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WEB 2.0 PERSONAL LEARNING ENVIRONMENT DESIGN BASED ON USER REQUIREMENTS

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Abstract:

Personal Learning Environments (PLE)s help learners to manage their own web courses, update their own learning content, search and share their own learning materials and conduct co-operative learning, therefore improving the value of student learning. In this study, PLE requirements were gathered from tertiary students, and then a personal learning environment architecture based on Web 2.0 was designed. Under this proposed design, the learner is able to control her/his own learning process. This paper is organized into three main sections. First, Web 2.0 concepts and technologies are described. Secondly, the suitability of PLE in the context of Web 2.0 is discussed. Next, requirements gathered from users are described, and finally, a detailed design of a Web 2.0 personal learning environment is presented.

Keywords: Web 2.0, Personal learning environment, E-Learning

I. INTRODUCTION

The adoption of Web 2.0 technologies into the learning and teaching process has become popular during recent years, and many universities have sought to utilize these applications and services in their teaching and learning processes. Web 2.0 technologies have the potential ability to shift the traditional learning method from teacher-centered to leaner-centered through the improvement of interaction, collaboration and conversation (U and Corder, 2009). Under this theory, learners have more opportunities to become involved in the control of the learning and teaching process.

Personal learning environments (PLE) offer a solution for people to apply Web 2.0 technologies for their own learning (Taraghi et. al, 2010). A PLE is a private space for learners to manage their own knowledge. This means that a PLE "can be viewed as a self-defined collection of services, tools, and devices that help learners build their Personal Knowledge Networks (PKN), encompassing tacit knowledge nodes (i.e. people) and explicit knowledge nodes (i.e. information)" (Chatti & Jarke, 2011). Casquero et al. (2010), also state that the purpose of a PLE is to build a learner-centered environment where the learner is able to embed several tools and services.

A PLE has been designed based on results gathered from users (online survey and interviews) who have had experience with Web 2.0 applications to meet learning outcomes. The users' perceptions of Web 2.0 applications for learning were addressed in the three questions below:

1. What are the advantages of Web 2.0 impact on the users' usage for learning;
2. What are the disadvantages of Web 2.0 impact on the users' usage for learning; and
3. How can Web 2.0 applications be used in a PLE.

II. WEB 2.0 CONCEPT AND TECHNOLOGIES

Web 2.0 can be defined as a loose collection of upgraded Web 1.0 based technologies and applications that are capable of enhancing the co-operation and sharing among users (O'Reilly, 2005). Through the adoption of Web 2.0 applications into learning, learners are given opportunities to be involved in the control of the learning and teaching process especially in being able to establish their own personal learning environments providing a means of changing from teacher-centered to learner centered based learning (U & Corder, 2009).

According to Jun and Huiping (2010), the unique concepts of Web 2.0 technologies are that these technologies are people-oriented. This leads to an enhancement in people's participation. Therefore, Web 2.0 technologies are able to "share many synergies and then fit well with social constructivist learning pedagogies" (Cochrane & Bateman, 2010, p.3). Prior to any web technology, Vygotsky (1978) suggested that knowledge cannot be transmitted but can be reconstructed by the participation of each individual learner. Bruner (1996) also believes that learning can be considered as a kind of social process, which happens by sharing information and interactions with each user. Theories posed by both Vygotsky (1978) and Bruner (1996) support the ability for Web 2.0 technologies to improve participation, interaction and collaboration among learners. Consequently, learning abilities appear to be enhanced during the process of reconstruction by learner participation. Each of the Web 2.0 services listed below supports and enhances the learner-centered theories of Vygotsky (1978) and Bruner (1996).

Web 2.0 services can be clustered into five main groups:

- User-centered contents (Blog, Forum, WiKi)
- Social network services (Facebook, YouTube, Second life)
- Emerging forms of publications (Podcasting, RSS)
- Online office suit-packages (Google docs)
- Instant Messaging (Windows live message, QQ).

The following section describes these five main groups.

Types of Web 2.0 Technologies

User centered content
User centered content is the main characteristic of Web 2.0, which is that the users are able to write to the web. Typical applications of this type are Blog and Forum that allow users to contribute ideas (Hourigan & Murray, 2010; Duffy, 2009), and upload other format media, for instance image, video or audio files. Consequently, Blog and Forum engage the "learners to hear from other learners, teachers, and experts' opinions and suggestion on questions (Jun & Huiping, 2010, p.498)".

WiKis functions are very similar to Forum or Blog. WiKis can be considered as a collection of web pages that grant the "write", "read" or even "restrict" permissions to different users. Therefore, different users may operate such web pages based on permissions granted. According to Wei_Tek et al. (2011), and Guo and Stevens (2011), Wikis present positive impacts for collaborative learning.

Social network services
Facebook and YouTube are topical, and heavily used examples of Social network services (SNS). In an SNS, the user is granted the privilege to establish and customize her/his own space

or website that can then be displayed to other users. The structure of this type of web site means that "decentralized search engines to look for information or to communicate with others is becoming obsolete (Ractham & Firpo, 2011, p. 1)". Creating a page on Facebook means that individuals can create their own personal environment where other people can be invited to participate and where sharing and communicating with others in this personalized network can take place.

Emerging Forms of Publications

Podcasting involves the distribution of video or audio file types that can be used to syndicate feed to the internet. RSS (Really simple syndication) is the main method of subscribing for individual feeds. Podcasting consists of two parts, one is "iPod" for Apple (Macintosh) and the other is broadcast. The user can subscribe to video or audio feeds, and then can receive these podcasts automatically. This method represents a very popular way to use web 2.0. Some lecturers like to record a class process by using iPod, after which files are transferred to mp3 and published on a website for students to download.

Online office suit-package

Google docs are a good example of this type. Google docs consist of three main applications, which are word processing, spreadsheet and PowerPoint. These applications have a similar interface to MS Office therefore making Google Docs easy to use. Conner (2008) suggests that Google Docs allows the user access from different computers and eases the ability to conduct collaborative work through document sharing with others as viewers or editors. "Google Docs support synchronous editing and comment writing, and save versions of the document, options that afford real-time collaborative learning" (Blau & Caspi, 2009, p. 49). Similarly to WiKi and Blog, Google docs are able to put comments or modified suggestions into other people's work without editing the original work (Herrick, 2009).

Instant messaging

Hariharan and Rani (2011) state that instant messaging is an attractive and effective communication method that can be used between people. Liebenberg and Lotriet (2010), in their research, also suggest that instant messaging is a successful tool for personal telecommunication. Commonly used instant message applications are MSN (now called Windows live messengers), yahoo messenger and QQ (China).

In terms of a communication method, instant messaging is a synchronous communication method. Instant messaging allows the learner to "be related with a higher level of perceived participation in the e-learning activities, be characterized by slightly denser social networks and spend more time working with content and communication with peers" (Hrastinski, Keller, & Carlsson, 2010, p. 655). Finally, instant messaging is the main communication method that has been used in mobile learning.

III. SUITABILITY OF PLE IN A WEB 2.0 CONTEXT

What is a PLE

In 2005, Downes indicated that a learning environment is a method of learning and is not an application. However, on the internet, a personal learning environment (PLE) can be treated as a personalized individual web space that includes "a collection of tools, brought together under the conceptual notion of openness, interoperability and learner control. As such, PLEs are comprised of two elements – the tools and the conceptual notions that drive how and why we select individual parts (Siemens, 2007). Similarly, Gillet et al. (2010, p. 898) asserted that PLE "are not monolithic systems. They can be simply a set of devices, tools, applications, and physical or virtual spaces associated by learners at a specific time, for a specific purpose, and in a given context." Therefore, based on the results of the two studies above, a PLE is a personal private

web space that is able to integrate several applications or services based on the owner's requirements and also can be organized and used for pedagogical purposes.

However, current research does not appear to have detailed what personal learning environments are. Schaffert and Hilzensauer (2008) defined the characteristics of PLE as:

- The role of the learner
- Personalization
- Content
- Social involvement
- Ownership
- Educational and organizational culture
- Technological aspects.

Reasons for Web 2.0 Technologies Adoption in PLE

Improved personalised settings
Under web 1.0, any webpage is focused on the website itself not the user. For example, on an e-learning web site, learners concentrated on the information presented on the web page. Therefore, teachers will give more consideration to what kind of knowledge students have learned and what kinds of learning resource have been uploaded, but are more likely to pay little attention to any user centric activities or information. Web 2.0 gives more opportunities for the user, in other words, it is user-centric based. All Web 2.0 applications are built for specific function modules and the users are able to select specific functions and then use these modules to meet their own requirements. For instance, Web 2.0 applications such as Weblog and WiKi empower users to create and manipulate their own content.

In using Web 2.0 technologies, users are given more chances and privileges to shape and customize their own PLE, which in turn, helps the learner in an active learning manner.

Micro contents in a PLE
"Micro content is the prime resource and valuable asset of Web 2.0" (Hu, Cai and Talib, 2010, p. 38) and micro content is a kind of data that is established by users. For instance, this data can be considered as feedback, comments, an article published in the space or a discussion topic conducted in a forum. All of these data types can be treated as micro content. Hu, Cai and Talib (2010), suggest that becoming the consumer or producer of micro content is popular in Europe. More than half of online users like to make comments in blogs, release video or video files from their own space or other web sites, or become social network contributors.

Micro content of Web 2.0 is also reusable. Anybody is able to use Web2.0 tools such as RSS, Tags or other applications to reorganize, manage, remove or separate those micro-content based on their own requirements. If a PLE consists of several Web 2.0 technologies, the ability to organize a PLE will be enhanced because the learning resources of PLE can be composed, organized and even packaged by the user.

Social involvement and user participation
Sociality is a general characteristic of Web 2.0. Web 2.0 focuses on a person-centric approach. That means anybody can generate own content and/or request content from others and then find a way to meet the demands of others. Web 2.0 allows peers to share, collaborate and publish own ideas and experiences with groups of people who share the same interests.

As a result of this, Web 2.0 applications such as WiKi, Weblog, SNS (Social network services) and Forum are based on social interactions and have the potential ability to support and enhance social learning (Shaohua & Peilin, 2010). Therefore, according to Liu et al. (2009), Web 2.0 social

interactions not only enhance interactions between each user but also generate rich content. As a result, the value and attraction of such user-generated information increases.

Suitable for constructivist learning theory
Constructivist learning theory was first mentioned by Piaget (1970). According to this theory, learning was considered as the process where knowledge was reconstructed by learners based on their own cognitive principles. Therefore, a personal learning environment under a constructivism approach based on Web 2.0 will be a place "where learners use a variety of information resources, pedagogical and assessment devices and interact with the tutor and other peers through communication in their guided pursuit of learning objectives" (Fan, 2011, p. 516). This means learners will be encouraged to reconstruct other people's knowledge or even establish their own knowledge instead of passively absorbing from a school class or their teachers (Garcia & Pacheco, 2010). Garcia and Pacheco also presented a methodology (Figure 1) about how to use constructivism theory in learning based on the Web environment (p. 567).

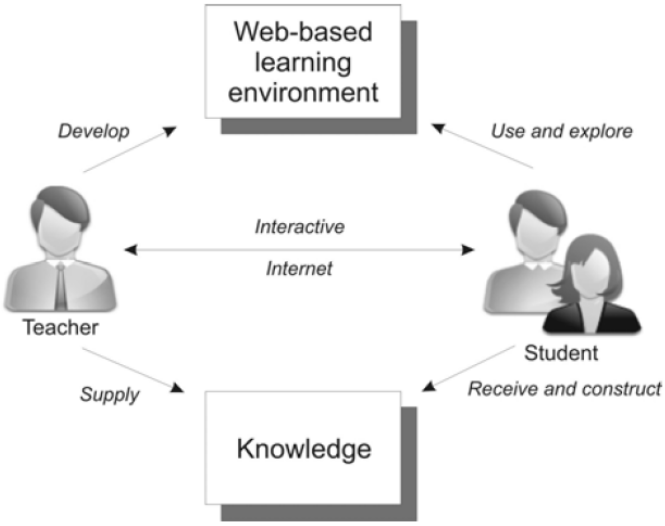

Figure 1 Constructivist educational model (Garcia & Pacheco, 2010, p. 567)

IV. WEB 2.0 PLE USER REQUIREMENTS

This paper uses descriptive statistics to analyze user requirements for a PLE. A set of reflections on the integration of Web 2.0 applications into PLE are also presented.

Requirement Questions

Younger generation users may accept Web 2.0 technologies more easily because they are familiar with and use some Web 2.0 applications such as Facebook, YouTube and instant messaging frequently. However, in order to gather Web 2.0 PLE requirements, three questions have been posed.

Q1. What are the advantages of Web 2.0 impact on users' learning
Q2. What are the disadvantages of Web 2.0 impact on the users' learning
Q3. How can Web 2.0 applications be used in a PLE.

To address those questions above, an online survey was conducted in New Zealand with postgraduate students at one tertiary institution (TI) and a Facebook student community from other tertiary institutions from December 2010 to Feb 2011. Participants were recruited in two

ways; one was by email sent to a learning management system email list for TI students; and the other was by adding a URL for the online survey to the researcher's Facebook page. A major limitation for this study is that most participants were postgraduate students.

V. RESULTS AND DISCUSSION

Demographics for Respondents Including Gender, Age Range, Majored Studied, Ethnicity and Educational Level

From Table 1, it can be seen that most respondents were aged between 21 and 30, and of the 84 respondents, 45 (53.6%) were male and 39 (46.4%) were female. Almost all respondents were international students (92.9%) and 52.4% students were undertaking computing degree the rest of students were undertaking business, or engineering.

Table 1 Demographic Information (n=84)

Age	**Count (%)**
10-20	8 (9.5%)
21-30	51 (60.7%)
31-40	18 (21.4%)
More than 40	7 (8.3%)
Gender	
Male	45 (53.6%)
Female	39(46.9%)
Education	
University	51 (60.7%)
Polytechnic	25 (29.8%)
Others	8 (9.5%)
Majoring studied	
Business	22 (26.2%)
Computing	44 (52.4%)
Engineering	7 (8.3%)
Others	11 (12.9%)
English as second language	
Yes	78 (92.9%)
No	6 (7.1%)

Table 2 rates IT general experiences of respondents from 1(no experience) to 7 (highly experienced) and it can be seen that most participants had good skills in using email, web browser and MS Office (average ranking scores around 6 out of 7), but skills in coding Web pages were rated much lower (average ranking scores was 3.31).

Table 2: General experience of IT Skills (n=84)

	No ex (1)	Really poor (2)	Poor (3)	OK (4)	Medium (5)	Good (6)	Excellent (7)
Web browsers		2	2	6	11	22	41
Email		0	4	4	9	21	46
MS Office		1	5	15	10	25	27
Coding		12	13	11	6	7	9
(Numbers in the table is the respondent count of that criterion)							

Table 3 provides descriptive statistics about the use of some common Web 2.0 applications by participants.

Table 3: General IT Skills (n=84)

Items	**Average score***
Using Web browsers	6.05/7
Using e-mail	6.20/7
Using MS Office packages	5.37/7
Coding Web pages	3.31/7
**Average score = number of respondents in this rating score * related rating score/84*	

Table 4 shows that most Web 2.0 applications have been considered by these respondents as providing co-operative learning, are easy to use and are able to have personal learning environments built. Respondents gave more emphasis to "ease of use" (Google apps 52.38%, YouTube 54.76%, WiKi 47.62%), which was also an expected outcome, because no matter how good the applications are, "ease of use" was the first priority.

Table 4: Advantages of Web 2.0 impact on user learning (number in the table is the respondent count of that criterion. (*n = 84*)

	Not used	Ease of Use	Cooperative learning	Concurrency control	Virtualized environment	Personalised environment
Facebook	13 (15.48%)	39 (46.43%)	35 (41.67%)	8 (9.52%)	21 (25%)	40 (47.62%)
Google apps	11 (13.09%)	44 (52.38%)	36 (42.86%)	32 (38.10%)	15 (17.86%)	29 (34.52%)
*MSN	16 (19.05%)	35 (41.67%)	29 (34.52%)	10 (11.90%)	10 (11.90%)	35 (41.67%)
Myspace	41 (48.81%)	20 (23.81%)	16 (19.05%)	6 (7.14%)	8 (9.52%)	23 (27.38%)
Second Life	51 (60.71%)	12 (14.29%)	11 (13.09%)	2 (2.38%)	12 (14.29%)	9 (10.71%)
YouTube	11 (13.09%)	46 (54.76%)	26 (30.95%)	8 (9.52%)	33 (39.29%)	20 (23.81%)
Blogging	13 (15.48%)	42 (50%)	37 (44.05%)	9 (10.71%)	10 (11.90%)	43 (51.19%)
Forum	7 (8.33%)	44 (52.38%)	47 (55.95%)	13(15.48%)	17 (20.24%)	27 (32.14%)
WiKi	7 (8.33%)	51 (60.71%)	40 (47.62%)	15 (17.86%)	17 (20.24%)	30 (35.71%)

(*MSN: Microsoft Service Network, the new version called Windows Live Message, it is in the type of instant message of Web 2.0 technology)

Facebook, Blogging and MSN are the three top Web 2.0 technologies that have been identified by the respondents (47.62%, 51.19% and 35.71% respectively) as providing a personalized learning environment. These respondents believed that the functionalities of Facebook, Blogging

and MSN were a good example for a PLE. Therefore, based on this result, it would be advantageous if PLEs have the functionalities of Facebook, Blogging and MSN.

Finally, co-operative learning is another characteristic that is been identified by these respondents. The three top Web 2.0 applications are Forum, WiKi and Blog (55.95%, 47.62% and 44.05% respectively, Table 4). Therefore, based on this result, it would be advantageous for a PLE to incorporate cooperative work functionality.

Table 5 shows disadvantages of some common Web 2.0 applications that have an impact on the users' learning.

From this sample, most respondents believe that a lack of information control (for instance, 40.48% of Facebook participants in this sample, Table 5), technical support (for instance, 40.48% for Forum and WiKi) and support for academic functions (45.24% of MSN users in this sample) are major issues of Web 2.0 technologies like Facebook, YouTube, Google apps, MSN, Blogging, Forum and WiKi.

Information control could become a problem when people use Web 2.0 technologies to create a PLE. Users familiar with Web 2.0 applications in this sample, felt they have the right to contribute to a PLE, and that a PLE needs to be able to control information. These participants also felt that a PLE needs to have a filter to control trash as well.

Table 5: Disadvantages of Web 2.0 impact on the users' learning (number in the table is the respondent count of that criterion. N = 84)

	Not used	Difficult to control information	Lack of technical support	Not compatible with common use apps such as MS Office	Not enough functions for academic use
Facebook	14 (16.67%)	34 (40.48%)	28 (33.33%)	26 (30.95%)	34 (40.48%)
Google apps	11 (13.09%)	21 (25%)	28 (33.33%)	32 (38.10%)	24 (28.57%)
MSN	15 (17.86%)	25 (29.76%)	30 (35.71%)	20 (23.81%)	38 (45.24%)
Myspace	43 (51.19%)	12 (14.29%)	19 (22.62%)	18 (21.43%)	22 (26.19%)
Second Life	58 (69.05%)	10 (11.90%)	11 (13.09%)	11 (13.09%)	12 (14.29%)
YouTube	16 (19.05%)	25 (29.76%)	26 (30.95%)	26 (30.95%)	25 (29.76%)
Blogging	15 (17.86%)	33 (39.29%)	29 (34.52%)	27 (32.14%)	32 (38.10%)
Forum	10 (11.90%)	32 (38.10%)	34 (40.48%)	26 (30.95%)	22 (26.19%)
WiKi	14 (16.67%)	30 (35.71%)	34 (40.48%)	20 (23.81%)	26 (30.95%)

In Table 6 it can be seen that participants in this study tended to believe that communication services (synchronous or asynchronous) was the most important role in an E-Learning system. Almost all participants paid more attention to communication in order to obtain feedback or comments from others. This result indicates that a PLE needs to integrate Web 2.0 technologies such as MSN, Forum and Blog.

Table 6: Summary of common uses of Web 2.0 applications for learning

Name of web 2.0 applications	**Purpose**
Skype	Communicate with another person
Google applications	Share documents
Facebook	Communicate in the community and public, share solutions, ideas, feelings , thinking
YouTube	Download, upload and share video files
MSN	Communicate with another person
Forum	Get feedback or comments from another person
Blog	Get feedback or comments from another person

Web 2.0 PLE User Requirements

Based on the results from this online survey, Web 2.0 PLE requirements are summarized below. These are:

- ease of use
- both synchronous and asynchronous communication methods
- users create web content and conduct co-operative work
- users have full privilege to manage their own PLE (including upload, download, remove, share and search learning resources)
- functions provided to control the information on a PLE (personal learning)
- enough technical support.

Proposed Web 2.0 PLE Structure

A Web 2.0 PLE based on the user requirements gathered in the previous stage is shown in figure 2 below. Žubrinić and Kalpić (2008) state that a Web 2.0 PLE is a Web application that allows the users to control their own learning processes through distributed resources.

Oliveira and Moreira (2008) presented a methodology (Figure 2) about how to use Web 2.0 applications in learning (p. 1174). The importance of this structure is to provide the initial theoretical support for integration of Web 2.0 technologies into learning processes. Therefore, through this model, people can see how Web 2.0 technologies are used for specific learning processes. For instance, Forum and Blog are used to conduct discussion, WiKi is used to do the collaborative work and RSS is used to subscribe to new resources. Further research will explore the construction, development and testing of this proposed design.

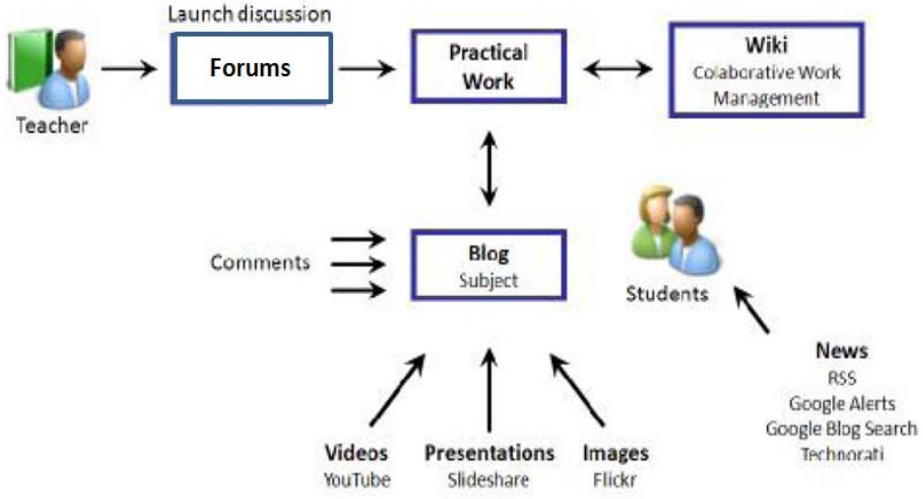

Figure 2 Methodology used in the study on the use of Web 2.0 technologies

According to Downes (2005), no matter what kind of technology is used, a PLE should have three basic principles: 1) interaction; 2) usability; and 3) relevance.

Interaction means “the ability to communicate with other persons interested in the same topic, or using the same resources available on the Web” (Žubrinić & Kalpić, 2008, p. 55). This opinion is consistent with the user’s requirements in the previous stage (communication).

The functionality of the Web 2.0 PLE that has been constructed in this research is based on the model proposed above. The PLE shown in Figure 2 makes possible the ability:

1) to conduct both synchronous and asynchronous communication;
2) for owners to have full privilege of own PLE (user-centered);
3) to conduct search, have cooperation and be able to exchange information with other users; and
4) to create web content based on knowledge in the domain for learning.

Under this model, learning represents the combination of watching, thinking and trying (Kolb and Fry, 1975).

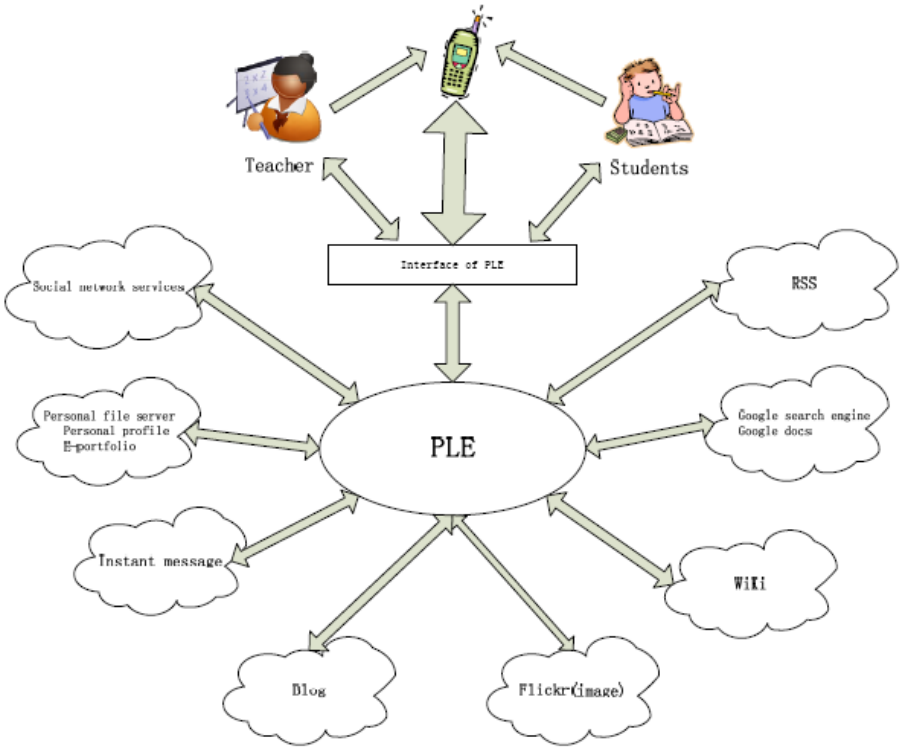

Figure 3 Conceptual model of a PLE

A UML design for this conceptual model of a PLE (figure 3) is the next stage in this research project.

VI. CONCLUSION

From Web 2.0 technologies emerge a new way for users to personalize their own online existence. “User centered, participation, social networking services empowers learners to create informal associations or communities of practice, in which to develop their own subject-based mastery (Hall, 2009, p. 38).” Through the integration of Web 2.0 technologies (tools) into a PLE, students are granted autonomy to develop their own learning processes.

The conceptual structure of a Web 2.0 PLE presented in this studying encompasses and integrates a diverse range of personalized aggregations of applications, and its contents are contributed from a range of different places. This aggregation and content certainly can be

reused or restructured in different places, depending on the different personal tasks to be carried out, or the specific requirements to be meet.

In conclusion, according to the results obtained from this research, although Web 2.0 technologies have some weaknesses like lack of information control or technical support, overall, the move towards the usage of Web 2.0 technologies is of benefit for learning activities because of its features such as ease of use, and the ability to conduct co-operative work. Because of these features, a Web 2.0 PLE is capable of providing learners with a flexible, diversified and self-control environment in which they can conduct their own learning processes. However, because Web 2.0 architecture and integration of Web 2.0 technologies into learning is in the initial stages, some problems may occur, for instance lack of authority and information control.

A major research limitation for this study is the small sample size, mostly drawn from a student population. Future research will be conducted with the conceptual Web 2.0 PLE model to which control functions will be added.

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