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Using Web 2.0 Tools to Enhance Learning in Higher Education: A Case Study in Technological Education

Chi-Un Lei, Tomas Krilavičius, Nan Zhang, Kaiyu Wan and Ka Lok Man

Abstract—Pedagogy with Web 2.0 technologies is shown to facilitate the teaching-learning process through content sharing and idea collaboration. In this paper, we explore the possibility of using social networking tools, to support teaching practice in technological courses. In our study, we utilized i) Facebook Page as a platform to share content, experiences and news of a general engineering course, and ii) blog as a collaborative writing tool to express thoughts and opinions in a common core (general education) course. After our one-semester (three-months) study, we found that Facebook Page is an easy-to-use and familiar tool for students to share and exchange ideas among classmates, peers and public.

Index Terms—Information technology in education, general education, Facebook, social media network, blog, technological education, higher education

I. INTRODUCTION

With recent advances in information technologies, an emerging mode of abstraction known as the “Web 2.0” has begun to change the paradigm of higher education [1]–[3]. Web 2.0 can be defined as “the social use of the Web which allows people to collaborate, to get actively involved in creating content, to generate knowledge and to share information on line” [4]. Web 2.0 development is shown to improve teaching and learning, and encourage student’s participation and collaboration. Different techniques, such as blog [5], [6], wiki [6] and other social networking tools [7]–[10], have been adopted in teaching practices. In our tertiary institution, we have also designed new curriculum [11]–[13] and adopted information technologies [14], [15] to facilitate the process of teaching and learning. In particular, in the Department of Electrical and Electronic Engineering, we have adopted various Web 2.0 technologies, for knowledge advancement and dissemination.

In this paper, we give an evidence-supported discussion about the effectiveness of technological teaching using Web

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Fig. 1. Sample view of the course FB Page for ENGG1015.

2.0 tools. Section II describes the study of using a social networking tool (Facebook (FB) Page [16]) for teacher-student communication in a general engineering course. Meanwhile, Section III describes the study of using blog (Blogger [17]) for collaborative writing in a technological common core (general education) course.

II. SOCIAL NETWORKING TOOLS FOR COMMUNICATIONS IN A GENERAL ENGINEERING COURSE

Introduction to Electrical and Electronic Engineering (ENGG1015) is a general engineering course first offered in 2010 by the Department of Electrical and Electronic Engineering [18]. Besides introducing to students the world of electrical and electronic engineering through twelve-weeks lectures, it also includes a design-based project to develop student’s indispensable skills as an engineer.

Based on the survey result from the pilot study, we decided to improve teacher-student communications within the class. Therefore, we adopted a social networking tool FB Page as a complementary tool to announce course news, share course materials and stimulate students’ (informal) discussions. A sample view of the constructed FB Page is shown in Fig. 1.

A. Facebook Page and its application in education

FB Page is a public FB profile that enables people to share their belief or interest. FB Pages are integrated with FB system, but also can be viewed by both FB’s users and public. Page owners, group members and public can distribute their news/opinions and share materials publicly through the “News Wall”, (mobile) FB system, microblogging tools (e.g. Twitter) and free-access RSS feed. Meanwhile, organizers

can also analyze the traffic flow of the Page through in-built tools. Furthermore, FB Pages allows customization by adding new Tabs using static FBML applications. This feature can bring additional functionality to the Page such as e-mail collections, specialized contents, or landing pages for activities.

Due to the dedicated features of FB Pages, there are some advantages of using FB Page in teaching:

- It acts as a friendly, interactive and less formal channel of communication with instructors/teaching assistants and classmates, since students use FB in everyday life.
- It provides a prompt and convenient channel for communication, giving feedback and raising questions. It is also convenient and free to share videos, photos and teaching materials using FB Page. It is considered useful for seeking prompt help, news announcement and resource sharing.
- It automatically generates a free-access RSS feed, which can be seamlessly imported into Internet news aggregators for news distribution to students.
- It can be customized for diverse teaching purposes.

B. Role of students and teachers in the FB Page

Students can use the developed course FB Page for the following purposes:

- raise questions about the course;
- discuss interactively and friendly with teaching assistants and classmates;
- obtain the most updated information about the course;
- share class photos and videos (with tags) of learning activities, such as mini-project, laboratory sessions and group project.

Meanwhile, instructors and teaching assistants can use the course FB Page for the following purposes:

- provide quick-response assistance to students about learning activities and assignments;
- discuss interactively and friendly with students;
- announce news about course administration, lectures, laboratory sessions, tutorials and homework;
- share photos and videos (with tags) of learning activities, such as mini-project, laboratory sessions and group project.

C. Tool evaluation

1) *Usage statistics:* Table I shows the FB Page usage statistics. Results show that there is a strong communication and collaboration across the FB Page. Statistics show that not only students and teaching assistants visit the Page, but also friends of the community and observers from the Faculty of Education. Therefore, it serves its purpose of communication and collaboration. Furthermore, uploaded (and tagged) photos, "Like", (positive and constructive) comments from their peers can stimulate students to participate collaboration in FB Page and learning activities of the course.

2) *Student questionnaire:* A survey analysis was used to evaluate the effectiveness of using FB Page in teaching and learning. The class that we studied consists of 141 students. In total, 89 students completed the survey resulting in a response rate of 63%.

TABLE I
FACEBOOK PAGE USAGE STATISTICS.

Item	Total number
Post views	44,208
Post feedback	4,495
"Likes"	6,428
Comments	269
Photos	110
Videos	31

In the questionnaire, we have posed Likert-type statements related to teacher-student communications. Table II shows the score distribution and the mean score that we have obtained on each of the statements. As can be seen, students agree that that FB Page facilitates teacher-student/student-student communication, in particular, they feel comfortable and open to use FB Page for communications. Such environment facilitates collaborations.

3) *Student comments:* Besides quantitative data, we also collected open-ended feedback. Overall, responses were positive. Many students acknowledge the benefits of using FB Page in learning, e.g.:

- "It is open. We can see other groups' project and get a lot of information."
- "Good idea for communication with students."
- "Very convenient. It's easy to see updates which shows up on news feed that I check often."
- "It is good to have the Page to get the information easily. Also, the Page also allow me to know more about the course, the HW and learning materials."
- "It was a good initiative and should be continued."

From questionnaire and comments, we can observe that most students have adopted Facebook Page for collaborative activities.

On the other hand, some students worried about their privacy and the invasiveness of social networking tools to their everyday life. Furthermore, some comments show that the effectiveness of social networking tools can be affected by students' social behavior and background culture. Examples of negative comments are as follows:

- "I didn't browse the Facebook Page, it is not organized in a systematic manner. all items were mixed up."
- "It should not be polled using Facebook, (since) that's not fair to those who do not have Facebook account."
- "Facebook is not quite popular among mainland students."
- "Who want to care about the study when browsing Facebook? Most of us use Facebook to communicate with friends, (but) not to work on the project nor study."

We believe, since FB is the most common social networking tools, and should be familiar for most of the students, we believe that FB is the best tool for collaborations and communications.

III. BLOG FOR COLLABORATIVE WRITING IN A TECHNOLOGICAL COMMON CORE COURSE

Everyday Computing and the Internet (CCST9003) is a common core (general education) course first offered in 2010 by the Department of Electrical and Electronic Engineering [19]. Besides introducing to students a "computational thinking" concept through twelve-weeks teaching,

TABLE II
NUMBER OF STUDENTS WHO INDICATED AGREEMENT-DISAGREEMENT IN THE SURVEY (1=STRONGLY DISAGREE, 2=DISAGREE, 3=NEUTRAL, 4=AGREE, 5=STRONGLY AGREE).

Survey item	1	2	3	4	5	Mean score
1. Using Facebook Page is efficient to share course-related videos, materials and news.	4	6	17	36	20	3.75
2. I can read the course Facebook Page asynchronously, anytime, anywhere.	2	9	13	40	19	3.78
3. Communication using course Facebook Page is student-centered.	3	6	15	45	14	3.73
4. Communication using course Facebook Page is on-demand.	3	6	25	39	10	3.57
5. Communication using course Facebook Page is collaborative.	4	3	25	43	7	3.56
6. Communication using course Facebook Page is interactive.	4	3	18	42	16	3.76
7. Communication using course Facebook Page is open.	2	1	13	46	21	4.00
8. Communication using course Facebook Page is comfortable.	4	4	15	37	23	3.86

CCST9003 also discuss intensively the societal impacts of computing technologies on our daily life, through surveying of computational methods and analysing usage of computational methods.

We want to facilitate collaborative writing and knowledge dissemination of content developed by instructors and students. Therefore, we use an open-access blog tool, Blogger, as a complementary tool to share course materials and create discussion with students.

A. Blog and its application in education

Blog is an electronic diary published on the Internet. Usually, it has a single theme, and can be written by individual or a group of authors. Since visitors can express their opinion to author and readers by commenting entries, it is an interactive and collaborative writing tool. Authors can also build social relations with their readers and bloggers (author(s) of other blogs). Author can construct and customize their blog site using Wordpress [20] or other blogging tools. They can also use online blogging tools, which can be customized via a CSS template and have a better technical support.

Some advantages of using blog in teaching are as follows:

- both teachers and students can write, share, and collaboratively create content;
- content can be shared with peers and public;
- blog commenting may increase learning for the course and interaction with classmates and peers.

B. Role of students and teachers in the blog

Students can use the blog site for the following purposes:

- develop course content, such as project report (survey and critique) and presentation slides;
- discuss interactively and friendly about content developed by peers and instructors through commenting;
- share content through emails or social networking tools.

Meanwhile, instructors and teaching assistants can use the blog site for the following purposes:

- develop course content, such as random thoughts (discussions of muddly questions), follow-up of discussions, questions and guidelines of tutorials;
- participate students' discussions and answer questions from students.

C. Tools evaluation

1) *Usage statistics:* Table III shows the FB page usage statics. In total, there are 6,029 post views and 26 comments.

TABLE III
DISTRIBUTION OF VISITORS TO CCST9003 BLOGSITE.

Country/Region	Number of visitors
Hong Kong	3,619
United States	716
India	155
France	153
Germany	138
Russia	136
United Kingdom	121
Canada	76
Netherlands	59
Latvia	45

Results show a strong collaboration across the blog site. In particular, visitors were not only students and friends of the community, but also from developing countries (e.g. India), countries in transition (e.g. Latvia) and developed countries (e.g. US and western European countries). Therefore, we can conclude that the developed blog site achieved its purpose to disseminate knowledge and spread the idea of “computational thinking” to the public.

2) *Student questionnaire:* A total of 92 students participated in the end-of-semester survey resulting in a response rate of 95%. Tables IV and V show the survey result. The data from Likert-type questions in Table V indicates that blog is generally effective and useful for collaborative writing. Some observations from the survey are shown as follows:

- most students agree that they can learn from the content provided by instructors and peers. This implies that blog can create an effective environment for collaborative learning;
- there is a merely positive impact in student interaction, which is similar to other studies [7]. Some students elaborated that they are more familiar with microblogs than blogs;
- students agree that blog is a “on-demand” learning tool.

3) *Comments from readers:* Besides survey from students, we also collected feedback from blog readers. Overall, responses were positive. Readers acknowledge the benefits of using blog in knowledge dissemination, e.g.:

- “Great! By sharing this post you have actually sorted out my confusion that I was facing in this concept. Thanks a lot for providing satisfactory answers for each of the problem shared above.”
- “This is very informative blog because I never heard about this topic related blogs. It gives immense pleasure while reading your blog. Still I need to learn more

TABLE IV
DISTRIBUTION OF VISITORS TO CCST9003 BLOGSITE.

1. How many blog articles do you read per visit?	1 28	2 46	4-6 12	7-10 4	>10 2
2. How many blog articles do you read in total?	1-5 36	6-10 40	11-20 13	21-40 2	>40 1

TABLE V
NUMBER OF STUDENTS WHO INDICATED AGREEMENT-DISAGREEMENT IN THE SURVEY (1=STRONGLY DISAGREE, 2=DISAGREE, 3=NEUTRAL, 4=AGREE, 5=STRONGLY AGREE).

Survey item	1	2	3	4	5	Mean score
1. I can read the blog asynchronously, anytime, anywhere.	1	12	31	34	14	3.52
2. The blog can enhance my understanding of technological issues in different aspects.	1	6	32	40	13	3.63
3. Blog is a suitable tool for presenting ideas.	3	11	34	29	15	3.46
4. I learned from student-developed contents (e.g. student survey and student critique).	2	11	34	38	7	3.40
5. The student-developed contents were clear and accurate.	0	8	47	31	6	3.38
6. I learned from instructor-developed contents (e.g. feedback of tutorial and random thought).	3	4	23	46	16	3.74
7. The instructor-developed contents were clear and accurate.	2	2	24	50	14	3.78
8. Blogging increased learning for this course.	3	10	32	36	11	3.46
9. Blog commenting increased learning for this course.	4	16	38	28	6	3.17
10. Blogging increased interaction with my classmates.	4	16	32	31	9	3.27
11. Blog commenting increased interaction with my classmates.	4	20	32	32	4	3.13
12. I prefer the blog format for the project oral presentation and the project report.	5	18	36	25	8	3.11
13. I will continue to read this blog in the future.	5	17	39	25	6	3.11

regards to these topic.”

- “I never knew the terms that you mentioned i.e. high, low, and no tech. And never thought that things can be classified in these. Your blog added these to my dictionary so thanks.”

IV. CONCLUSION

In this paper, we have evaluated the effectiveness of using Web 2.0 tools (social networks and blogs) in the teaching of two technological courses. Evaluation shows that social networking creates a blended, social constructive learning environment that encourages collaboration, conversation and sharing. Results of the study can be extended to several directions, namely:

- mobile learning via social networking;
- teaching and learning via microblog;
- Web 3.0 tools (e.g. augmented reality, semantic web) for education.

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