



## Implementing Online School Collaboration Projects with Learning Tools Interoperability

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### Abstract

*New online technologies help erase boundaries and requirements for physical learning spaces, devices, and platforms while connecting students and cultures. Conversely, Learning Management Systems (LMSs) may seem to perpetuate boundaries between registered users and non-member “outsiders,” for the systems are basically built to offer services only to the enrolled users. For over six years, a team of LMS collaborators has attempted to blur remaining online walls between universities through online collaboration. In this way, students from different universities share learning materials, exchange ideas, and engage in collaborative activities transcending traditional environments without obvious borders.*

*The early research involved several online collaborative projects using Moodle Networking (MNet). MNet allows multiple Moodle installations to connect using Single-Sign-On (SSO). The students studying with Moodle at each of four different universities in Japan collaborated across the borders of respective e-learning environments. A TOEIC-style quiz activity was created for all remote participants to challenge. A shared online discussion forum was created for intercollegiate exchanges of opinions. Also, a shared database was created for collaborative work among students from different schools. However, one larger limitation of MNet revealed that learning outcomes (grades, etc.) did not transcend this online border between LMSs.*

*Learning Tools Interoperability (LTI) is a method for giving remote access to a learning activity or course with the added ability to share learning outcomes. LTI was used for collaborative school projects in conjunction with the PoodLL multimedia plugin, which was developed in Japan. In one example, students each created a mock travel plan to the Grand Canyon and reported their plans in an LTI provided Moodle Database. In a second example, students made detailed travel plans and itinerary to a foreign city using an LTI provided Assignment. We confirmed later that each set of points received in the ratings from peer reviews and grades from facilitators were reflected in the local Moodle grade books.*

*This paper will illustrate how LTI can be utilized for integrating different remote activities for advanced online collaboration.*

### Introduction

With global infiltration of the Internet and its related technologies, the learning world has become more connected and more “open” [1] than before. Text, audio, and video materials are to learners’ avail all over the world and the development of ICT allows connectivity with other distance learners with ease using emails, chats, and video conferencing. It seems there are no boundaries between learners living in different geographical locations, cultures, and time zones that hinder them from interacting, collaborating, and gaining knowledge with each other. Knowledge is now *a property of the network* as David Weinberger states, “As knowledge becomes networked, the smartest person in the room isn’t the person standing at the front lecturing us, ... [it] is the room itself: the network that joins the people and ideas in the room, and connects to those outside of it. [2]”

However, tendencies to go against this trend of open-ness have appeared as Tim Berners-Lee, the inventor of World Wide Web, regrets regarding the current development of social networking sites; “Large social-networking sites are walling off information posted by their users from the rest of the Web. ... Each site is a silo, walled off from the others” [3]. In the learning world, the same worries apply to the appearance of Learning Management Systems (LMSs). Each LMS basically offers services to only the learners who are enrolled in a particular course on the site. The system impounds its users inside and shuts them off from outside intruders. This situation is regrettable, for the essence of the Internet lies in the dynamism of inter-connectivity and universality.

The authors from five universities in Japan burning with an ambition to tear down the walls around LMSs, joined forces together to find ways to get their LMSs connected to make it possible for students



to communicate, collaborate, and evaluate each other without appearing to leave their local online learning environments. This is a report of efforts spanning more than six years.

## 1. Linking LMSs

Like the metaphor of neurons forming synapses in our nerve systems, the authors believed that LMSs would be more efficient if they became connected. Content sharing and utilization of repositories are a common practice but involve much duplication of materials. Instead, direct linkage of learning environments and sharing of learning activities could make learning more dynamic, motivating, and accessible. Moodle Networking functions were utilized to make this possible. Moodle Networking, (MNet) is standard functionality in Moodle 1.8 and newer. By configuring and activating MNet, learners visit remote Moodle courses using Single Sign On (SSO). MNet is established by the following procedure:

- 1) Turn on Moodle Networking
- 2) Register the URL of the partner site
- 3) Activate MNet authentication plug-in
- 4) Allow users to be added automatically
- 5) Activate SSO services in MNet settings
- 6) Allow roaming for a specific Moodle user type
- 7) Add Network Servers block in your course

By accessing the link in the Network Servers block, the user jumps to the remote server and is given access to the remote course without further authentication.

## 2. Inter-school Online Collaborative Activities

Utilizing MNet a variety of online activities involving participation by students from multiple schools were tested.

### 2.1 Resource sharing

First we examined if quizzes could be taken by remote access with MNet. We placed 20 TOEIC-style reading quizzes on the research hub server and asked students to take the quizzes logging in from remote Moodle servers. Students were able to take the quizzes without difficulties and the automatic marking was problem-free.

### 2.2 Exchange of opinions

A shared forum was created on the research hub server. Students from different schools accessed the forum and left messages related to a current news story. They were encouraged to exchange opinions through questioning and answering. The forum functioned as designed with each group of remote users posting messages to one another successfully.

### 2.3 Collaborative learning

Next, having students create a collaborative work online was attempted. Students were instructed to research the world's most influential people. First, signed up to research an influential person using the glossary module on the research hub server in order to avoid duplicate entries. Finally they made entries reflecting the results of their research in a database module activity. This work was revealed to be a collaborative effort of Who's Who. This activity proved that online collaborative learning is possible among students even when they belong to different remote institutions.

### 3.4 MNet customization

One of the challenges faced in the multi-institutional collaborative efforts was the difficulty in identifying the students' host institution. The authors struggled to comment on and evaluate them because remote users all appeared alike. To better display each student's affiliation and also to fan a sense of inter-university rivalry, a customization of the Moodle software was introduced for MNet by revising the "fullname" function. As a result, all remote user names were automatically color-coded (MNet\_host\_color function) according to each unique school from which they originated [4].

### 3.5 Debate-style discussion

Using the added feature of color-coding, the authors implemented an online debate-style discussion forum. This time the students were instructed to take part in discussing controversial issues by expressing the pros and cons of each topic. The color-coding helped the students noticeably through



participation in the discussions as well as showing competitive spirit against rival schools. Teachers also found it easier than before to identify student groups and give necessary advice and evaluation.

### 3. LMS linkage and multimedia

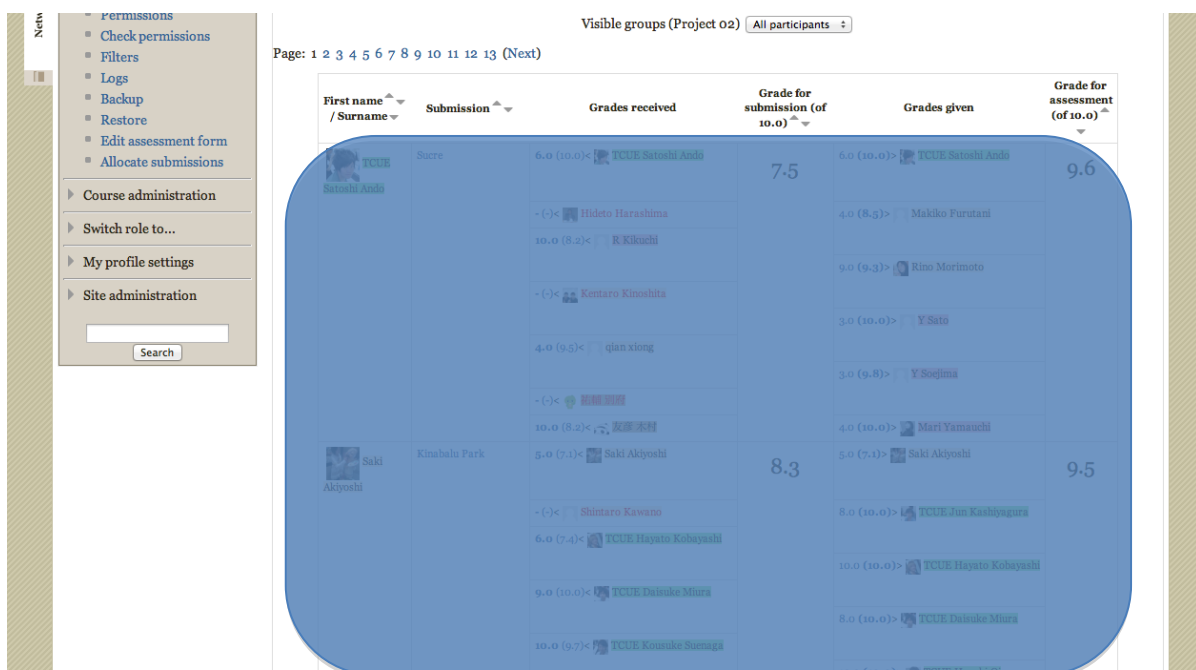
Having confirmed that the basic LMS functions are maintained through networked use of the system, the authors ventured to see how LMSs react with online activities using multimedia.

#### 4.1 Local cultural exchange project

For this project, the multimedia plugin PoodLL [5] was installed on the research hub server. This plugin makes it possible for Moodle users to capture audio and video materials within Moodle and attach them to forum posts and assignments. The first trial was a local cultural exchange project where students made short videos showing regional food specialties or sight-seeing spots. These were posted with a text message in a forum on the research hub server via MNet. We confirmed that multimedia content was uploaded and shared on the server without issue and remote peer evaluation ratings of the forum posts were accurately calculated.

#### 4.2 World heritage sites project

Students from four universities participated in this project. The students were instructed to research one World Heritage site and introduce it with some text and an audio presentation. The Moodle workshop module, which supports both teacher and peer assessments for grading, was used for this project. Rubrics were designed for the students to perform peer evaluation. Student performed peer assessments of up to 5 other students. Each student's overall grade was composed of a project grade plus a peer evaluation grade. The final project grade was a result of both personal project and performance as a peer assessor. Fig. 1 shows the final phase of peer evaluation. Each student both was evaluated by peers (grades received) as well as gave performance evaluations (grades given).



First name / Surname	Submission	Grades received	Grade for submission (of 10.0)	Grades given	Grade for assessment (of 10.0)
Sasaki Anahi	Sasaki Anahi	6.0 (10.0) < TCUB Satsuki Anahi	7.5	6.0 (10.0) < TCUB Satsuki Anahi	9.6
		- (-) < Hideto Harashima		4.0 (8.5) > Makiko Furutani	
		10.0 (8.2) < R Kikuchi		9.0 (9.3) > Rino Morimoto	
		- (-) < Kantaro Kinoshita		5.0 (10.0) > Y Sato	
		4.0 (9.5) < qian xiong		5.0 (9.8) > Y Soejima	
		10.0 (8.2) < TCUB Saki Akiyoshi		4.0 (10.0) > Mari Yamachi	
Saki Akiyoshi	Kimabalu Park	5.0 (7.1) < Saki Akiyoshi	8.3	5.0 (7.1) < Saki Akiyoshi	9.5
		- (-) < Shintaro Kawano		8.0 (10.0) > TCUB Jun Kobayashi	
		6.0 (7.4) < TCUB Hayato Kobayashi		10.0 (10.0) > TCUB Hayato Kobayashi	
		9.0 (10.0) < TCUB Daizuka Miura		8.0 (10.0) > TCUB Daizuka Miura	
		10.0 (9.7) < TCUB Kouzou Sumaga			

Figure 1: Peer evaluation using rubrics on a Moodle workshop module

LMS connectivity proved faultless throughout this very complicated activity using multimedia, peer matching, and rubrics-based evaluation within the workshop module. (For details, refer to [6].)

### 5 Utilizing learning tools interoperability (LTI)

In 2014 the authors began making use of a different authentication system. This new system was a planned replacement for MNet authentication. The reasons were: 1) support for MNet was planned to be phased out of Moodle entirely, 2) security - MNet allows full access to remote Moodle sites, 3) grades for remote activities were not transferred back locally; teachers were required to login to the



remote server, sort through students from four universities, and transfer the grades to the local server manually - a cumbersome process. LTI is a new technology designed to better manage these issues.

### **5.1 What is LTI?**

LTI, or Learning Tools Interoperability, is an industry standard proposed by IMS Global Learning Consortium [7]. It allows learning objects to be “published” by and “consumed” across different LMS constructs in a standardized manner. It uses a secure link to an external tool from inside a Tool Consumer, which can be an activity, a course, or an entire site. It also supports cross platform integration between different online learning environments, for example, between Moodle and Blackboard or between Moodle and Moodle. LTI objects consumed in a local course impress learners as if they were regular activities in that course; users will not feel that they are logging into a remote site. Also, grades can be passed back to the consumer if needed.

### **5.2 Implementing LTI**

Configuring LTI in Moodle very straightforward. On the research hub server, the LTI Provider plugin is used. Providing LTI objects is not standard Moodle functionality, so the added plugin gives Moodle this functionality. Once installed, the administrator selects an activity as an object to be provided in the LTI settings. The system creates a "Launch URL" and a "Shared Secret" which will be used by the consuming LMS. Various settings allow the option for grades to be passed back.

On the consumer LMS, the Launch URL and Shared Secret are used when configuring an "External Tool" activity. LTI consumption is out-of-the-box functionality in Moodle as of version 2.2. The tool appears as an activity on a selected course page where it is created. When the user clicks the tool, LTI launches the activity on the remote site. By establishing LTI connection, the authors attempted two online projects as follows. (For further reference, see [8].)

### **5.3 My trip to Grand Canyon project**

Students from two universities made a mock travel plan to the Grand Canyon. Specific details on dates, transportation, accommodation, activities, and budget were reported in a Moodle database activity through LTI. They also designed and added a postcard using the PoodLL whiteboard. Each student peer reviewed other travel plans by giving ratings and leaving comments. The scores of the ratings were then automatically passed back to each participating Moodle course.

### **5.4 Travel abroad project**

Students from four universities picked one foreign city, made detailed travel plans, and submitted them to an assignment module created on the research hub server as an LTI object. Teachers using a marking guide performed the grading. Safe transfer of grades to each local server was confirmed as shown in Fig. 2.





You are logged in as トム ローソン (Log out)

		Project #2			Project #3		
Department	Institution	Category total	Application Essay (submission)	Application Essay (assessment)	Category total	Travel Abroad Project	
国際観光	長崎国際大学	25.14	70.80	13.00	36.80	92.00	🔍
国際観光	長崎国際大学	22.99	62.08	14.56	35.20	88.00	🔍
国際観光	長崎国際大学	20.81	52.04	17.33	34.40	86.00	🔍
国際観光	長崎国際大学	16.41	42.32	12.39	31.20	78.00	🔍
国際観光	長崎国際大学	21.90	60.72	12.30	28.80	72.00	🔍
国際観光	長崎国際大学	23.12	59.76	17.30	28.00	70.00	🔍
国際観光	長崎国際大学	20.19	61.52	6.79	25.20	63.00	🔍
国際観光	長崎国際大学	18.59	52.97	8.99	23.20	58.00	🔍
国際観光	長崎国際大学	7.20	24.00	-	10.00	25.00	🔍
国際観光	長崎国際大学	20.58	51.68	16.91	-	-	🔍

Figure 2: Grades transferred to a local grade book by LTI

## 6. Conclusion

Linkage of LMSs promotes sharing of learning materials, and communication and collaboration among students from distant places. A learning activity provided using LTI can function as if it were one of the regular activities in a local Moodle course, and the results of learning activities are automatically recorded in the local grade book. The authors are convinced that LTI will further expand possibilities for online learning using LMSs, especially with a prospect of team teaching where remote teachers get together and teach and evaluate each other's students online by linking LTI learning objects.

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