INTEGRATION OF WEB 2.0 TOOLS IN LEARNING A PROGRAMMING COURSE

Dr. Nazatul Aini Abd Majid
*Center of Artificial Inteligence (CAIT), Faculty Information Science and Technology(FTSM), Universiti Kebangsaan Malaysia (UKM),
Bangi, Selangor, Malaysia*
nazatulaini@gmail.com

ABSTRACT
Web 2.0 tools are expected to assist students to acquire knowledge effectively in their university environment. However, the lack of effort from lecturers in planning the learning process can make it difficult for the students to optimize their learning experiences. The aim of this paper is to integrate Web 2.0 tools with learning strategy in order to enhance the motivation of the students to use the Web 2.0 tools. The integration of the tools in learning a programing course is based on PQR strategy, which includes three components: Preview, Questions and Reflect. The study sample consisted of 39 undergraduate students for identifying their preference towards the use of Web 2.0 tools which include Blog, Youtube, Google Form and Padlet. The results show that the perception of students towards the use web 2.0 tools was positive. Hence, it was possible to integrate a learning strategy with specific Web 2.0 tools, and, thus, facilitate blended learning.

KEYWORDS: Web 2.0 tools, teaching and learning, programming course

INTRODUCTION
Collaboration, social-networking, as well as knowledge generation and sharing have been identified as the key learning technology trends that will reshape the education worldwide (Brown & Adler, 2008; Hargadon, 2008). Higher education is undergoing a major transformation enabled by Information Technology (IT), such as Web 2.0 tools, which support the key learning trends (Grosseck, 2009). Moreover, Web 2.0 tools provide on-demand applications for students in retrieving and sharing knowledge in a distributed environment. This supports the need for a new approach, as suggested by Brown and Adler (2008) who explained:

> "We now need a new approach to learning – one characterized by a *demand-pull* rather than the traditional *supply-push* mode of building up an inventory of knowledge in students' heads".

Students treat everything offered by Web 2.0 tools as a service. In fact, this is a concept of cloud computing where applications reside in the cloud (O'Reilly, 2008). Google docs spreadsheets are a cloud application (O'Reilly, 2008) where students from different locations can co-edit the same document simultaneously (Qiyun & Huay Lit, 2009). Moreover, students can share knowledge, give comments, support ideas or retrieve new knowledge whilst networking with their friends at the same time by using a prominent example of social networking services, Facebook (Uzunboylu, Bicen, & Cavus, 2011). Thus, integrating Web 2.0 tools for higher education offers many advantages, as stated by Grosseck (2009), which include: easier and faster access to information, when and where it is needed; sharing accumulated experiences and resources; and compatibility with the elements of the educational field and the existing contextual dynamics.

More and more higher education institutions are taking advantage of Web 2.0 tools, including the University of Leeds, University of Brighton and University of Edinburgh. In the University of Warwick, for example, blogs are being widely used with 4,540 blogs that have changed the social context for students in this university (Franklin & Van Harmelen, 2007). One of the leading universities in Malaysia, Universiti Kebangsaan Malaysia (UKM), is also moving towards implementing the use of Web 2.0 in teaching and learning. Training has been given to the interested staff about Web 2.0, for example, Web 2.0 workshop series concerning presentation tools, content creation tools, research tools, survey/voting tools and collaborative tools. In fact, an e-book entitled 'Web 2.0 Research Tools: A Quick Guide' has been published online by the co-director of the Academic Development Centre in UKM. This e-book is accessible for free at http://www.scribd.com/doc/95039625. This situation, together with the recent progress in many higher institutions, has shown the role of Web 2.0 tools in transforming the teaching and learning environment into a new era.

In the transformation, however, the best way to leverage the use of Web 2.0 tools needs to be found in order to optimize the teaching and learning activity. Since the teaching approaches of the lecturer can influence the attitude of their students, which are now mostly from digital natives (Margaryan, Littlejohn, & Vojt, 2011), some frameworks based on the Web 2.0 learning design have been developed in order to promote more confidence in learning using Web 2.0 tools. Bower et al. (2010), for example, provide a comprehensive list that categorizes the Web 2.0 tools into knowledge types, pedagogies, modalities and synchronicities. In addition, Grosseck (2009) provides a table for integrating Web 2.0 technologies in educational applications in higher education. However, there is still a lack of research that integrates the Web 2.0 tools into the teaching and learning strategy,

particularly in computer science courses. Therefore, the objective of this research is to integrate the Web 2.0 tools with learning strategy in a programming course in a higher education institution, UKM. A blog was used to integrate various education resources from different web 2.0 tools. A questionnaire was given to 39 programming students in order to assess the preference of students towards the use of web 2.0 tools in their learning.

LITERATURE REVIEW

A variety of strategies that integrate Web 2.0 tools in the teaching-learning environment can be found in the literature in this twenty-first century. The movement from conventional teaching methods (supply-pull mode) to service-oriented teaching methods (demand-pull mode) has been inspired by the use of cloud computing applications: Web 2.0 tools. Inspired by the definition of cloud computing by the National Institute of Standards and Technology (NIST)(Mell & Grance, 2009) and cloud manufacturing by Xu (2012), cloud education may be defined as *a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable education resources (e.g., education software tools, education contents and education support) that can be mapped with Web 2.0 tools, and teaching and learning strategy*. In order to develop a teaching plan using web 2.0 tools, three factors should be under considerations. These factors are:

1. Education resources - what resources are used in the learning system using Web 2.0 tools?
2. Strategy selection layer - which learning strategy is selected for planning the teaching and
3. Implementation layer - how frequently can the lecturer monitor the learning process and how is the interaction between lecturers and students during the process?

Education resources layer

The key function of this layer is to identify the education resources required for learning development. The identification of the resources is not only based on the permanent need of the subjects, but also the changing needs of the students. The education contents used in this layer may have been created from information based on the syllabus and course materials, e.g., web (scribd, slideshare), documents (pdf, words), presentation (.ppt), accumulated experiences, pictures and videos. In an object-oriented programming course in UKM, for example, contents in the form of presentation slides is the main content source to cater to the permanent need of the subject. Meanwhile, the changing needs can be catered using other sources of contents, such as discussion, videos and blogs on the web.

Strategy selection layer

The main function of this layer is to select a strategy that is suitable for understanding the course materials using all the identified contents in the education resources layer. In the programming course, the course materials are in a presentation format developed using Microsoft Power Point where most of the contents are presented in text. Many strategies have been developed in order to improve learning from text. Kombartzky et al. (2010) listed some examples including the MURDER-Strategy (Mood, Understanding, Recalling, Digesting, Expanding, Reviewing; Dansereau et al., 1979) and the PQ4R-Strategy (Preview, Question, Read, Reflect, Recite, Review; Thomas & Robinson, 1972). In this paper, a strategy based on PQ4R was used because it can be expanded to not only text, but also other forms of contents. However, the strategy was slightly modified by using only one R, Reflect, instead of 4R in order to use the Web 2.0 tools in a suitable way.

Implementation layer

The key function of this layer is to implement the integration of Web 2.0 tools in learning and teaching. There are three levels of frequency of use in this layer – pre, during and post lecture. In this paper, the interaction between Lecturer-Student happens throughout the framework where the lecturer usually initiates the interaction. For example, for each new chapter, the lecturer provides the intention of each new lesson on a blog page, embeds a video on the blog page for preview and posts a question on a wall and blog before the lecture. The lecturer then uploads the materials for the new chapter in a learning management system and the contents of the new chapter are usually discussed during the lecture. Finally, in order to reflect on their lesson after the class, the lecturer posts information and questions about the new topic on the blog page using Google form.

CASE STUDY

A blog was designed as shown in Figure 1 to integrate various web 2.0 tools to engage students' attention in learning complex materials in a programming course. The integration of Web 2.0 tools was implemented as below:

- Platform- Blog
  A blog entitled Object-oriented programming was created where selected web 2.0 tools were integrated on the blog page (Figure 1).
- Preview – YouTube embedded in Blog

Videos from YouTube were embedded in the blog for students to view before the class (Figure 2).
- Questions – Padlet embedded in Blog
  A wall was created using Padlet so that students can post questions before the class (Figure 3).
- Reflect – Google form embedded in Blog
  An exercise based on a specific topic was created using Google form. Students can reflect their understanding using this exercise after class (Figure 4).

Participants
The study sample consisted of 39 undergraduate students who enrolled for subject OOP from the Information Science programme and Multimedia programme. These students were assumed to have the ability to use Web 2.0 tools because they were doing an information technology course in UKM. In fact, they were second-year students.

Instruments
Data was collected from a questionnaire entitled *The integration of Web 2.0 tools in teaching and learning in object-oriented programming course*. This questionnaire uses a 7 point scale from strongly disagree to strongly agree. Questionnaires were completed by the students in the last week of the semester.

Data analysis
Each student completed the questionnaire that was uploaded online. Analysis of the questionnaire was done by using descriptive statistics.

RESULTS AND DISCUSSION
Table 1's two rightmost columns display descriptive statistics for each item that describe the preference of the students towards the use of web 2.0 tools. The highest mean scores were yielded by item 11 with min 5.36 and frequency of students selected scale 5, 6 and 7 was 29 out of 39. The lowest mean value was obtained by item number 1 with min 4.56 and frequency of students selected scale 5, 6 and 7 was 19 out of 39. Overall, min for every item ranged from 4.56 - 5.36. These results indicate that students were moderately favoured the use of web 2.0 tools in learning the course.

Table 1: Survey statements and the received responses

No	Statement Total response for	Frequency (scale 5-7)	Mean
1	I like to watch related videos on YouTube suggested by lecturers before class	19	4.56
2	Questions posted by the lecturer in the discussion through padlets before the class increase my curiosity	29	4.95
3	I like to receive materials for reading using blogs	29	5.13
4	I like to access the recorded lessons	29	5.26
5	I like to share lesson contents on Facebook/blog	26	5.10
6	Sharing information in web 2.0 tools (e.g., Facebook and blogs) increases my motivation	31	5.31
7	I like to discuss about the lesson using the web 2.0 tools, e.g., Facebook and blogs	25	4.69
8	Being able to connect with the lecturer using web 2.0 tools after class can increase my interest in such lessons.	27	5.13
9	To learn lesson based on PQR using web 2.0 tools make learning more effective and attractive	26	4.90
10	If web 2.0 tools are used for my other lessons, my success will increase.	24	4.64
11	How motivated do you feel towards the use of web 2.0 in your studies now?	29	5.36

The highest mean score corresponds to item 1 which states I am motivated to use web 2.0 tools in my studies now. 29 out of 39 students thought that it was true that they were motivated to use web 2.0 tools in learning this programming course. Since programming language Java is difficult to learn (Pendergast, 2006), the use of web 2.0 tools in learning can help in increasing the students' interest towards the subject. Meanwhile, 31 out 39 of

the respondents agreed that sharing information in web 2.0 tools (e.g., Facebook and blogs) increases their motivation (item 6). This might be because they want a platform to share and discuss the lesson for further understanding.

Since web 2.0 tools are emerging technology in education, further understanding about the preference of the students towards these tools can further help in the learning process. 24 out of 39 students agreed that If Web 2.0 tools are used for my other lessons, my success will increase (item 10). This shows an interesting finding in which the students may want to use Padlets to post their questions, use blog to share information related to the subject or use Youtube to preview the contents of the upcoming class. For example, a student can stick a note on a wall for any questions related to a topic anonymously. The lecturer, then, can discuss every sticky note on the wall during the lecture. The students will be appreciated when the lecturer responds to their questions in this interaction.

Another interesting finding is that 26 out of 39 students agreed that learning based on PQR using web 2.0 tools make learning more effective and attractive. This shows that web 2.0 tools provide an alternative way for the students to discuss the subject with the lecturer other than face-to-face meeting. This is also support the finding that web 2.0 tools can be used for blended learning. Blended learning models stated by Köse (2010) was:

"Blended learning models are formed by combining face to face education and online learning activities mostly. In this case, teachers can use advantages of both face to face education and online learning"
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CONCLUSIONS

A strategy for integrating web 2.0 tool was proposed in order to organize education resources for a specific subject effectively. A learning plan using web 2.0 tools can be developed using a PQR strategy where students can do online learning based on three important components in learning which are: preview, questions and reflect. This can support blended learning where students with different learning style can get benefits from a combination of using on-learning learning and face to face education. Therefore, the learning plan was not only to capture the interest of students for optimizing their learning experience but also to cater to the needs of all students with different levels of thinking.

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FIGURES

Figure 1: The integration of web 2.0 tools in a learning plan.
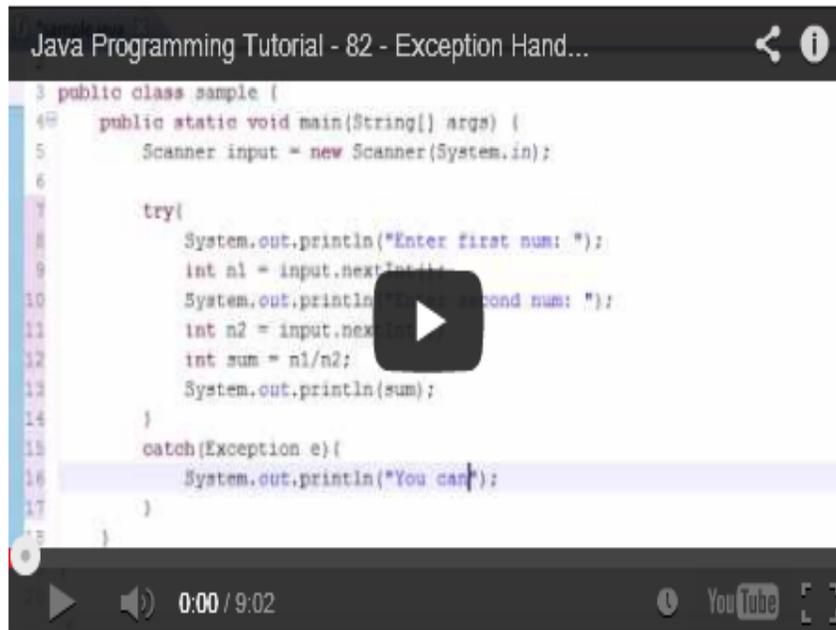
2. Preview this great video

Figure 2: Youtube is integrated on a blog for preview item in the learning plan.
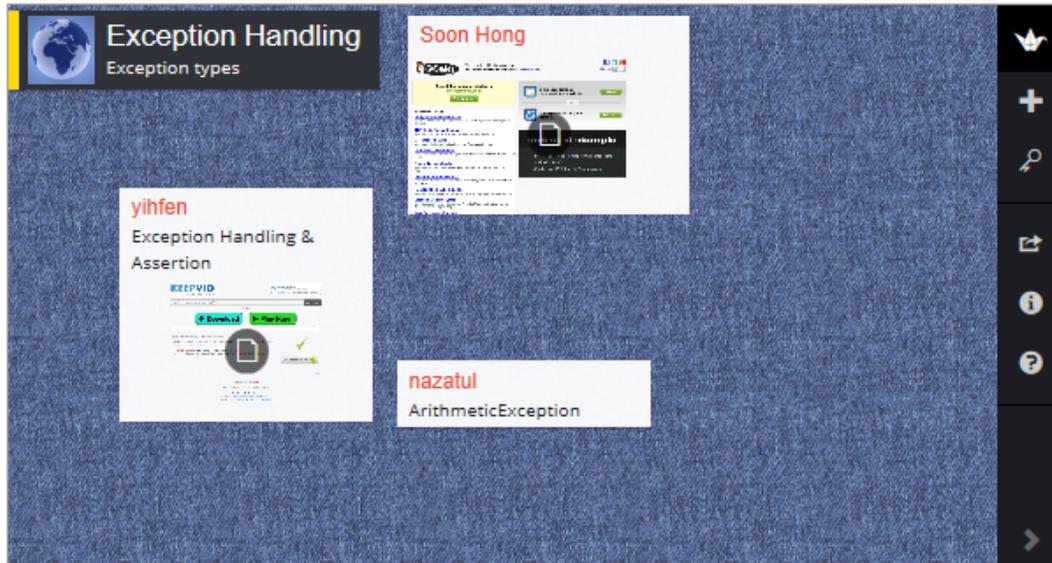
3. Stick a note here!

Figure 3: Padlet is integrated on a blog for question item in the learning plan.

5. Reflect your understanding of the topic

Exception handling

Answer ALL questions
* Required

1) _____ is a mechanism for dealing with runtime errors *

2) In Java, exceptions are represented as objects. *
○ True
○ False

3) Java exception handling model is based on 3 operations *
☐ declare
☐ throw
☐ catch
☐ state

No Matrik *

Tutorial set *

Submit
Never submit passwords through Google Forms.

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Figure 4: Google form was use for reflect item in the learning plan.