Research Constructs and Interaction Patterns of Learning in Social Networking Site

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ABSTRACT

Despite the increasing popularity of social networking sites (SNS) due to a major involvement of students in online social activities, there is a significant challenge involved in using SNS, particularly as a learning platform in teaching computer science education (CSE) to undergraduate students in non-engineering and engineering studies. To find out the perceived factors of learning through SNS approaches, two-round data collection was performed. The first phase involved distribution of questionnaires to a total of 219 undergraduate students ranging from non-engineering (n=80) to engineering (n=139) that resulted in identification of three measured learning constructs: Social Bonding, Social Bridging and Social Intention. In phase two, evaluation of students' learning transcripts in SNS were performed. Results identify 22 interaction patterns, which then are further grouped into four learning dimensions of Participative, Interactive, Social and Cognitive. The evaluation of students' learning transcripts in SNS indicated teaching CSE through SNS enhanced students' understanding of CSE. The study is shown to support social constructivism, which promotes knowledge that is distributed across a network of connections.

Keywords
Social Networking Site, Interaction Patterns, Learning Construct, Learning Analytics, Computer Science Education

Introduction

In this modern day, our life activities are closely related to technology, from the simplest and low-tech to the latest and high-tech. Technologies such as television, radio, and computer are among common technologies. These technologies are not only for entertainment but also as a means of obtaining information for learning and teaching (Said, Tahir, Ali, Noor, Atan, & Abdullah, 2014). With the widening coverage of internet in schools and universities, there are many tools and applications which have emerged. Among of them is Web 2.0. The term Web 2.0 was first introduced in 2004, in which the user has the opportunity to 'read and write' a dynamic website (i.e. blogs, wikis, podcast) (Said, et al., 2014). Web 2.0 also has the characteristic of being socially personalized, interactive and participatory (i.e. social networking sites) (Abdullah, Tasir, & Junaidi, 2012; Yahaya, Puteri Yusof, & Abd Halim, 2013; Said, Forret, & Eames, 2013). Of all the Web 2.0 components, particularly social networking sites, Facebook is the most popular. Statistics Brain (2014) reported that Facebook is ranked second out of the top five most visited sites on the internet after Google.com. The statistics indicated that Facebook is also the most frequently visited social network site compared to other social network sites such as YouTube, Twitter or MySpace. Table 1 shows some statistics as reported by Statistics Brain (2014) as of 5th November 2014.

Table 1. Facebook statistics by Statistic Brain (2014)

Facebook Statistics	Data
Total number of monthly active Facebook users	1,310,000,000
Total number of mobile Facebook users	680,000,000
Percentage of all Facebook users who log on in any given day	48%
Average time spent on Facebook per visit	18 minutes
Average number of Facebook friends per user	130
Links shared every 20 minutes	1 million

Research Background

In Malaysia, Facebook has been reported as the most visited site and contributes to one-third of the web traffic in Malaysia (Kevin & Nicholas, 2013; Said, Tahir, & Ali, 2014). Spending time on Facebook seems to have become a daily routine with Malaysian users, especially Malaysian youth. Studies showed that 82% of Facebook users use Facebook on a daily basis (Irshad, 2012). A study conducted by Ellison, Steinfield, and Cliff (2007) reported that students spent an average of 10-30 minutes daily on Facebook. In another study conducted by Towner and Muñoz (2010) also reported similar findings, where 22 % of the students spent 10-30 minutes on Facebook. Concerns arise when students spend too much of their time on Facebook rather than studying. A study conducted by Irshad (2012) found that 80% of students used Facebook for killing time. The finding indicates that many students spent their time on Facebook with no learning intentions, with a resultant lowering in academic grades. A study conducted by Kirschner and Karpinski (2010) found that students who do not use Facebook have a better academic performance than those who frequently logged on into Facebook site.

Although Facebook is not specifically designed for educational use, there are several features of Facebook site that resemble traditional learning management systems (i.e. Facebook post, comment, like and share, chatting, and file upload). Facebook group also offers several features that can be used in learning and teaching. It enables both learners and instructors to post announcements, photos and videos. With all posts automatically appearing on the Facebook group wall it is easier to keep track of all activities within the group (Yahaya, Puteri Yusof, & Abd Halim, 2013; Said, Forret, & Eames, 2013). Other than that, event functions can also be used to organize face-to-face class meetings. Wang et al. (2012) in their study have used Facebook event function to organize weekly learning activities and obtained a good response from their participants. Past research has shown the engagement of students in social networking sites, especially Facebook. In the context of education, Facebook has been seen to have high potential for student's interaction, collaboration, information and resource sharing (Said, Forret, & Eames, 2013). The use of Facebook as a learning environment proved to be beneficial for students. Facebook was viewed as having the ability to promote interaction beyond the boundary of the classroom. Bosch (2009) found lecturers could contact students quicker and easier via Facebook compared to normal classroom contact, and students felt more comfortable asking questions via Facebook. Additionally, students also felt that their lecturers were more approachable in the classroom after following them online via Facebook (Bosch, 2009; Duffy, 2011).

Research suggested that Facebook could support peer interaction, increased communication about course content, and assessments. For example, Selwyn (2009) indicated that students used Facebook to discuss their learning experiences and events as well as exchange information for assessment requirements. Peer interaction via Facebook can be a valuable learning method, due to the fact that students learn more by interacting and communicating with other students (Said, & Tahir, 2013; Said, Tahir, & Ali, 2014). Concurrently, a study by Mazman and Usluel (2010) who examined three dimensions of Facebook, namely: communication, collaboration, and resource or material sharing. Results of the study found that Facebook adoption as learning tool has a significant positive relationship with usefulness, ease of use, social influence, facilitating conditions and community identity. The study also indicated that usefulness was determined as the crucial factor in the adoption of Facebook as a learning tool. Many researchers have reported the potential of Facebook for educational purposes. Towner and Muñoz (2010) reported that college students used Facebook for both formal and informal learning. They also found that 56% of students leave a message on other students' wall about class, 43% talk about class through Facebook chat, and 38% talk about lectures. Additionally, the study also indicated that 47% of students helped other students with required materials for their coursework via Facebook, and the study concluded that Facebook is an ideal medium for learning, supporting interactions between peers and conversations about course material.

Research Objectives

With the students as well as teachers increasingly using Facebook, the main objective of this research was addressed to find out students' perceptions of learning via Facebook as a chosen SNS, and its implication as a learning tool. Specifically, two research questions were formed in accordance to the research objective:

- What are students' perceptions of using Facebook as a learning tool?
- What are students' interaction patterns of learning via Facebook?

Literature Review

Past research has shown the engagement of students in social networking sites, especially Facebook. In the context of education, Facebook has been seen to have high potential for student's interaction, collaboration, information and resource sharing (Said & Tahir, 2013). The use of Facebook as a learning environment proved to be beneficial for students. Facebook was viewed as having the ability to promote interaction beyond the boundary of the class-room. Bosch (2009) found lecturers could contact students quicker and easier via Facebook compared to normal classroom contact, and students felt more comfortable asking questions via Facebook. Additionally, students also felt that their lecturers were more approachable in the classroom after following them online via Facebook (Bosch, 2009; Duffy, 2011). Research suggested that Facebook could support peer interaction, increased communica-tion about course content, and assessments. For example, Selwyn (2009) indicated that stu-dents used Facebook to discuss their learning experiences and events as well as exchange information for assessment requirements. Peer interaction via Facebook can be a valuable learning method, due to the fact that students learn more by interacting and communicating with other students (Said, Tahir & Ali, 2014).

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Computer Science Education (CSE) Course

The computer science education (CSE) course has been offered at the Faculty of Education, Universiti Teknologi Malaysia, since 1997 and has been through several curriculum revisions. At its earliest introduction, this course was offered on the basis of conventional face-to-face teaching to cater for the needs of teachers training for ICT and computer use in Malaysia, specifically to equip secondary school teachers with basic ICT and computer science knowledge in developing computer-based teaching aids (or courseware) and other related ICT teaching materials. The computer science education (CSE) course is a compulsory 15 week paper in which students have to enroll once a year during the second semester of the academic calendar. The course objectives are to provide opportunities for students to learn and develop skills in building educational courseware, and focus on the technical development of software and web pages. It also focuses on the educational theoretical concepts, the basic concepts of authoring and programming language, the process and language used for CD-ROM, and web-based development. The teaching of the CSE course consisted of conventional face-to-face lectures together with Facebook participation. The course ran for 15 weeks, comprised of 13 weeks of lectures, and one week each of mid-semester break and study week. During the course, students in each programme were formed into groups of 4-6. Using the existing CSE course outline as shown in Table 2, the incorporation of Facebook activities were embedded through Task 1, 2 and 3 which were designed to enable students to participate online and be involved in discussion.

Table 2. Existing CSE Course Outline

Week	Topics	Notes
1	The development of the multimedia and smart schools	Task 1
2	Current issues in CSE development	
3	The effectiveness of computer-based materials and computer-assisted learning in education	Task 1 due
4	Design of computer laboratory	Task 2
5	Guide to teaching computer science in different group sizes	
6-7	Teaching approaches of computer science and computer aided learning	Task 2 due
	Semester Break	

9-10	Micro teaching	
11	The development of computer and communication and media in education	Task 3
12	Use of internet in teaching & learning	
13	Distance & virtual learning in teaching	
14-15	Writing and preparing computerized teaching, and learning materials	Task 3 due

The Facebook activities were divided into three modes which were primarily designed to reflect the goal of fostering students' participation through their contribution of course learning resources. Students were organised into groups for this work, with groups formed within CSE programme (SPT, SPL, SPI and SPS). The second mode of Facebook activities had the goal of fostering students' peripheral and emergent interactions through collaboration and negotiations, as they learnt about CSE. The essence of mode two is to move away from closed group discussion but encourage open discussion that can be viewed and accessed by public users. The third mode of Facebook activities was conducted to enable students to share their personal and academic interests and aspirations, thus mixing different contexts of learning, social and personal life. The essence of mode three is to allow students to post and comment on Facebook wall related to affective communication (e.g. group reinforcement, encouragement and support).

Method

This section first presents the study's population and participants, and then describes data collection and analysis for the study.

Participants

The targeted population of this study was the undergraduate students of Universiti Teknologi Malaysia (UTM). According to the official website of UTM, 10846 undergraduate students were enrolled in UTM (as this study was started). A random-purposive sampling method was used to select the samples. Within UTM undergraduate students, students who enrolled in the engineering course were purposively selected because they represent the largest group of students in UTM – 219 random students were chosen as a sample to answer the questionnaire in this study. The second lots of samples were selected based on a stratified-purposive sampling method for CSE course (SPM4712). A total of 80 students were purposively selected based on three different CSE course sections (SPM4712- Section 02, 03 and 05).

Data Collection

There are two parts to the data collection of this study. The first part is the collection of data using questionnaires given to all final year engineering and non-engineering students (approximately 300) through an online method. The questionnaire was organized into three parts. Part A had eight questions on demographics and general use of Facebook. Part B questioned students' experiences on using Facebook. The last part, C, dealt with students' perceptions of Facebook as a learning tool. The second part of data collection was done through the Facebook page. A total of 80 students from three different CSE course sections (SPM4712- Section 02, 03 and 05) participated in the second part of the study.

Data collected from questionnaires was analyzed by descriptive analysis, using Statistical Package for the Social Sciences (SPSS) software version 15.0. Next, a further independent t-test was performed to compare the perceived factors of learning through Facebook approaches between engineering and non-engineering students. Finally, data collected from the Facebook page was analyzed using content analysis to reveal students' interaction learning patterns through Facebook for the CSE course.

Principal Component Analysis

Data obtained from 219 students were analyzed using principal components analysis (PCA) with varimax rotation to identify the underlying factors of the perceived learning con-structs. PCA with varimax rotation was applied on the data to reduce the number of items in the questionnaire down to their principal components, which in this study would be social bonding, social bridging and social intention. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .713, indicating that the sample size relative to the number of ques-tionnaire items was adequate for applying PCA. The Bartlett's test of sphericity was statisti-cally significant (χ 2= 3474.248, p = .000), and indicated

that the overall correlations within the correlation matrix were adequate. In summary, these results showed the factorability of the data, hence justifying the use of PCA in the study.

Preliminary results of the PCA indicated that a few items cross-loaded in the pattern ma-trix table; thus the factor solution could not be accepted. In order to ensure that the issue was solved, some procedures were followed to ratify the problematic items. Firstly, after referring to the communalities table, six items were discovered to be below 0.5 and five items cross-loaded in the pattern matrix while another five items were discovered to be problematic were removed sequentially to get results. After PCA, five items were retained as valid and reliable for Social Bonding, four items for Social Bridging, and five items for Social Intention. Table 3 shows the final factors with their respective items.

Table 3. Factor structure

Constructs	Item statements	Loadings
Social Bonding	Facebook helped me to share ideas or communicate.	.747
	I like participating and sharing my ideas in Facebook discussions	.732
	Facebook provided me an easy way to get additional information for my assignment from my friends.	.717
	I feel Facebook is an effective tool for learning.	.663
	I can connect with lecturer and other students outside the classroom at anytime and anywhere via Facebook.	.640
Social Bridging	I use Facebook to learn more about other people in my class.	.736
	I feel Facebook is suitable for networking.	.713
	Interacting within Facebook was easier than I thought.	.685
	I feel sensitive with my friends' updates in Facebook.	.674
Social Intention	I feel out of touch when I haven't logged onto Facebook for a while	.739
	Facebook is a part of my daily routine.	.734
	I feel I am part of the Facebook community.	.667
	I use Facebook to get attention that I need from my friends.	.662
	I am proud to tell people I'm on Facebook.	.623

Results

Students' demographics

To find out students' perceptions of using Facebook as a learning tool, 219 students of Universiti Teknologi Malaysia (UTM) were randomly selected. Of the 219 students, 150 (68%) were engineering students and 69 (32%) were non-engineering students. 111 (51%) of them were male and 108 (49%) were female. The majority of the respondents were between the ages of 19 and 23 (66%). 42 (19%) respondents aged in the range 24-30, 29 (13%) were in the age range 31 years and above, and 2 (1%) were under 19 years old. Another 1 (1%) were identified as unknown age because he/she did not answer the age question in the questionnaire. Most of the students are Malay (163, 74%) followed by Chinese (35, 16%), Indian (16, 7%) and other (5, 3%). Other than the demographic data, questions about student spending time on the internet and on Facebook were also asked. The result reveals that the majority of students spend more than 3 hours using the internet (98, 45%), followed by 2-3 hours (66, 30%), 1-2 hours (44, 20%), 31-60 minutes (8, 4%), and 10-30 minutes (3, 1%), on a daily basis. From the collected data, it was found that the majority ,34 (40%), of the respondents have 500-999 Facebook friends, followed by 38 (17%) respondents with 301-499 Facebook friends, 34 (16%) respondents with more than 1000 Facebook friends, 29 (13%) respondents have 201-300 Facebook friends, 19 (9%) respondents have 101-200 Facebook friends and another 11 (5%) of the respondents have 'other' total number of Facebook friends. Additionally, an item from the questionnaire was used to investigate the types of content that students shared on Facebook. The results show that the types of content students shared the most was motivational or spiritual quotations with 118 votes, followed by news and current affairs with 96 votes, academic content with 82 votes, photos with 75 votes, personal opinion with 71 votes, moods and emotion with 58 votes, idle talk with 42 votes and 'other' type of content shared with 3 votes (Figure 1).

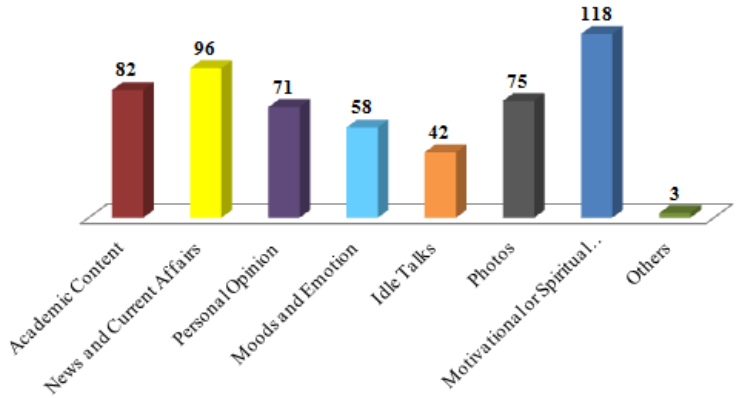

Figure 1. Types of content shared on Facebook

Students' experiences and perceptions of using Facebook

To find out students' experiences and perceptions of using Facebook as a learning tool, data that consisted of Facebook experiences and perceptions was collected through questionnaires. Types of variables were identified, namely type of course as the independent variable which was classified as engineering and non-engineering. Based on the questionnaire items, two constructs were identified from Part B-Facebook experiences (Table 4) and another five constructs were identified from Part C-Facebook perceptions (Table 5).

Table 4. Identified Construct I

Construct	Items From Part B	Mean Scores
Social Bonding	I use Facebook to keep in touch with my old friends.	3.28
	I use Facebook to get attention that I need from my friends.	2.20
	I feel out of touch when I haven't logged onto Facebook for a while.	2.31
	I feel I am part of the Facebook community.	2.67
Social Bridging	Facebook is a part of my daily routine.	2.68
	I am proud to tell people I'm on Facebook.	2.10
	I have used Facebook to check out someone I met socially.	2.74
	I use Facebook to meet new people.	2.53

Table 5. Identified Construct II

Construct	Items From Part C	Mean Scores
Sharing perspectives	I like participating and sharing my ideas in Facebook discussions.	2.84
	Facebook helped me to share ideas or communicate.	3.03
	Facebook helped me to share ideas.	3.03
Communicative process	I prefer seeking out feedback from my friends in Facebook.	2.61
	I can connect with lecturer and other students outside the classroom at anytime and anywhere via Facebook.	3.05
	I feel happy when I get a response from my friends in Facebook.	2.83
Emotional/ cohesiveness (social) expression	I prefer to focus my attention on my friends' updates in Facebook.	2.51
	I feel sensitive with my friends' updates in Facebook.	2.40
	I like to express my emotions in Facebook.	2.18
Peers Interaction	I use Facebook to learn more about other people in my class.	3.02
	Interacting within Facebook was easier than I thought.	2.80
	Facebook provided me an easy way to get additional information for my assignment from my friends.	3.00
Tools and resources (learning)	I feel Facebook is suitable for learning.	2.71
	I feel focused by mixing information and learning resources in Facebook.	2.65
	I feel Facebook is an effective tool for teaching and learning.	2.69

A further independent t-test was conducted to seek any statistically significant mean difference between engineering and non-engineering.

Table 6. Independent t-test for all constructs

Dependent Variable	Course	Mean	SD	p-value
Social Bonding	Engineering	2.56	0.44	0.007
	Non Engineering	2.73	0.37	
Social Bridging	Engineering	2.48	0.51	0.091
	Non Engineering	2.60	0.44	
Social Intention	Engineering	2.93	0.42	0.486
	Non Engineering	2.90	0.41	
Sharing Perspective	Engineering	2.93	0.42	0.63
	Non Engineering	2.90	0.41	
Communicative Process	Engineering	2.91	0.40	0.60
	Non Engineering	2.88	0.42	
Peers Interaction	Engineering	2.88	0.28	0.000
	Non Engineering	2.70	0.25	
Emotional/cohesiveness (social) expression	Engineering	2.56	0.32	0.005
	Non Engineering	2.70	0.31	
Tools and resources (learning)	Engineering	2.77	0.47	0.024
	Non Engineering	2.62	0.40	

Further, the independent t-tests were conducted to seek any statistically significant mean difference between engineering and non-engineering. Findings were presented within the constructs studied.

Social Bonding: Social bonding is the binding tie or the bonding between a person with their family, friends, and people surrounding them. Social bonding usually occurs within groups or community where the people in the group interact with each other. In this research, social bonding was used to examine the relationship bonding between students and their peers when interacting via Facebook. There was significant difference in the scores for engineering students (M = 2.56, SD = 0.44) and non-engineering students (M = 2.73, SD = 0.37); t (214) = -2.71, p=0.007. The result suggests that there is a significance difference between engineering students and non-engineering students in terms of social bonding while using Facebook.

Social Bridging: This construct refers to the interaction between different groups or communities. This research was to see if there was social bridging between students and other groups or communities inside Facebook, and also to find out whether there was a difference between engineering and non-engineering students. There was no significant difference in the scores for engineering students (M = 2.48, SD = 0.51) and non-engineering students (M = 2.60, SD = 0.44); t (216) = -1.70, p=0.091. This result suggests that there is no difference between engineering students and non-engineering students in terms of Social Bridging while using Facebook.

Social Intention: This construct was used to determine in the students' social activities using Facebook as their tool for social purpose. The activities include academics, news and current affairs, personal opinions, and motivational quotations. There was no significant difference in the scores for engineering students (M = 2.93, SD = 0.42) and non-engineering students (M = 2.90, SD = 0.41); t (216) = 0.486, p=0.63. This result suggests that there is no difference between engineering students and non-engineering students in term of sharing their social activities while using Facebook.

Sharing Perspective: This construct was examined to determine the sharing activities through Facebook that were carried out by students. The sharing includes academics, news and current affairs, personal opinions, and motivational quotations. There was no significant difference in the scores for engineering students (M = 2.93, SD = 0.42) and non-engineering students (M = 2.90, SD = 0.41); t (216) = 0.486, p=0.63. This result suggests that there is no difference between engineering students and non-engineering students in term of sharing perspectives while using Facebook.

Communicative Process: Several items were identified as communicative processes in which students used Facebook as a means of communication between their peers and instructors. This construct was used to determine the use of Facebook as a communication medium among students. There was no significant difference in the scores for engineering students (M = 2.91, SD = 0.40) and non-engineering students (M = 2.88, SD = 0.42); t (216) = 0.527, p=0.60. This result suggests that there is no difference between engineering students and non-engineering students in terms of the Communicative Process while using Facebook.

Peers interaction: This construct was used to determine students' inclination to use Facebook with the purpose of interacting with their peers. From the test, there was significant difference in the scores for engineering students (M = 2.88, SD = 0.28) and non-engineering students (M = 2.70, SD = 0.25); t (213) = 4.40, p=0.000. This result suggests that there is a difference between engineering students and non-engineering students in terms of Peers Interaction while using Facebook.

Emotional/Cohesiveness (Social) Expression: This construct was used to find out students' emotions and feelings when interacting on Facebook, and the emotional expression that they shared on Facebook. From the test, there was a significant difference in the scores for engineering students (M = 2.56, SD = 0.32) and non-engineering students (M = 2.70, SD = 0.31); t (215) = -2.86, p=0.005. This result suggests that there is a difference between engineering students and non-engineering students in terms of emotional/cohesiveness (social) expression while using Facebook.

Tools and Resources: The last construct identified from the questionnaire was the tools and resources for Learning. This construct was used to find out the use of Facebook as a learning tool among students. From the test, there was significant difference in the scores for engineering students (M = 2.77, SD = 0.47) and non-engineering students (M = 2.62, SD = 0.40); t (215) = 2.28, p=0.024. This result suggests that there is a difference between engineering students and non-engineering students in terms of tools and resources (learning) while using Facebook.

Facebook Interaction Patterns

A Facebook group was created for the purposes of collecting students' interaction patterns with their peers and instructors. All students' interactions in Facebook group were then analyzed using content analysis in order to reveal their interaction pattern in Facebook. To investigate students' interaction patterns in Facebook, four learning dimensional patterns were used: Participative dimension, social dimension, interactive dimension and cognitive dimension. The Participative Dimension was used to measure students' participation in Facebook. There were two themes that were used where dimension of Posting was used to measure the number of postings the student's made, either in the individual Facebook group or in the course's Facebook wall. Results showed that SPT is the high level participation group with a high number of postings and viewings, while SPI and SPL are the active groups with a high number of postings but low number of viewings. The SPS group was considered as low participation because the number of postings and viewings made by students was low. Social Dimension was used to measure social cues made by students while discussing and interacting with their peers and instructor on Facebook. The most social cues made by students were the Emoticon Icons and the least were concern and encouragement. Students from SPL group made the highest number of social cues while interacting via Facebook. Interactive Dimension: This identifies students' interaction pattern while learning via Facebook by measuring their cooperation and collaboration interactions while working towards task completion. Cognitive Dimension is used to measure students' cognitive ability when responding to issues on Facebook. Several cognitive indicators were used to determine students' cognitive ability, namely: clarification, inference, judgment, and strategies. This shows that the highest interaction made by students in cooperative theme is providing information, and the least interaction is suggesting new ideas. Overall result shows that students are mostly clarifying the issues or tasks given in the Facebook group.

Discussion

The demographics finding shows that most students spend more than three hours per day surfing the internet. In addition, it was also found that the majority of the students spend 1-2 hours a day on Facebook. These findings are similar to the findings of research conducted by Mustaffa et al. (2011) who found that Malaysian youth spend 1-3 hours a day on Facebook. In investigating students' perceptions of using Facebook as a learning tool, seven constructs were identified, namely: social bonding, social bridging, sharing perspectives, communicative process,

emotional/cohesiveness (social) expression, peers interaction, and tools and resources (learning). A series of independent t-tests were also conducted to find out whether there was any statistical difference between engineering students and non-engineering students' perceptions of using Facebook in teaching and learning. The first and second constructs were used to examine whether social bonding and bridging were perceived by students within the Facebook environment. Results show that there was a significant difference between engineering and non-engineering students in terms of social bonding activities within Facebook. However, no significant difference was found for social bridging. This shows that students perceived the use of Facebook as a medium to get updates from their friends. This finding is consistent with several other studies that reported students' primary motive of using Facebook was to maintain existing relationships and to keep in touch with their old friends (Ellison, Steinfield, & Lampe, 2007; Yahaya, Puteri Yusof, Abd Halim, 2013; Wang et al., 2012).

Descriptively, the sharing perspective construct shows no significant difference between engineering and non-engineering students. The findings indicated that students perceived Facebook as a place where they could easily share their ideas with their friends on Facebook. Next, the communicative construct also shows that there was no significant difference between engineering and non-engineering students in terms of how students perceived the use of Facebook as a communication medium to stay in touch with their friends and lecturers. However, the last three constructs (emotional/cohesiveness, peer interaction and tools and resources) show that there were significant differences between engineering and non-engineering students in terms of their emotional expression, reciprocal relationship and learning material support when engaging in Facebook activities. Finally, the Facebook interaction patterns show that SPT students had high participation and interaction leading to learning, but were average in social and cognitive aspects. On the other hand, SPL students showed an active participation, with high reciprocal interaction and high social cues, but average for cognitive aspect. In a similar vein, the SPI students showed an active participation and high reciprocal interactions, with average social and low cognitive aspects. As for the SPS students, they showed low in all aspects (participation, interaction, social and cognitive) to learning in Facebook.

Limitation and Future Studies

Any educational studies have some constraints and limitations. This study is no exception and has some limitations in terms of the methodology used. In terms of access to participants, this study faced two constraints. Firstly, the researcher was also the instructor who taught the class. While the issues of power and authority were considered, which related to the assessment of the course, it is likely that this position could have influenced the students' interactions. Secondly, when this study was conducted, there were frequent interruptions to the Internet connection. It is likely that this situation could have affected the research outcomes and therefore may not have adequately captured the students' potential interactions in Facebook. Nevertheless, this study could be possibly further by including different aspects in designing, implementing and evaluating the use of Facebook such as a more personalised user interface, learning resource, learning activities; guidance and communication. Additionally, the approaches to learning, known as learning style, cognitive style, learning strategies, learning patterns or study orchestrations; also bear further investigation in order to understand the effects of learning interactions within the context of Facebook.

Conclusion

This research has revealed several findings on students' perceptions of using Facebook as a learning tool and their interaction patterns while learning via Facebook. This study found that students had positive perceptions towards the use of Facebook in learning, which they used to interact with their friends, and at the same time, informally engaged for academic purposes. The research also revealed students' interaction patterns based on selected dimensions (participative, interactive, social and cognitive). The findings indicated support for social constructivism, which promotes knowledge being distributed across a network of connections for various groups of students (SPT, SPL, SPI, and SPS).

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