was adopted. Students in the experimental group received interactive FB instructional methods while the control group received traditional lecture method. The experiment period lasted for 10 months, with 2 hours of face-to-face class lecture in each week. Based on the research findings, students in the experimental group presented significantly better engagement than those in the control group in the constructs of TT, TQ, CL, AL, SQ, and SI. In addition, individual improvement scores of the experimental group were significantly higher than those of the control group and mean grades of the experimental group were significantly higher than those of the control group. Consistent with the findings of other studies (Heiberger &

Harper 2008) but in contrast with other findings (Astin 1984; Kirschner and Karpinski 2010), the amount of time spent on FB was found to be a positive predictor of grades. Based on the students in this sample, the amount of time spent on co-curricular activities on campus was positively correlated with engagement and was a strong positive predictor of grades.

More importantly, specific FB activities were found to be stronger predictors of student engagement, grades, and time spent engaging in co-curricular activities on campus compared with the overall amount of time spent on FB. This finding is consistent with prior research on educational technology, which has shown that the manner in which technology is used tends to be a stronger predictor of outcomes than the amount of time that is spent using the technology (Cotten 2008; Ellison et al. 2007; Heiberger & Harper 2008; Pempek et al. 2009).

Furthermore, the amount of time spent on FB explained 27.7% of the variance in grades, and FB-based instruction explained 21.9% of the variance in time spent engaging in co-curricular activities.

Students use FB in ways that are both positively and negatively related to their grades and engagement. It is important to examine the real-world implications of these findings to better understand why students engage in FB activities. Specifically, initiating projects, uploading videos, and tagging videos were positive predictors of grades, whereas playing games and using non-game applications were negative predictors of grades. Given that certain types of FB use result in positive outcomes and are positive predictors of engagement in the real world, these types of activities may be related to the construct of engagement and may foster academic benefits (Kuh 2009). The connection between FB-based instructions and learning engagement that was revealed in this study suggests that FB can be integrated into instructional method to encourage students to engage in ways that are important for their academic outcomes and learning engagement. This is to say that educators can consider the use of SNSs, particularly FB, an instrument for merging students' social and academic lives to foster learning engagement. Particularly, examination periods were associated with the highest use of the FB course groups. Use of FB could help to bridge the span between classes. More importantly, FB can be used as an educational

communication and interaction tool to enhance faculty to assume a more active and participatory role. Thus, this study provides support for the 7 principles of improving engagement (Chickering and Gamson 1987) in FB learning environment.

The results of this controlled experimental study offer three significant contributions. First, this research provides evident that the use of FB contributes to the level of learning engagement in the real world. Specifically, FB assists students in merging their social and academic lives. Second, the use of the popular Web 2.0 artifact sustained learning engagement both inside and outside of the classroom. Third, this study found that the use of FB as a new learning tool led to better academic outcomes in certain ways (Ellison et al. 2011). FB can indeed empower the e-learning environment and is certainly not merely a time waster. Therefore, it is crucial to ensure that the current thinking regarding the implementation of new learning social network sites in classroom curricula is compatible with opportunities related to Web 2.0 activities. To summarize, SNSs such as FB can greatly increase the value of a class for both students and instructors.

For the students, the benefits can be summarized as follows.

- Extends the learning continuity beyond the classroom setting
- Develops collaborative learning among students
- Provides motivation and award constantly
- Promote active learning through a rich discussion
- Allows students to process learning information and reflect deeply on a topic
- Provides learning with no boundaries
- Maximizes time on a task

For the instructors, the benefits can be summarized as follows.

- Provides prompt feedback
- Promotes high-quality learning and knowledge sharing
- Allows instructors to express their high expectations

- Maintains learning interest in the cycle
- Enables instructions to communicate with students
- Produce an effective pedagogy that accommodates diverse talents and methods of learning

Limitations

This study has a number of important limitations that should be considered when interpreting the results. The first limitation is possible sampling bias. All students who volunteered to participate in the study took the same classes, so the students represent a distinct population within the university. As such, the sample was very homogeneous and may not be representative of all the university students. Furthermore, a narrow selection of the overall student population at one institution is not sufficiently adequate to be representative of all university students.

Another limitation is the variables used in the present study. The results of this study were drawn from the standard quantitative approach. Like all self-reports, the survey used to measure the variables of student engagement has reliability and validity limitations. Further research should include alternative techniques for assessing the actual process of student learning engagement, such as in-class observation and interview with students and faculty.

Additional limitation is the instructors' skills and characteristics. Ractham and his associates (2012) note that "the more open and friendly the instructors are with students, the more friendly and responsive they were likely to be in terms of the community atmosphere and system usage" (181). This is a time-consuming process; the instructor needs to monitor and chat in the group. In other words, the instructors' passionate and high abilities in the adoption of technology in their classrooms may be the major cause for increasing student grades and learning engagement. The instructors' skills and personal characteristics must be considered for further research to better measure students' learning engagement through the use of Web 2.0 tools. A final limitation is the students' and instructors' unique computer background. Completing a task actually depends on peers, instructors, and administrators.

Therefore, the findings of this study are limited by students' computer background and their access to the computer technology.

Furthermore, whether the school policy can allow any system that is not hosted by the school should also be considered.

Recommendations

The findings have several implications for educators. First, the instructor should demonstrate a positive perspective toward FB communication tool when they decide to include it as a class activity. Clear instructions and course requirements including guidelines of FB participation should be addressed in the class. Second, the instructor should create a collaborating learning environment to promote students' participation in the FB discussion activity. The instructor should also value the postings of all FB discussion and help students recognize the value of their participation. Third, the instructor should actively engage in the FB discussion, leading students' learning direction and guiding their interests for further interaction among students themselves.

Finally, the authors recommend further studies of the use of FB or other Web 2.0 artifacts in educational settings, particularly controlled experiments to confirm and verify the cause-effect relationships that were inferred in this study. Analysis of student interviews is recommended to explain the results from the standard quantitative approach. In addition, researchers must continue to explore the relationships and factors that are associated with student FB use in relation to academic learning outcomes. Another direction of further research might include the development of students' experience in the use of mobile Web 2.0 tools within the process of teaching and learning. Hence, mobile Web 2.0 learning studies implementing telephone devices and other mobile devices to the shaping of new concepts of teaching and learning are suggested.

Furthermore, use of the qualitative evaluation research for examining and the monitoring of student learning progress via Web 2.0 artifacts for the development of students' key competences are also suggested.

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