The Development of Collaborative Learning Environment with Learning Blogs

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***Abstract*--Collaborative learning is a kind of group learning mode where members of group learn any concept or topic through communication and discussions. Current researches on collaborative learning paid little attention to the functionalities of group members. In order to solve this problem, this paper utilizes a Learning Blog (LBlog) to share experience and viewpoints of group members, and achieve learning goals together in the end. The LBlog also integrates Learning Management System (LMS) to manage the group members' profiles to evaluate the learners' learning efficiency. Our initial experiments with the LBlog indicate that it is an useful educational tool to support collaborative learning.**

***Index Terms*--Learning Management System, Collaborative Learning, Blog, E-learning, SCORM**

I. INTRODUCTION

With the emergence of Internet technologies, web-based learning as an increasing acceptable learning approach makes interesting and possible. The concept of web-based learning totally differs from classroom-based method by online communications and powerful computer technologies. This pedagogical mode offers many possibilities, such as approaching new groups of students [3], the freedom of choosing the time to learn anywhere and the way learners prefer, and collaborative learning environment [2]. Many recent studies show that Computer-Supported Collaborative Learning (CSCL) is a promising paradigm for research in web-based education that focuses on the use of Information and Communications Technology (ICT) as a mediation tool within collaborative methods of learning [9] and provides advanced activities, necessary functionalities and learning resources to all participants to enable the collaborative learning experience in open, dynamic, large-scale and heterogeneous environments. However, one of the main challenges in the development of CSCL systems is to overcome important non-functional requirements arisen in distributed environments such as scalability, flexibility, availability, interoperability, and integration of different, heterogeneous, and legacy Collaborative Learning Systems.

In order to overcome these issues, we propose an LBlog that combines with the Web2.0, weblog, and LMS technologies to improve the quality of collaborative learning and life-long learning. Our proposed LBlog is the first one to extend blog functionalities with LMS based on IMS Tools Interoperability (TI) architecture to manage learning course materials and learners' learning processes [12]. IMS organization has recently announced the Common Cartridge specification [1] in draft version. This specification mainly focuses on providing the framework in order to integrate SCORM (Sharable Content Object Reference Model) and QTI (Question and Test Interoperability) standards, and also provide Tools Interoperability architecture which aims at the LMS functionalities expanding part. All LMSs can possibly utilize the tools or functionalities based on TI architecture in order to improve the lack of functionalities for LMSs. We mainly focus on TI architecture and the Web2.0-based blog functionalities to make suitable learning interface for LMS. We hope it can improve the usability of LMS in order to fulfill the learners' needs and improve the utility rate of LMS. Our experiences indicate that collaborative learning at LBlog mechanism may give as good results as CSCL or even better.

The remaining of the paper is organized as follows. In section 2, the state of the art in this research field is stated. In section 3, the architecture of the IMS Tools Interoperability is introduced. The system design and construction of the LBlog collaborative learning are introduced in section 4. The last section summarizes our work and draws some conclusion.

II. RELATED WORK

Collaborative learning has presented a pedagogical mode around a long time. It is a student-centered approach that interacts with one or more collaborating peers to accomplish a given problem. In [4], authors explore the strengths and weaknesses of CSCL, including the viewpoints of the repositioning of the responsibility of learning in which the lecturer's role has been transferred to that of facilitator and resource guide as CSCL requires that the student take a more active role in his or her own learning [10]. [11] states vicarious learning that points out the knowledge is formed from others' experience. [13] proposes a concept of distributed constructive learning that explains knowledge comes from "doing", not "receiving." The author [2] builds a web-based collaborative learning environment via a web-based course to indicate that collaborative learning

at web-based environment may give as good as results as classroom learning.

However, the weblog has been widely accepted in use in e-learning during the past four years, it not only provides the personal web vision, but also facilitates the command post function for learner to provide the opportunity to make a discussion with each other [5]. This rapid growth reflects attempts to circumvent the constraints of centralized authorship [6] and increase needs for instant communication on knowledge-building community [7], as it allows alternative forms of learning, such as self-reflection, student-student and student-tutor different to the conventional ways. Besides, with the concept of Web2.0, the weblog is much easy to develop a suitable personal learning interface for LMS in order to fulfill the construction of the collaborative learning environment. If we can design the blog functionalities which can be utilized by other LMSs, it can not only reduce functionalities development time but also make the functionalities popularize in other LMSs. One issue herein is how to implement such kind of tools or functionalities. The IMS proposed the Common Cartridge draft in 2007. The Common Cartridge specification have three parts, it respectively includes IMS Tools Interoperability Guideline, IMS Common Cartridge Authorization Web Service and IMS Common Cartridge Profile. IMS Tools Interoperability Guideline specification focuses on the LMS functionalities developing architecture, runtime environment and related concept. It also resolves the reusable problems of functionalities for multiplatform LMS. Therefore, we propose a LBlog with the integration of weblog and LMS to illustrate that the LBlog has great potential to become one of the effective groupware in collaborative educations.

III. IMS Tools Interoperability Architecture

Fig. 1 shows the IMS Tools Interoperability architecture. On the left-hand side is the LMS, and the right-hand side contains the related tools. We utilize the web services to serve the connection. This architecture mainly contains two parts. One is Proxy Tool and the other is Tool Interoperability Runtime (TIR).

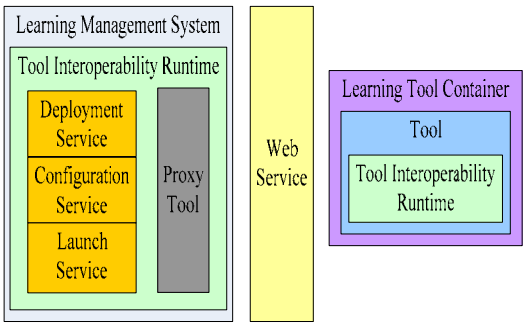

Figure 1. Tools Interoperability Logical Architecture – revised by [1]

- Proxy Tool - LMS takes advantage of the tool to make communication with exterior Tools.
- Tool Interoperability Runtime (TIR) - TIR is a set which contains a series of services and provides a series of different services to manage Proxy Tool (Ex, deployment, configuration, initiation and so on).

In TIR part, it includes several kinds of services:

- Deployment Service: The TIR deploys the service. Tools are deployed under the LMS environment by Proxy Tool and become the part of LMS.
- Configuration Service: This service ensures the normal deployment and initial operation in the middle of LMS.
- Launch Service: In the Host part, this service must be able to produce related proxy tool and related security mechanism. In the end, this service can utilize the web service to receive the initial message which transmits by LMS TIR, and then understand and use this security mechanism to make the correlation response.
- Outcome Service: Outcome profile which produces by Tool will transmit to LMS TIR, but LMS TIR must be able to receive, understand this profile and make responds for Tool TIR.
- Security Management: To guarantee an elastic authentication mechanism, TIR can provide Security Management to make the security profile and utilize the proxy tool to transmit the authentication information to LMS.
- Session Management: When the user uses new Tool, LMS can provide the user a URL to open a new browser. At this time, it will use session to manage its transmission data. Therefore, TIR must provide session management to do the session control.

This framework utilizes the Service-Oriented Architecture (SOA)/web services to do the data transmission. Fig. 2 shows the related TI components and interaction relations between the user, tool and LMS. The operation steps are as follows:

Step 1: When the tool editors or the learners use the tools, LMS produces the Proxy Tool URL related to the particular Tool in order to provide user choice links. After LMS accepts the request, it will be sent to Launch Service in TIR and then to coordinate Configuration Service to produce related configuration data. This Launch message will then be sent to the Proxy Tool.

Step 2: The Security Manager in TIR will process the data which is provided by Configuration Service and Launch message in order to produce the identity authentication data and Security Header. And then the Security Header will put into the Launch message.

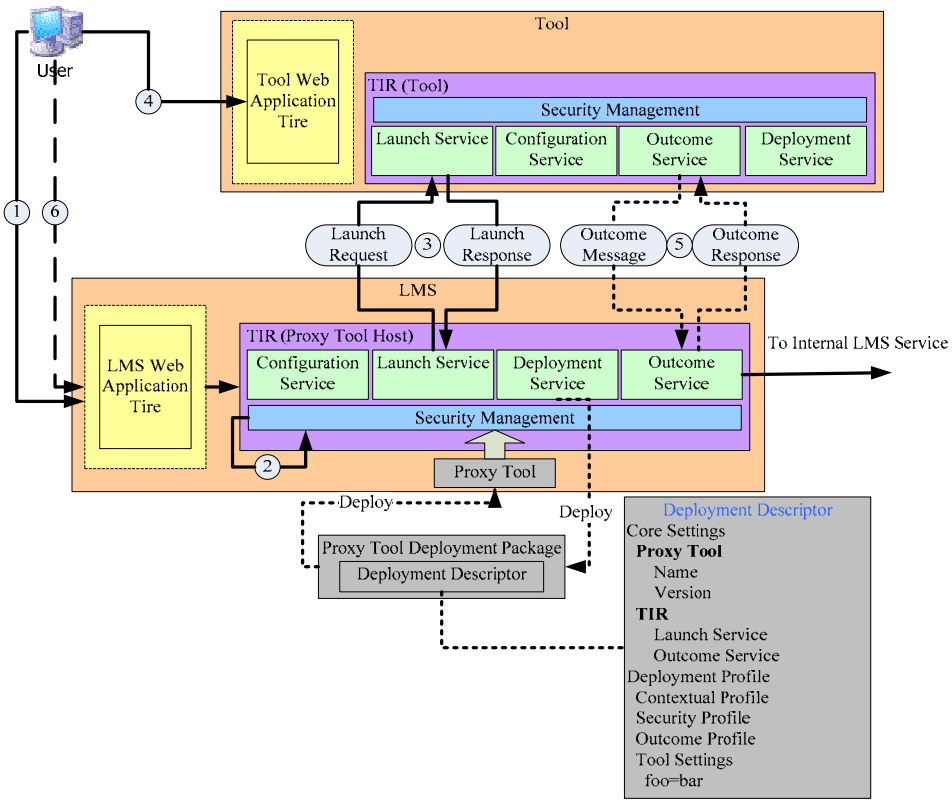

Figure 2. Tools Interoperability Interaction Diagram – revised by [1]

Step 3: The Launch Message produced by step 2 will be sent to Tool TIR by the way of Proxy Tool. This message will be received and processed by Launch Service in Tool's TIR. In this message, the Security Header will assure the identity authentication process by way of Tool's TIR. The identity authentication's result and related message processed by Launch Service will be returned to LMS.

Step 4: When finishing identity authentication, the LMS will receive the Tool feedback message, then the user will open new browser and operate the Tool directly. And at this stage, it has no interaction between LMS and Tool.

Step 5: After the user completes the particular work, Outcome Service will possibly produce some data and then send it to LMS. At this time, Tool's TIR will do the coordination between the Security Service and Outcome Service in order to produce the Outcome Profile. The Outcome Profile includes the Security Header which will be sent from Proxy Tool to LMS's Outcome Service in order to do the process. LMS Outcome Service will return the outcome message to Tool in order to inform the processing result.

Step 6: After the user finishes the interaction with the Tool and returns to the LMS's delivery context, the LMS will close the new browser window opened by step 4 and then remove the related Proxy connected with the Tool.

IV. Constructing a Collaborative Learning Environment with Learning Blogs

According to the features of the weblog, it is easy to provide collaborative workspace, where the learners can exchange information in a synchronous or asynchronous manner and support primitive activities and resources in collaborative learning, such as dialogue channel, shared workspace, technologically mediated remote communication, and personal workspace [8]. In order to emphasize these characteristics, we propose an LBlog integrating with LMS to share knowledge or interaction when a learner faces a problem that he/she cannot solve, he/she can exchange meaningful information.

First of all, in order to process the collaborative learning in the open learning workspace, it is very important to find out the suitable group members. It consists of two ways to manage the searching method.

- Searching for mentors
  - Searching for course materials: browsing members' blogs and realizing their learning statuses and interests.
  - Learning goal: utilizing members' learning goal records and course scheduling strategy to learn the similar knowledge courses.
- Building study forum: The forum is used to construct a more get-together and affinity group such that it is easy to the same learning goal.
  - Grouping members

- Scheduling the same goal and time
- Monitoring each other
- Displaying status
- Synchronizing multiple discussion
- Delivering messages

Personal LBlog architecture encompasses two functions-traditional blog function and e-learning function. The former presents the personal operation and interface to exchange and retrieve the learning contents. The latter compliments the features of the pedagogical learning to promote the learners' interests and to motivate their self-learning potentiality. The architecture consists of three managers shown in Fig. 3.

- Learning Schedule Manager: providing the functions of learners' self-scheduling courses, making the learning goals, and then saving as XML documents in the blog learning database.
- Learning Process Monitor: Monitoring and recording the learners' learning status and behavior, including the beginning time, the reading ID, and time duration.
- Learning Note Manager: Notating the learners' experience and thought and saving the learners' IDs and courses' IDs to database.

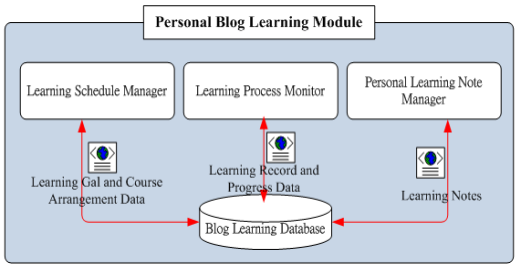

Figure 3. Personal Learning Blog Framework

In the meanwhile, in order to manage the learners' own blogs, this system provides a Learning Object Operation Module to control the learning resources. It consists of two functions shown in Fig. 4.

- Learning Object Navigator: Having a responsibility to view all kinds of learning objects. It parses course imsmanifest file, loads and shows the course architecture, retrieves the course metadata, and represents the course contents.
- Learning Object Manager:
  - Learning Object Subscribing and Collection: Assigning the name and ID of the courses which are stored in the repository.
  - Learning Object Uploading: Authoring self course contents and uploading to course repository.
  - Learning Object Deletion: Deleting learners' collecting courses names and IDs.

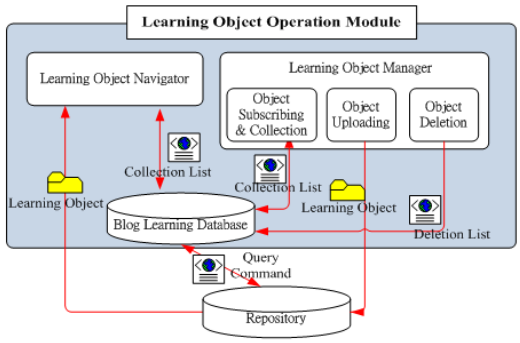

Figure 4. Learning Object Operation Module

The Cooperated Blog Learning Module provides the functions and services of collaborative learning. It divides into two functions shown in Fig. 5.

- Mentor Relation Manager: Consisting of Member Connector and Status Tracer part and Synchronous and Asynchronous Communication Service part to automatically build the mentors lists. The communication records are saved to database in order to be an important evaluation factor.
- Study Group Manager: Consisting of Member Management, Operated Learning Management, Discussion Board, and Synchronous and Asynchronous Communication Service to deliver a message to willingly organize a member group and call for members publicly. The establisher dispatches the learning goals and jobs such that the group members are able to realize the learning progress and status each other.

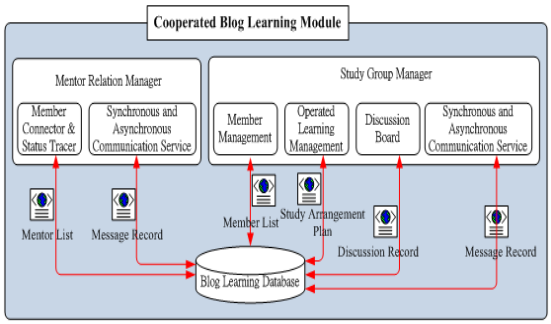

Figure 5. Cooperated Blog Learning Module

Fig. 6 shows the MINE LMS2.0 system [12], and it also has the basic functionalities, like the register course, view course and view learning records, etc.

Blog functionalities architecture will be divided into two parts. One is teaching blog which provides the course content, and the other is LBlog where learners can make the interaction and discussion in this area.

- Student (Learning Blog):
  - Each student can be assigned a learning blog.
  - Personal learning blog is similar to the satchel. The student can subscribe the course he wants to learn in a semester.

- Student can utilize the notebook to connect to the learning blog, than the student will get his/her own learning course.

- Teacher (Teaching Blog):
  - Each teacher will assign a teaching blog.
  - The teacher can issue courses to students.
  - The teacher can construct the related course forum, and he can broadcast course information to the related students.

Learner/Teacher can utilize the JavaScript Call and HTTP method to connect with LMS Server, and utilize the SOA and HTML&CSS to show the result in the user browser.

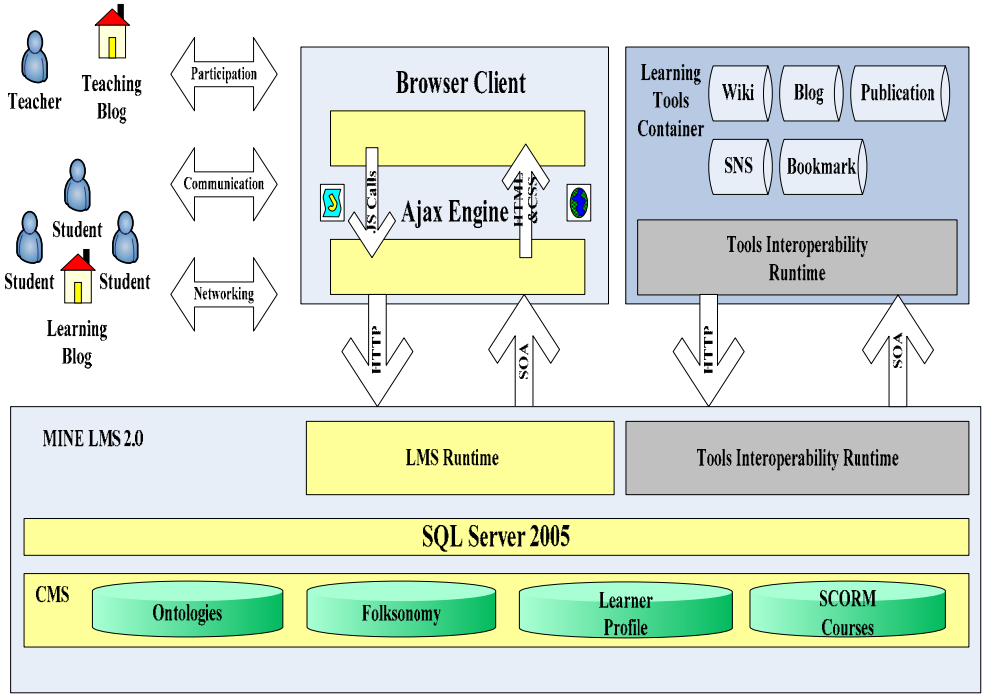

Figure 6. MINE LMS 2.0 based on Blog Functionalities with Tools Interoperability Architecture

Fig. 7 shows the view and implementation of the LBlog. The functionalities of the LBlog are introduced as follows:

1. LMS: MINE LMS2.0 provides Proxy tool and Tool Interoperability Runtime (TIR) to make communication with exterior tools.
2. Personalized Calendar Functionality: The learner clicks the date of the calendar to realize their own courses when he/she would like to learn. If the learner has arranged the learning courses in advance, system can automatically load the courses.
3. Group mentors: This area shows the name list of the mentors and displays if they are on-line at the same time. Using the hyperlink, the learner is able to visit their learning blogs directly. Also, system keeps track continuously if there are new learning goals or activities, and then notifies to learners.
4. Course representation area: The area shows the webpage learning materials, video, or a picture. If the learners have interest in these courses, they click the button on the right corner to collect the courses.
5. Evaluation area: The learners can browse the courses that peers collect. The learners also can evaluate them.
6. Authors: This area shows all of data that author have. The learners are able to leave messages to authors directly.
7. Collection area: This area shows all of courses that authors collect. These maybe are IMS Common Cartridge or video courses.

Figure 7. The View and Implementation of the LBlog

Based on the implementation of LBlog, our proposed LBlog is able to provide the functions of collaborative learning to assist learners with the achievement of lifelong learning such that group members can share his/her learning experiences and discuss with each other.

V. CONCLUSION

In the case this paper showed that the LBlog has been proved to be an efficient environment that enables group members to achieve the learning goal in a collaborative learning. Besides, in the system architecture, we utilized the multiplatform tools designing architecture proposed by IMS Tools Interoperability Guideline to develop our integrated system and took advantage of the Tamkang University MINE LMS2.0 to do the system design issues. This collaborative learning environment combining with MINE LMS2.0 and Web2.0 functionalities observes as a very important mechanism for motivating students' continuous communication, discussion or participation and sharing their learning experiences in the e-learning field.

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