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CHiLOs: A New Virtual Learning Environment for Large Scale Online Courses

Masumi HORI[a*], Seishi ONO[a,b] , Shinzo KOBAYASHI[c] , Kazutsuna YAMAJI[d] & Toshihiro KITA[e]

[a]NPO CCC-TIES, Japan
[b]Musashi Academy, Japan
[c]smileNC&co., Japan
[d]National Institute of Informatics, Japan
[e]Kumamoto University, Japan
**hori@cccties.org*

Abstract: This research reports the development of a new online platform for Large Scale Online Courses (LSOCs) that combines e-textbooks and a Learning Management System (LMS) such as Moodle or Canvas in an effort to increase course completion rates. The platform, called Creative Higher Education Learning Objects (CHiLOs), consists of e-textbooks, e-lectures, digital badges, and learner's communities.

Keywords: Peer-to-peer learning, Open Education, Large Scale Online Courses, e-book, e-textbook Learning Management System, GakuNin, Massive Open Online Courses, lurker

1. Introduction

One of the main goals of Massive Open Online Courses (MOOCs) like Coursera and edX is to make higher education available to everyone. Many people worldwide experience barriers to higher education such as social restrictions, geographical disadvantages, and academic expenses. Anyone who wants to study at higher education institutions should be able to learn any time and any place. Large Scale Online Courses (LSOCs) using videos, assigned readings, and problem sets can provide hundreds or thousands of learners with access to higher education in a stable format.

LSOCs provide access to learning content, distributed content, and virtual learning environments (VLE) after users apply for the course and are authenticated (see Figure 1). However, LSOCs face some challenges:

- Network stability: Relying on a specific vendor (vendor lock-in) causes less stable operations. This was seen when Coursera experienced a partial outage caused by failure of the Amazon Web Services system (Gupta, 2012).
- User authentication: Biometric authentication and video monitoring are less cost-effective than examination at the traditional classroom (Arnold, 2013; Young, 2012).
- Completion rate: The average completion rate of a MOOC is less than 10% (Hill, 2013).
- Peer-to-peer learning: The face-to-face learning experienced in traditional classroom environments is not always possible in LSOCs because a number of learners.
- Ubiquitous learning environment (ULE): The use of the web paradoxically prevents diverse learners from studying in the ULE (Yang, 2006).

The authors propose an architecture for LSOCs using e-textbooks as a learning management system (LMS) interface, 1-minute nano lectures, and Academic Identity Federations (AIF) (see http://refeds.org) by dealing with open education in Japan's higher educational community as well as focusing on lurkers and tutors called by Connoisseur such as experts in our online communities. E-textbooks are advantageous due to their portability and learnability (Jamali et. al., 2009). Therefore, our user-friendly LMS interface using e-textbooks can create a ULE for diverse learners regardless of their computer skills or network access.

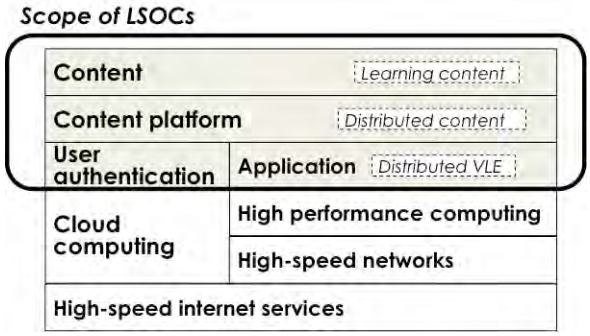

Figure 1. Scope of LSOCs

2. CHiLOs project

2.1 CHiLOs structure

We developed the Creative Higher Education Learning Objects (CHiLOs) project for open online courses in Japan. CHiLOs consist of 1-minute lectures, e-textbooks, digital badges, and learners' communities (Figure 2).

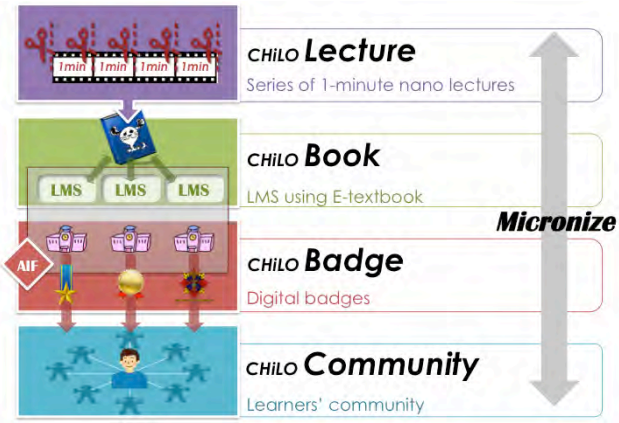

Figure 2. CHiLOs structure

Through the CHiLOs project, the authors of this paper aim to develop a new VLE based on an e-textbook user LMS interface called CHiLO Book. The CHiLOs' VLE consists of 1-minute nano lectures called by CHiLO Lecture and will provide digital badges called by CHiLO Badge based on the user authentication by means of the AIF. Additionally, each CHiLO Book is granted a digital object identifier (DOI) (see http://www.doi.org) to ensure that it is traceable and is discoverable in web searches. Finally, CHiLO Book will contain varied Internet resources to replace a traditional web browser (Hori et al., 2012; 2013). These elements will achieve a flipped classroom, which may facilitate the creation of several small communities of learners within the LSOC called CHiLO Community; peer-to-peer learning will be achieved through these communities. The CHiLO Book and CHILO Lecture distributed and the presented CHiLO Badge in the CHiLO Community will help develop educator-to-learner and learner-to-learner links and further promote mutual understanding of the educational content.

2.2 Lurkers in online communities

90% of the users in most online communities accessed by the general public are lurkers who only browse and do not actively participate (Nielsen, 2006). In LSOCs, it is common for learners to drop out because they do not want to try a quick quiz or assignment and many do not contribute to message boards. This is referred to as pedagogical lurking (Dennen, 2008; Rodriguez, 2012) and such lurkers are prominent in MOOCs. In short, LSOCs should aim to motivate pedagogical lurkers to contribute.

2.3 CHiLO Lecture

In designing our system, we analyzed data obtained from an actual 2008 experiment with open courses involving 30,000 learners (Hori et al., 2013). As shown in Figure 3, the probability of the number of viewers decreased over viewing time.

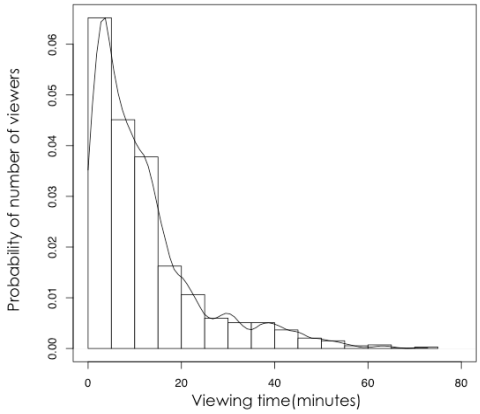

Figure 3. Learners' viewing time

The results of the experiment showed that most learners prefer short, 1-2 minute lectures. Therefore, in the present study, we focused on creating 1-minute nano lectures and developed an LMS interface using 1-minute nano lectures in CHiLO Book. This structure is called CHiLO Lecture.

A complete CHiLO course consists of 15 CHiLO Books and each CHiLO Book includes approximately 10 CHiLO Lectures. Learners receive a CHiLO Badge after they complete each the CHiLO Book and the CHiLO course. Diverse learners and lurkers can easily and repeatedly access these short lectures and gain CHiLO Badges. The present study showed that repeatedly viewing a series of CHiLO Lectures and receiving CHiLO Badges for completing assignments provided the same learning effects as "the mastery learning approach" advocated by Bloom in Coursera's experiment (Do et al., 2013).

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2.4 Peer-to-peer learning in CHiLO Community

LSOCs should be diverse enough to attract a wide range of learners, including lurkers. Lurkers have a tendency to passively disseminate and search for information (Bishop, 2007), and supportive learning communities can help them become more interactive. Peer grading in MOOCs is currently not adaptable to lurkers who only browse and lack motivation. Although face-to-face teaching is required for learners on LSOCs, it is impossible for so many learners.

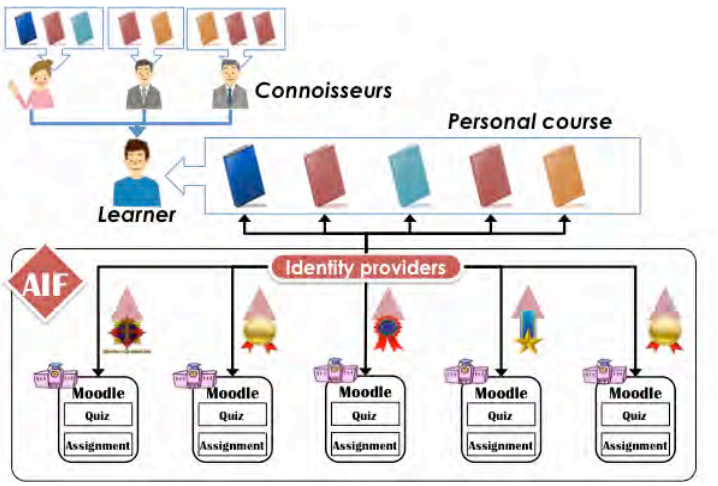

Figure 4. Relationship between educational Connoisseur and learners

We propose new peer reviews of the CHiLO Lecture, encouraging learners to become Connoisseur. University educators manage learning communities in traditional higher education online courses; however, learners themselves organize the communities in peer-to-peer learning. Our Connoisseurs are not teachers, but reputable learners. They create small groups or classroom communities, support learners through peer-to-peer learning, and integrate information according to the learners' levels. Figure 4 shows the relationship between Connoisseurs and learners in CHiLO Communities using CHiLO Books with AIFs (https://refeds.org/resources/) of which authentication trust framework is maintained by each country..

3. Implementation of CHiLO Book and CHiLO Badge in CHiLO Community

CHiLO Book and CHiLO Badge are developed under the above-mentioned concept of peer-to-peer learning in CHiLO Community. Figure 5 shows the development of CHiLO Book, CHiLO Badge, and CHiLO Lecture.

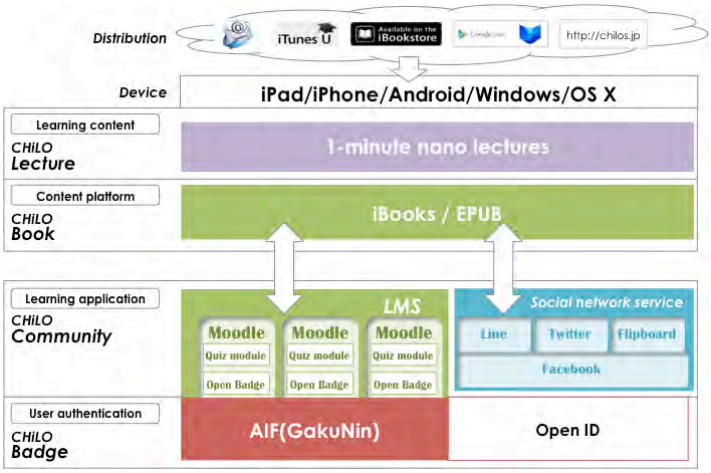

Figure 5. Components of LSOCs by the CHiLO Books

3.1 Moodle-based development using GakuNin

The LMS of CHiLO Book was configured and developed on Moodle, a commonly used open source LMS, using the present Application Programming Interface (API). Since Moodle is an open source system, each university can run it independently. Moodle 2.x is the basis of the CHiLO LMS, so Open Badge from the Mozilla Foundation can be issued as CHiLO Badge. The Moodle LMS have to be configured to activate SAML authentication and then be registered as one of the service provider in GakuNin; the Japanese AIF. This helps us to solve the identity management issues in LSOCs in the sense that providing and updating GakuNin user data is the responsibility of the affiliated universities (Yamaji et al., 2010).

3.2 CHiLO Book configuration

A typical CHiLO Book is about 20 pages and consists of a lecturer video, a lecture summary, lecture content and a unit examination. There are 1-minute lectures, the lecture scripts, slides, a link to a comment box allowing the user to post to Facebook, and each page of the book has a link to quizzes on the material presented.

4. Discussion

4.1 Micro LSOCs in CHiLOs

Online content in CHiLO Lectures is divided into 1-minute nano lectures. Online content in CHiLO Books is distributed by many LMSs using e-textbook interfaces. CHiLO Community encourages peer-to-peer learning so that each individual in the community becomes an active learner as well as a Connoisseur. Therefore, the CHiLO project consists of various micro systems distributed within LSOCs.

The benefits of micro LSOCs in the CHiLO project are as follows:

- CHiLO Book has desirable features for VLE which have scalability for distributed systems in LSOCs.
- CHiLO Lecture enhances learning effects through distributed 1-minute nano lectures that learners can repeatedly study.
- CHiLO Community creates a supportive peer-to-peer VLE for lurkers because the content is easily accessible and do not to require learners to be computer literate.

However, micro LSOCs in the CHiLO project also have the following disadvantages:

- Management of the integrated system for the distributed LMS is complicated. Therefore, it is difficult to process high volumes of data relevant to learners' private information and learning outcomes.
- Creating many 1-minute lectures is laborious and requires specific skills and knowledge.

4.2 Integrated micro LSOCs

CHiLOs' distributed architecture enables scalability of LSOCs. Learners are required to find the relevant information from the distributed learning resources. That is, connecting with other learners who have a similar learning target is an important functionality offered by CHiLOs.

Within a CHiLO course, there is an option for users to allow their CHiLO Badges, which are issued from each individual LMS, to be aggregated into the main CHiLO LMS server. CHiLO Badges can contain embedded principal information of the learning process such as selected CHiLO Books, meaning that the CHiLO LMS server plays a role in allowing learners to discover and connect with each other. In addition, CHiLO Badges can be seen as a certification of user attributes, especially in the e-learning field. Although the identity provider in the AIF can provide minimum user attributes which are managed by the users' home organization, the CHiLO LMS server can provide additional course certificates in the form of CHiLO Badges. The CHiLO LMS server will play an important role as an attribute provider of micro LSOC networks based on the AIF.

5. Conclusion

The MOOCs movement has created a new educational environment that impacts a large number of learners. New merits of MOOCs are expected to emerge as a greater number of learners with different skills and values use the same VLE. On the other hand, Dennen (2013) showed that weaknesses such as prior experience, external vision, support needs, faculty incentive, and political climate are disadvantages of MOOCs. Furthermore, to provide stable and instructive services to many learners, we must radically change the way online learning is compared to traditional education.

In traditional education, university teachers provide educational content to students according to the curriculum (content platform) designed by the university. Students physically gather on a campus to receive guidance from the teachers. The university provides accreditation for their achieved learning outcomes. In other words, universities centrally manage all aspects of a student's learning. This method can only provide learning opportunities to a limited number of people and is unable to fulfill the learning demands of modern society.

CHiLOs LMSs are designed not only to serve as a system that conforms to LSOCs, but also to significantly change the framework of traditional education. In traditional education, universities only exist to grant degrees and teachers just transmit information. In future LSOCs, there will be significant changes to academics as students can freely select the content that they want to learn and create their own curriculums.

Furthermore, the support provided to lurkers by introducing social network service and 1-minute nano lectures in the CHiLOs-based environment cultivates intellectual curiosity among learners and can be a good learning environment for increasing online course completion rates.

We believe that the educational roles of traditional universities should incorporate MOOCs and CHiLOs as they are better able to meet the diverse requirements of modern society. CHiLO book is one of many possible strategies universities could implement to meet the diverse educational needs of individuals, organizations, and society.

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