Exchanging Course Content Mechanism for Moodle LMS

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Abstract—Moodle is an open source and one of the most popular learning management systems (LMS) currently. Developers can customize functionality and modules for educating purpose. When integrating with other systems, developers have to deal with the barrier that comes from Moodle servers with different version or other human resource system. Therefore it will be valuable for allowing teachers who are at different places to exchanging teaching materials. To solve these problems, a set of Course Communication services based on web service were built. With these services, developers can more easily build connection among Moodle servers and other kinds of systems. In addition, A Moodle module called OpenMoodle is also developed. With this module, instructors can exchange course materials and teach collaboratively with other educators and monitor student’s learning status by holding course materials locally. In addition, students can acquire material from multiple resources.

Keywords: Web services, LMS, Moodle, Teach Collaboratively

I. INTRODUCTION

Learning Management System (LMS) makes interaction between teachers and students becomes more convenient. It provides a platform on the web, and a lot of pedagogical activities can be performed on it. Team teaching offers several significant advantages for teachers including increased the opportunity for on-going conversation about teaching, and experience in learning how to improve technology capacity for teaching and practice [1]. Betty Robinson and Robert M. [2] indicated collaborative teaching can inspire educators to discover, share, and verify fresh ideas for constructing course sessions, and creating more effective assignment. It will be valuable for teachers to cooperate with each other by exchanging their respective teaching materials.

Moodle is an open source and one of the most popular learning management systems (LMS) currently. To allow share and exchange course between different Moodle sites, a set of services and a module are presented in this paper. The Course Communication services for Moodle (CCM) allow developers build their own functions based on uniform rules. The OpenMoodle module lets educators communicate, discuss, and teach collaboratively. Experienced teachers can share their teaching experience to young teachers. Teachers can teach collaboratively to learn from each other by exchanging views

II. BACKGROUND

A. Moodle LMS

Moodle is an open-source Learning Management System (LMS) which has been developed since 1999. It has been widely adopted over 200 countries, has 49000 registered sites, and the number of courses is around 3,500,000. In addition, about 35,000,000 users join the Moodle community [3]. It is one of the most excellent and popular LMSs. Ajjan and Hussein [4] make comparisons between Moodle and other CMSs based on technical aspects of CMSs, features and categories of CMSs, adaptation category, and usability of web-based e-learning system in universities. The result of comparison showed that Moodle outperform almost all other systems and get nearly maximum scores. The reason make Moodle defective was that it doesn’t support SCORM and limit the role and permission system. But in version 2.0, all are fixed. The services and module presented in this paper takes Moodle v2.0 as based platform.

In Taiwan, Moodle is popularly adopted as well especially in academic domain. The current usage of concerning higher education in Taiwan is shown in Figure 1. Tunghai University [5], Ming Chuan University [6], and National ChiNan University [7] are the representatives. Tunghai’s site holds over 35,000 users and 6,500 courses per year. Site at Ming-Chuan has established 90% of teaching materials. ChiNan’s site has been integrated with the administrative affairs system. And LMS at National Cheng
Kung University [8] has transferred from BlackBoard to Moodle last year as well.

B. Related works

There are two projects similar with our OpenMoodle module. They are Open Course Ware and Community-Hub. Both of them have their own characteristics, but also lack of some parts.

Open Course Ware (OCW) project is initiated by Massachusetts Institute of Technology (MIT) in April 2001 [9]. It is free for everyone. They tried to lower the cost of creating course content in OCW by integrating with the LMSs provided by faculties for their students. However, there were some problems when integrating practically. Because making materials transforming automatically from OCW might put an unacceptable burden on faculties [10]. In addition, the content of course is provided unilaterally by original faulty, and it lacks diversity.

As of Moodle, there’s no capability of sharing course materials between sites built in released packages (till v1.9). In the roadmap (v2.0), they add a new feature named Community Hubs that permits teachers download courses as templates from other educators [3]. But after restoring the templates, users cannot keep updating the latest curriculum’s content continuously. It only supports exchanging data in the beginning. In addition, the courses publisher is unable to trace the resource statistics.

III. SYSTEM DESIGN

A. Moodle Standard Web Services

Standard web services for Moodle is proposed at Moodle roadmap 2.0. It’s a module that aims to support multiple web services protocols. The CCM that we developed are based on it. Figure 2 shows the structure of the Moodle standard web services.

1) External Service Interface

Moodle supports many kinds of protocols like SOAP, REST, XML-RPC, and AMF. This layer is responsible for dealing with tokens, emulating user session, parameter processing. Moodle core functions can be accessed from remote servers running somewhere on network via this layer.

2) Public PHP API

As the name implies, this layer is the set of web service functions that open up the avenue to low-level core function. All core functions that can be accessed by the way of web services should be wrapped in web service description format. The available web service functions can be declared at first, and then the corresponding external function is defined which are both located at each module folder.

3) Low-level Internal API

The low-level internal API is also called core function. It is foundation of the external function. The request comes from external function is executed by the core functions and the result is returned to the external function. The developer can utilize existing core functions or write them on their own.

B. Course Communication services for Moodle

The Course Communication services for Moodle (CCM) are a set of services that provide external developers the approach to Moodle core function. As mentioning in previous section, the Moodle core function needs to be encapsulated to support CCM. There are two categories such as Moodle Built-in services, and Customized services in CCM. First of all, there are handful of services are already built-in at standard Moodle development version 2.0. These services are supported from the core Moodle group and tend to global Moodle data usage. In addition to the standard built-in

Figure 2. The Moodle standard web services layer

Figure 3. The overview of Moodle sites using OpenMoodle module
services, we refer to ten courses running in last two years. And considering the popularity and practicability of Moodle's resources and activities which are used in these courses, we choose four kinds of resources and five kinds of activities as our implementation goal. There are four resources and two activities modules which are totally accomplished by our self. The rest of three activities module come from third parity but they are fixed by us. We find these available services from DFWikiLABs. DFWikiLABs is an open-source developing group in Spain. These services they implemented are quite good but don’t work correctly. So we fixed some bug and make them suitable for the latest Moodle web service specification.

C. OpenMoodle

The next part we proposed in this thesis is named “OpenMoodle” module. The OpenMoodle module is mainly designed for sharing course content and collaborative teaching. It allows teachers to cooperate with other like-minded instructors. Figure 3 depicts the overview of Moodle sites using OpenMoodle module. The educators at friendly Moodle site can export their course contents. The instructor at ordinary moodle site can import the course materials that come from other friendly moodle sites to create a new course or to enrich existing course content. The learners can gain more plenteous and integrated resources than traditional way.

OpenMoodle is a block based module in Moodle. The course communication services developed in previous section was adopted to support OpenMoodle. It consists of three major components: OpenServerList, Importable Curriculum Admin, and Local Curriculum Export. The component of OpenMoodle module is shown at Figure 4.

1) OpenServer List: Before starting to exchange course materials with other educators, the instructor who owns the course materials should configure external servers first. OpenServer List component provides moodle administrator an interface to enter the web service login account of both local and curriculum exporting-side sites, and to manage the list of moodle sites which are willing to export their teaching materials. These accounts are stored at first and used during the period of exchanging data. The curriculum importing-side site needs to get metadata information (e.g. available exported courses list, available exported course content in a course) before importing course materials. Once a site has imported curriculums successfully, the curriculum exporting-side site has to record the login information of curriculum importing-side site so that if there is any change occurs, the curriculum exporting-side site will be able to notify those curriculum importing-side sites.

2) Importable Curriculum Admin: The Importable Curriculum Admin component is used to manage and import external course content. The available exported curriculums will be listing here. By entering individual course, the resources and activities which are ready to export are shown. The instructor can choose what he wants among these exported moodle course materials like url, page, lesson, resource…etc. After finishing selecting available modules and clicking the “Import” button, the content of remote course will be delivered to local server right away. Local server will use these data to enrich an existing curriculum or establish a new curriculum.

In addition to import the resource and activity, instructor can set the synchronous option to make system enforce corresponding action when exporting-side site update the content of curriculum. Three types of synchronous options are defined in the Importable Curriculum Admin component. They are “None”, “Only-inform”, “Auto-sync” synchronous options classified in Table I.

The “None” option represents that system does nothing when there is any up-to-date material being published. In this case, instructor can utilize the curriculum data from other educators as sample course without keeping following latest exported resources. If instructor prefers that the curriculum content entirely come from another teacher, he can adopt the “Auto-sync” option. The imported curriculum data will be sync no matter what thing change at exporting-side site. The last option is “Only-inform”. Curriculum importing-side site only receive update message. The instructor can filter out that content and then import profitable materials.

3) Local Curriculum Export: The instructor is able to share resources with other like-minded educators through this component. The system will record the permissible resources and activities list. External educators at other sites can view the exported curriculum materials as long as they have entered the login information of exporting-side server. In order to do so, we should provide an account for other educators to access our curriculum materials. This account is “Web services authentication”-based in moodle and assigned the corresponding capabilities which are checked during the

<table>
<thead>
<tr>
<th>Synchronous option</th>
<th>Corresponding Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Do nothing</td>
</tr>
<tr>
<td>Only-inform</td>
<td>Notify instructor. Do not sync curriculum data automatically.</td>
</tr>
<tr>
<td>Auto-sync</td>
<td>Imported curriculum data will be sync with exporting-side</td>
</tr>
</tbody>
</table>
Table II. Comparison between OpenMoodle Open Course Ware and Community Hub

<table>
<thead>
<tr>
<th></th>
<th>OpenMoodle</th>
<th>OpenCourseWare (OCW)</th>
<th>Community Hub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expense</td>
<td>Free / charge</td>
<td>Free / charge</td>
<td>Free / charge</td>
</tr>
<tr>
<td>Create course template</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Teach collaboration</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Update latest content contiguously</td>
<td>Automatic / Manual control</td>
<td>Manual control</td>
<td>No</td>
</tr>
<tr>
<td>Provide teaching materials</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Provide teaching activities</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Course content source</td>
<td>Any educator</td>
<td>Institute's faculty</td>
<td>Any educator</td>
</tr>
<tr>
<td>Keyword Search</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>User Feedback</td>
<td>Text comment &amp; resources statistic</td>
<td>No</td>
<td>Text comment</td>
</tr>
<tr>
<td>Integrated with each other LMS</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

procedure of course content sharing. Besides exporting data to outside server, the instructor should be able to make some modification, improvement of his teaching materials based on other user’s feedback. We record some statistics which are related to what kinds of materials are selected by other educator’s. We list the information about sites which had imported curriculum materials. Moreover, we also record usage of each exported module.

IV. EVALUATION AND COMPARISON

An experiment to evaluate the OpenMoodle module has been undertaken among two universities which are Tunghai University, and Tahwa Institute of Technology. We separately built Moodle server embedded with OpenMoodle module and made use of 15 courses within Department of Computer Science, Tunghai, and 12 courses within Department of Computer Science and Information Engineering, Tahwa [11]. These courses are currently running. And we create a testing site for assembling purpose in National Chiao Tung University. All the integrated 27 courses were imported at testing site. As time goes on, it will follow faculty’s footstep to update the latest content.

The comparisons between OpenMoodle and other course content sharing system are shown in TABLE II. Educators can create course template through OpenMoodle and Community Hub. But collaborative teaching with other like-minded teachers is only allowed within OpenMoodle. Besides, users can keep following the latest content contiguously depend on different usage scenarios. In OCW, users have to do it manually and they do not provide such facility for users in Community Hub. We take the MIT OCW as sample. Although MIT is one of top universities, OCW’s course content is provided unilaterally by MIT’s faculty. They have good quality of course content in OCW’s courses but lack of diversity. Although there is an Open Course Ware Consortium consisted of several institutes, users need to filter these sites and find proper content by themselves. And these OCW sites are not easily integrated together because of adopting myriads of content management system. In OpenMoodle, any educator, teacher, or lecturer can work together and provide learning content for students. Because of OpenMoodle integrates with Moodle LMS, they can provide not only teaching materials but also teaching activities. Different with Community Hub just provide text comment feedback, OpenMoodle provides individual resource statistic. The OpenMoodle is lack in keyword-search. Educators have to use other way, i.e. manually, to search other people.

V. CONCLUSIONS

Moodle is such a successful open-source LMS and is widely adopted around the world. Developers can customize functionality for specific purposes on their demand. The CCM provides a unified approach to Moodle’s resources and activities. Educators can develop custom-made services and integrate with other heterogeneous systems more easily. The OpenMoodle module was also presented in this paper. It lets teachers who are not at the same place to make the interaction and teach collaboratively. Experienced teachers can make a short cut for new teachers by sharing their precious experience. Teacher can collaborate with another one who teaches same course but hold data separately to control the autonomy. They measure the data of course and choose the most appropriate materials for students. Students get diversity of knowledge, view, and teaching style as well. Course publishers can benefit from user’s feedback and usage statistics. Furthermore, the OpenMoodle is implemented based on the CCM. Other Moodles can be integrated with the OpenMoodle.

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