Designing e-learning environment to encourage student centred learning

Arkhadi Pustaka (arkhadipustaka@gmail.com), Herman Saksono (utik@ugm.ac.id)

Center of Innovations in Higher Education, University of Gadjah Mada, Indonesia

Abstract: The use of the internet for learning evolves from merely a tool for presenting learning materials as a powerful means of facilitating learning and enabling collaboration. Meanwhile, student-centred learning is becoming a promising option for education in general and engineering education in particular. eLisa, the in-house learning management system (LMS) developed by University of Gadjah Mada, was redesigned to adopt web 2.0 approaches of user interaction to encourage the practice of student centred learning by shifting from content-oriented LMS paradigm to collaboration-oriented LMS paradigm.

This paper describes the structure of the redesigned eLisa and analyses the instructional effects of the design. The detailed description of the design shows how the eLisa software was engineered to provide an easy to use and comfortable LMS to facilitate student-centred learning.

Furthermore, this paper includes the investigation of eLisa utilization on its early deployment after being redesigned over the first semester of August 2011–January 2012. Qualitative and semi-quantitative analysis was conducted on three classes in Engineering Department of University of Gadjah Mada to reveal the trends in the usage of eLisa by engineering students. The results of the analysis highlight the lessons learnt in developing an engaging learning environment within the engineering community.

Introduction

The internet evolved from Web 1.0, which is content-centred, to Web 2.0 which is user-centred. Web 2.0 facilitates user-controlled, collaboratively generated knowledge and community based enquiry (McLoughlin & Lee, 2007). The new paradigm shift opens the possibilities of Internet utilization to new ways of delivering learning. In particular, the use of Internet for learning has evolved from a mere repository for presenting learning materials to becoming a tool for enabling collaboration.

This paradigm shift is also observed in the field of learning and education. Student Centred Learning (SCL) approach introduced by Carl Rogers in 1983 has become a preferable option in education in general as the reflection of today's society where choice and democracy are important values (O'Neill & McMahon. 2005). SCL was also seen as the future of engineering education in particular (Felder et al., 2000). Since then, there are many success stories on the implementation of the SCL approach, particularly on engineering education (Ebner & Holzinger, 2007; Heitmann, 2005; McDowell, 2001; Prince, 2004).

There are similar properties on Web 2.0 and SCL in terms of active contribution and participation of the people involved. SCL approach emphasizes active learning, autonomous learning and mutual respect between the teacher and student (Lea, et al. 2003). On the other hand, Web 2.0 technology facilitates the user active involvement on generating the web content (Selwyn, 2007). Thus, eLisa, the in house e-learning developed by University of Gadjah Mada (UGM), was redesigned to encourage SCL practices by adopting Web 2.0 user interaction approach.
eLisa

eLisa is a learning content management system (LCMS) of UGM developed in-house by Center Innovations in Higher Education (CIHE), a department at UGM which has the mission to facilitate betterment of teaching and learning at UGM by the use of education technologies. eLisa was conceived in 2004 and was aimed at serving approximately 60,000 students and 2,164 faculties. The early version of eLisa was mostly a content-centred e-learning system for lecturers to upload learning materials.

The LCMS was built on a Firebird relational database system management system (RDBMS) and PHP platform. These relatively dated RDBMS technology often presents a challenge as its limited scalability often causes eLisa to halt on high usage.

To satisfy the evolving need of an LCMS, eLisa was redesigned and redeveloped in 2011. The requirement was to build a new LCMS, with comparable features like its predecessor but enhanced with features to enable active and collaborative participation. The new eLisa was also required to be built on the most recent RDBMS with good scalability. Through a series of assessments, CIHE selected MySQL and PHP as the RDBMS and web-based platform, respectively. Another consideration by CIHE to select MySQL and PHP is the popularity of both platforms.

eLisa Design Comparison

The new eLisa was launched in midst 2011. While the underlying code was completely rebuilt from scratch, the new eLisa carries features that are relatively the same as its predecessor. Therefore, the most significant change visible to eLisa users was the new design and interface.

The Homepage Redevelopment

We are going to compare how the new design improved upon its predecessor to give the feel and look of eLisa redevelopment. The home page of early version of eLisa is shown in Figure 1.

The layout of early version eLisa consisted of three main elements: 1) Login & Registration, 2) Community List, and 3) Anecdotal Information. The login section was redundantly shown twice and contained of many anecdotal information (survey, browser information, news board and recent activities) are occupying a large portion of the page.

After the redesign, the home page was simplified, as shown on Figure 2. The aim of this redesign was to provide concise information and relevant options to users to help them make choices faster, and in turn, help users navigate easily.
In the redesigned eLisa, the Login and Register button was moved to the top part of the page. As these features have to be accessed by users before they are accessing the learning courses in eLisa, it is important to have both buttons highly accessible. This change also eliminated the redundant double login section found in early eLisa. In the new version, the login button was also made more prominent and placed at top most of the home page.

While the new eLisa retains the departments list found in early eLisa, a new search box was inserted above the categories. The eLisa team chose this layout to facilitate present day users who are more familiar with the concept of searching as they are used to the concept of search engines.

A large amount of anecdotal information that was present in early eLisa was also removed and replaced with a help desk section to assist users. The help desk section provides on-line manual book and contacts information where user can directly contact eLisa administrator when help is needed. eLisa currently offers two means of communication to the support staff, they are email and Yahoo! Messenger. This change was made in order to give the easier access for users to the help desk.

The baseline of the redevelopment of eLisa is how to make eLisa as easy as possible to use. Simplicity becomes the main values of the interface design. By the easy-to-use e-learning, we aim to reduce the obstacle in the learning process.

**The Term of “Community” in eLisa**

eLisa uses the term “community” to represent a course. The term was chosen based on the requirements which was laid out by UGM suggests an e-learning system for past students and even the general public can participate. The term “community” was chosen to allow and encourage lecturers at UGM to build not only formal academic courses, but also topic-based communities as the open courses for public, for example “disaster mitigation” or “sustainable farming”.

The term “community” also conveys the notion that students will learn in groups rather than individually. Learning in “community” refers to learning through social interaction. Social interaction plays an important role in the development of cognitive abilities (Vygotsky, 1978). Vygotsky’s Zone of Proximal Development Theory stated that “the range of competencies that can be achieved with the aid of the peer student is higher than the range of competencies that a student can achieved in solitary”. Thus, the term “community” endorses students to learn as a member of learning society.

Furthermore, the use of the term “community” is meant to create an impression of an egalitarian environment to students as one of the attributes of participatory learning (Haberman, 2004). The egalitarian nuance is expected to encourage the spirit of student-lecturer equality as well as mutual respect.
The Learning Page Redevelopment

The more fundamental redesign was applied to the main learning page. The main learning page in early version of eLisa is shown on figure 3.

There are 5 elements of the main learning page of early eLisa:

1. Community identity: it contains the information of community: course name, course code, lecturer name, and access information.
2. Learning materials: it was designed to present the learning objectives for the community but we observed that many course creators used it to present the entire learning material.
3. Archives/downloadable learning materials: It appears as a link to the learning material repository page.
4. Discussion forum: It also appears as a link to the discussion forum page, separated from the main learning page.
5. Browser information: It provides users with trivial information unrelated to learning, such as web-browser version and operating system version.

During the redesign, the main learning page was reorganized to be more focused for learning and more simplified. The screenshot of the new learning page is shown on figure 4:
While the new design still consists of five features found in the early eLisa, the layout was rearranged with its features refocused:

1. **Community Name**: It was simplified from the detailed community identity found in early eLisa, to display community name alone. However, the community name appears as a link to the community identity page which contains the detailed information.

2. **Learning Material Summary**: Rather than typing in the whole learning material, the redesigned eLisa encourage course creators to present just the summary of the learning section. The main learning material should be presented in the download section instead.

3. **Downloadable Learning Materials**: It appears as list of web links to the learning material files. Community member can view the files on separate browser tabs or download them to the hard disk.

4. **Discussion**: It becomes the central feature of the main learning page of redesigned eLisa.

5. **Sections**: It occupies the leftmost column in the early version where less important information used to reside. This feature divides the learning material into smaller and more manageable chunks of topics.

**Rationale for the Redesigned eLisa Features**

There are two important elements on the main learning page of the redesigned eLisa: 1) discussion allocation, and 2) section with downloadable materials.

**The Discussion Allocation**

Student’s involvement and participation are two of the main principles underlying the SCL approach (Brandes & Ginnis, 2005). The redesigned eLisa is a shift of paradigm from content-oriented LMS to collaboration-oriented LMS by the inclusion of new discussion engine as well as collaborative group work feature which is currently in development. This paradigm shift can be observed in the new layout and space allocation in the main learning page. In the early eLisa, discussions were “hidden” on a separate page and unrelated to the learning sections. We also observed that, discussion in early eLisa was not real time and was not encouraging to participate to. Lecturers and students must manually refresh the page to check new replies. In the new eLisa, the discussion section occupies the largest part of the learning page and placed in the central part of the page. This new layout was chosen to encourage user’s focus on the discussion section. The main allocation of discussion is meant to give the social presence of the learning community member. Interactivity as one of the key aspects of social presence contributes to the level of participation of online learning (Tu & McIsaac, 2002). By utilizing Asynchronous Java Script and XML (AJAX) technology, online discussion in the new eLisa was made to allow real time interaction by updating users on new replies every 5 seconds. Replies can contain images which are useful to aid comments with a diagram or a picture.
The new eLisa also added an “agree” button on every reply so that students have option of agreeing with the proposition. This “agree” button was added to promote better bonding among students and encourage a stronger sense of community. However, when a lecturer clicks on the “agree” button on a student’s reply, the new eLisa will internally record this as a special event. This feature can be used by the lecturer to leave a track record of good comments from the students as an alternative way to assess discussions quality. These events are then normalized and combined with a discussion participation rate, which is then presented as stars in the lecturer’s grade sheet. Student receiving 3 to 5 stars indicates discussion participation and quality higher than the class average which is calculated from the lecturer’s “agree” button record, and student with less than 2.5 stars indicate below average participation and quality. Therefore, at the end of the term, the lecturer can easily assess every student’s discussions.

The new eLisa also provides simple and unobtrusive animations during discussion creations and replies. While these animations do not directly contribute to learning, it however adds a fun element when users perform actions (Weber & Gunther, 2010). The subtle property of enjoyment effect on doing discussion was added to encourage users starting a discussion and participating in one.

The Section with Downloadable Materials

Discussions in the new eLisa are organized into learning “Sections” which is created by lecturers. These sections divide the learning material into smaller portions which reflect the topics or classes in the face-to-face learning. Every section acts as a packet of resources, discussions, exercises and assignments that students should complete and master before moving up to the next section. As every section has discussions and learning materials that are relevant to the topic, the eLisa team expects this approach will maintain discussions to remain on topic by avoiding the overwhelming discussion threads (Bonk, Wisher & Lee, 2004).

Learning materials in the redesigned eLisa are presented as downloadable files in each section. This decision was made based on lecturers’ and students’ behaviour in UGM based on the database of the previous version of eLisa. The previous eLisa offered two kinds of learning material delivery which are online articles and downloadable files. The database showed that lecturers tended to use the downloadable files option. As observed on the in-house training held by the eLisa team, most lecturers felt more comfortable to develop their learning materials using familiar document editor such as Microsoft Word or Microsoft PowerPoint. We rarely found lecturers developed their learning materials online. In some occasions, the lecturer prepares their learning content offline then copy-paste it to the online form. As formatting of offline documents are often lost or broken after copying and pasting, lecturers would later become burdened with the task of re-editing the document. We also observed that, students tended to favour downloading the materials and read it offline rather than reading them online regularly. It was shown by the user access traffic data. The database showed that the 9 minutes average time access of the students on eLisa indicated that they did not read the learning material online which could take at least 10 minutes in the lowest level of average time spending on e-learning (Cocea & Weibelzahl, 2006). Based on this behaviour, eLisa presents learning material as links to downloadable files. It is easy to upload for the lecturers and flexible to view or download for the students. Just as the rest of eLisa, uploading files is done with AJAX technologies that allow ed easier and seamless operation for lecturers.

Sections also act as containers for exercises (named: Kuis) and assignments (named: Tugas), which is needed to facilitate SCL. Kuis enables the lecturer to conduct online exercises for the students. eLisa supports multiple choice and text answers. Certain question requires student to type in the answer and have it automatically checked by eLisa. Tugas is an online assignment system, where lecturer announces assignments online and students can submit their work online. Tugas is a new feature to the new eLisa, the early version did not have such feature. It is a preliminary feature to the next level of collaborative learning on eLisa: group assignment.

Early Implementation of Redesigned eLisa: Engineering Classes Case Study

Redesigned eLisa was employed by several engineering classes on August 2011 to January 2012 semester and many more classes in other departments at UGM. Some of the lecturers were assisted with financial grants but other lecturers used eLisa voluntarily because they were motivated to improve their teaching.
We monitored three engineering courses, an Industrial Engineering class (A) on product design, a Civil Engineering class (B) on tropical timbers, and a Chemical Engineering class (C) on dynamics (mechanics). The summary of activities recorded the online courses during the early development of redesigned eLisa is shown in Figure 5.

![Engineering Classes Activity Record](image)

**Figure 5: Engineering Classes Activity Record**

There are various trends on the usage of eLisa. In class A, the large class with many students contributed significant amount of discussion posts and visits. The lecturer of class A delivered the product design topic and used eLisa as a media for the students to submit their tasks on product design. On average, class A has only 3.24 visits per student and 1.8 posts per student. It means that in a semester, a student was likely to visit the online course less than four times and send discussion posting less than two times. We monitored the discussion and found that only approximately 10% of class members have actively posted replies on online discussion. Compared with class B and class C, class A did not have engaging factors such as clearly stated consequences of posting discussions to the students’ grade or new learning experiences such as having conversation with the international lecturers.

Meanwhile, class B which delivered tropical timbers topic had the least student from the three classes but had the highest total visit. In average, class B has 41.7 visits per student and 4.36 posts per student in a semester. This activity is relatively high compared to class A. In class B, students actively discussed the learning topics. For example, they discussed about how to calculate dead load on timbers, the preservation of tropical timbers, and the decay of wood regarding to its effect on timbers connection strength. The high number of total visit indicates that they actively monitored the online course to engage in the discussions. The community lecturer also invited his professor from Japan as one of the lecturers during his online delivery. Probably, the presence of an international lecturer was one of the influencing factors of the student active engagement to the course.

A contrasting case was observed in class C on dynamics (mechanics). The class C course creator used the online course mainly as a learning materials repository and for conducting an online test. So, even if the number of total discussion was the lowest relative to other courses, it had a high average of visits per student: 12.9. This number shows that in a semester, at least a student was likely to visit the online course 12 times. It can be inferred that the students’ visited the online course to download the material and do the online test on the active 12 weeks.

At the end of the term, interviews were conducted with the courses’ lecturers. The course creator of class A revealed that it was difficult to encourage all of 170 students actively involved in online discussions but he admitted that some of shy students in class became more confident to participate in the online discussion. The course creator of class B responded that eLisa helped students to speak up and participate actively in online discussions. The course creator of class C responded that eLisa was used mainly for uploading preliminary materials and quizzes so the students can prepare themselves before classes and actively participate during in-class discussions. She perceived that distributing learning materials using eLisa was successfully prepared her students for having in-class discussions. They all agreed that the use of eLisa encouraged students to actively engage on discussions but they perceived that the increasing of students’ participation in the discussion did not correlate to the students’ achievement in the final exam.
Conclusion

The “new” eLisa was redesigned and redeveloped to encourage students’ participation in discussion as one of the attribute of student-centred learning. Rather than advocating faculty members to implement SCL in e-learning, CIHE adopted a persuasive approach by designing an e-learning environment that is suitable to conduct SCL by providing: 1) real-time AJAX-based online discussion, 2) easy access to learning materials, and 3) “agree” button on discussions to improve user engagement and interactivity as well as allowing community members to influence each other. While the LCMS has been enhanced by new features to encourage discussions participation, we find out that LCMS environment designed for active and collaborative learning is not the only factor to accomplish successful active discussions in the LCMS. Our observations on eLisa usage on engineering classes indicates that successful implementation, measured by visits and discussion participation, depends on how the lecturers use eLisa as a tool for delivering learning.

References


**Acknowledgements**

The authors would like to acknowledge colleagues from the Industrial Engineering, Chemical Engineering and Civil Engineering Departments University of Gadjah Mada which used eLisa as the learning content management service for their classes.

**Copyright statement**

Copyright © September 2012, authors as listed at the start of this paper. This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License ([CC BY-NC-ND 3.0](http://creativecommons.org/licenses/by-nc-nd/3.0)).