Open School Cambodia: Open Web-based E-learning Platform for Khmer-Speaking Users

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Abstract: The purpose of this usability study was to evaluate the ease of use of an open web-based learning platform called Open School, which was developed for Khmer-speaking users for taking and creating online courses. Based on an audience analysis, Open School was designed to be bilingual (English and Khmer), responsive to different devices, easy to use, and open. The development started in WordPress using WordPress Learning Management System (WPLMS) and other open plugins. To evaluate the ease of use of the platform, the researcher conducted two rounds of distance usability testing in Khmer language with twelve subjects in Cambodia via Google Hangouts. The usability tests focused on six important tasks including: navigating the platform homepage, creating an account, registering for a course, navigating the course pages, requesting to be an instructor and creating a course. The results from the two rounds of testing allowed the researcher to develop relevant support for the users with little experience in e-learning, and most importantly to improve the ease of use of the platform as indicated by a significant improvement of the average usability score from 4.4 to 5.03 on the six-point scale. Open School will be one of the first distance learning platforms in Khmer language when it launches and is hoped to solve some educational issues in Cambodia. Now that the usability issues have been fixed, the next big step for the researcher is to find a way to encourage people to use the platform.

Introduction

The current Cambodian education system is witnessing a great gap of educational quality between schools in the capital city and those in the provinces. Even within the capital city, there is still an educational gap between public and private schools. The issue stems from the lack of motivation of the government teaching staff and the inadequate financial support to the public schools, which also indirectly increases the cost of education and results in school dropouts among students from poor families (NGO Education Partnership, 2007). By Cambodian law, public general education is free. However, many of the government teaching staff are providing private tutoring classes outside of the school hours to their students to earn extra money to supplement their current minimum wage ("Why educate Cambodia", 2016). Teachers tend to take the formal classroom instruction for granted, which has caused a compromise in the quality of such instruction. A sustainable solution must be addressed for such an issue to guarantee the future of Cambodian next generations.
Development of Information and Communication Technology (ICT) has been made one of the priorities by the Cambodian government as stated in its National Strategic Development Plan (NSDP) for 2014-2018. In 2009, the World Bank, as cited by Adler (2014) in his article, reported that the increase in ICT in Cambodia contributed to 1.38 percent of GDP growth and enabled the disadvantaged to access to basic service. The data from the same article showed that in 2014, as many as 2.5 million people had Internet access at home while other 2 million people used their smartphone to access the Internet. An article on the importance of e-learning in developing countries by Nikos (2015) discussed how e-learning had played the role in developing countries in Africa by reducing the costs associated with education, extending access to education to students in remote areas, and enabling skills training in addition to basic education. Therefore, the purpose of this usability study in response to the aforementioned educational issues in Cambodia was to develop and evaluate the ease of use of an open web-based e-learning platform for Khmer speaking users to create and take free online courses.

Literature Review

There have been quite a few research studies that looked directly at the design of e-learning Learning Management System. The study by Garcia-Penalvo, Conde, Alier and Casany (2011) identified the reasons for which learning platforms should become open and flexible environments. Per this study, the student is conditioned by temporal issues, LMS technical constraints or an inefficient use of learning platforms features. It is important that student be taken into consideration as e-learning evolves. Therefore, it is necessary to open the LMS conception by allowing the integration of other tools and must be centered in the user.

The results from the study by Kwok (2015) showed that perceived usefulness and interaction with peers were significant predictors of e-learning course outcomes, whereas perceived ease of use and lecturer support were not. However, perceived ease of use had an indirect relationship with course outcomes through perceived usefulness. Lecturer support also had an indirect relationship with course outcome through interactions with peers.

In 2012, Buhasiri, Xaymoungkhoun, Zo, Rho, and Ciganek conducted a comparative analysis between ICT experts and faculty on critical success factors for e-learning in developing countries. Findings revealed that an e-learning environment did not influence the learning outcomes as compared to instructional strategies. The findings also indicated that creating technology awareness, motivation, and changing learners’ behavior were required for the success of e-learning implementation. Moreover, computer skills, technical background, training programs and computer literacy were key factors for faculty to implement e-learning in developing countries.

What to include in the e-learning platform is one of the key factors for the success of e-learning. In the journal article Patterns for Designing Learning Management Systems, Averious, Papasalouros, and Retalis (2003) divided design patterns for an LMS into 5 categories: access patterns, learning patterns, instructional patterns, informational patterns and administrational patterns. Waard (2015) came up with seven principal elements in the design of mobile MOOC (mMOOC) based on the evaluations of two e-learning courses. The seven elements were
mMOOC in the cloud, central agora, adaptable course overview/syllabus, unknown learner audience, supporting self-regulated learning, mobile social media toolkit, and mobile multimedia.

In the presentation video, Accommodating Diverse Learners: Designing an Effective E-learning Platform, Dan (2012), an instructional designer at Design3, discussed the differences between linear and non-linear learners and prominent features in an e-learning platform to accommodate those learners. He also mentioned a few of effective e-learning platforms including Lynda.com, Design3.com, and Codeacademy. Some effective features in these platforms include modularized content, video tutorials/presentations, live feedback loop, and community for social learning.

A usability test is critical to determine if a learning management system is easy to use, and it is especially necessary for the platform for a massive audience. Krug (2010) explained in his book *Rocket surgery made easy: The do-it-yourself guide to finding and fixing usability problems* that it is almost impossible to fix all the problems in the design project and that the designers should focus on finding and fixing the most important problems. The author also advised that the design teams test early and often so that they can identify the problems while it’s still easy to fix them.

Sauro (2013) introduced the 6 steps to identifying usability problems. Per Sauro, a usability problem is anything in a product or website that leads a user to an undesirable outcome. To help identify and fix any of these problems, six steps were presented. These steps include recording the undesirable outcome, identifying what part of the interface is causing the problem, determining if the issue affects the entire interface or just a portion, assigning the problem a severity rating, recommending workable solutions, and finally presenting the usability problems.

**Project Design and Development**

Based on the principle of design thinking, it is important that users of a product be involved in all steps of the product design. With that, the project development began with a quick online survey on Facebook to gather the opinions on the design features for the platform. Thirty-eight people responded to the survey, and most them indicated little or no experiences with e-learning. This implies that they have no specific preferred design features in the e-learning platform. The data also showed the researcher the characteristics of the target population. With low English proficiency, the population communicates best in local language: Khmer. A larger number of them have low technical skills. Additionally, although there has been a tremendous increase in the number of Internet subscribers in the last few years, more than half of the number of the Internet users access the web contents using mobile data on their smartphones. This set of audience analysis data, together with the literature review, gave the researcher four main characteristics of the intended learning platform: 1). bilingual (English and Khmer) using as simple language as possible, 2). responsive to different types of screen resolutions and screen sizes, 3). easy to use with self-accessible support throughout the platform and 4). open so that everyone can contribute the content to the platform.

The primary development started on a local host computer to reduce the expense on the web-hosting services. The researcher first set up the development tools using a free WordPress stack by Bitnami, which allows a simple and quick setup, and then evaluated different existing tools to
create the main components of the learning platform. The basic features of the learning platform include: a course management system (CMS) using a commercial yet open source WordPress Learning Management System (WPLMS) plugins, user profile settings using BuddyPress plugin, a community forum where users can discuss using bbPress plugin, a file storage using BuddyDrive where users can store and share their documents throughout the platform, a user support page to assist users new to the platform, and an information board for system-wide communication. The selection of tools for the design was based on two major criteria. The first criterion was that the tools are open, which means they allow modifications to fit the needs of the design. The second criterion was based on the number of people using the tools, which indicates not only that the tools are good, but also that support for users and updates are available. (See Appendix A for a complete list of plugins and their descriptions).

Figure 1 on the next page shows the homepage of the platform. The top section consists of a fixed header, which stays on top of the page as the users scroll down the page. In this section, there is also an action button which links to the course directory where users can find their favorite courses. The second section features the popular courses in the platform. The top eight courses are automatically displayed based on the number of students in the courses. The next section, Our Facilities, exhibits other functionalities of the platform besides taking and teaching online courses. These functionalities include a library, a science lab, conference rooms and a community bookstore. These are beyond the current scope of the project and currently under development; therefore, each icon, which represents each functionality, only links to the page under construction. The next section, Community, shows the community features of the platform: making friends, creating a group, and discussing in the forum. The closing section is the footer where a brief description of the platform can be found on the left side. There are also quick links to different pages in the platform. On the right side of the footer is the flexible teacher button. If the logged-in user is a student, the button links to a teacher request form where users can request to be a teacher. If the logged-in user is an instructor, the button links to a course creator page where teachers can create a course.

To allow user registration, the researcher used the account registration tool of BuddyPress. There are two sections in the registration form as seen in Figure 2. The first section is Account Details, which is where the user inputs required information to be used for logging in. The other section collects additional information that is to be displayed in the user’s account profile.

As mentioned in the early part of this section, the researcher used WPLMS as the main tool to manage courses. Once installed, WPLMS automatically created custom post types including courses, quizzes, questions, and assignments. Quiz, question, and assignment post types are child post types to course post types, and these post types are incorporated together to form complete courses (Figures B.6, B.7, and B.8 in Appendix B).

To allow teachers to create courses on the platform, the researcher used an open-source plugin called WPLMS Front-End, which originally came with the theme package. This plugin works on the front end of the platform, and teachers can create courses without having to go to the back-end dashboard of WordPress (Figure B.12 in Appendix B).
Figure 1. Homepage
The researcher also included social and collaborating components in the platform using BuddyPress and bbPress plugins. These components allow users to connect with one another, to form groups and to ask and answer questions in the forums (Figures B.9, B.10, and B.11 in Appendix B).

Once the English version of the platform was complete, the researcher translated the platform into Khmer language using a localization plugin called Loco Translate. This plugin collected all strings in the platform’s interface and allowed for a manual translation of each string. The use of simple and easy to understand words and expressions was the key in the process of translating the platform considering the target population is relatively new to e-learning. The researcher also used an additional plugin, qTranslation X to create bilingual contents and to enable a language menu/button that allows the users to switch between English and Khmer.

The last step of the development was moving the complete platform from the local host computer to an online host so that it is accessible online. For this, the researcher subscribed to affordable web-hosting services on eHost.com. and re-setup the WordPress CMS on the online host. Then the researcher transferred the project files and database from the local host to the online host folders using free applications Duplicator and FileZilla. The functional prototype is now available online at http://beta010.openschoolcambodia.org/. (See Appendix B for screenshots.) Table 1 provides important login information for testing out the prototype.
It is worth noting that the initial development of the platform focused on achieving all defined components and characteristics of the platform. The tasks mainly involved putting together the existing theme and plugins to build the prototype and translating the prototype. Therefore, only a small amount of effort was put into modifying the original source codes of these tools.

**Methodology**

**Research Questions**

The purpose of the project was to evaluate the ease of use of an open web-based e-learning platform for Khmer-speaking users to create and take online courses. The overall ease of use of the platform was defined by the ease in doing important student and teacher tasks including: creating an account, searching and registering for a course, navigating the course’s pages, requesting to become a teacher, and creating an online course. Additionally, the study also partly looked at the use of Khmer language in the platform.

**Participants**

Since the learning platform was developed in Khmer language and intended for Khmer users, the participants in this study were selected among the volunteers from Cambodia who can speak and read Khmer. The researcher randomly contacted twelve people and scheduled a specific date and time for each of them. Figure 3 summarizes the information of the study participants.
<table>
<thead>
<tr>
<th>Education level</th>
<th>High school diploma</th>
<th>Bachelor's degree</th>
<th>Master's degree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average computer skill level (5-point scale)</th>
<th>4.15 = skilled</th>
<th>4.06 = skilled</th>
</tr>
</thead>
</table>

3 most common Internet access mediums

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Home Internet (5=always)</td>
<td>Smartphone data (4:33=often)</td>
<td>School Wi-Fi (3.5=sometimes)</td>
</tr>
<tr>
<td>1</td>
<td>Home Internet (4.67= always)</td>
<td>Smartphone data (4.67= always)</td>
<td>Work Internet (3.5= sometimes)</td>
</tr>
</tbody>
</table>

3 most common activities on the web

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connecting with people on social networking sites (5=always)</td>
<td>Entertainment (4.66 =often)</td>
<td>Communicating with people for work/study purposes (4.66=sometimes)</td>
</tr>
<tr>
<td>1</td>
<td>Connecting with people on social networking sites (5=always)</td>
<td>Entertainment (4.83=always)</td>
<td>Looking for information via search engine (4.83=always)</td>
</tr>
</tbody>
</table>

Average time spent on the web weekly

|    | 24.5 hours | 51.25 hours |

Online learning experience

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Learning platforms known/heard of

|    | Coursera, Khan Academy | Coursera, Khan Academy, EdX |

Online teaching experience

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

**Figure 3.** Study participants’ information

**Instrumentation**

This research study involved the use of different instruments including surveys, usability test protocols, and interview.

The researcher used a pre-survey in Google Forms to collect the subject’s information that could be associated with the results of the study. Such information included: demographic information, experiences on the web, computer skills, online habits, and e-learning experiences. The survey consisted of a total of 39 closed questions and took around five minutes. The instructions and questions in the survey were written mainly in Khmer with an English translation beneath each instruction statement and question (Appendix C).

The researcher also used two usability test protocols for the usability testing. The first protocol was for student subjects. This protocol consisted of four tasks: navigating the homepage, creating
an account, searching and registering for a course, and taking a course. The second protocol was for teacher subjects. There were also four tasks in this protocol: navigating the homepage, creating an account, requesting to be an instructor, and creating a course (Appendixes D and E).

Like the pre-survey, a post-survey was in Khmer language and created using Google Forms. This survey gathered information on overall satisfaction and feedback on the website. It consisted of three open-ended questions for general feedback and other 13 Likert-scale questions for feedback on design layout of the platform, navigation, and the use of Khmer language. The 16 questions took about seven to ten minutes to complete (Appendix F).

The study also used an interview as an instrument to collect qualitative data. It aimed to gather more in-depth feedback from the subjects regarding their experience on the platform. (The list of interview questions can be found at the bottom of Appendixes D and E.)

**Procedures**

Two separate rounds of usability testing were conducted remotely with the subjects in Cambodia using Google Hangouts and its screen-sharing feature. Each round of testing involved six subjects with three being student subjects and the other three being teacher subjects. The entire process of usability testing took approximately 60 – 90 minutes for each student subject and 90 – 120 minutes for teacher subject.

Prior to the testing, the researcher asked the subjects to read and submit an online consent form (Appendix G). Then the subject completed a short pre-survey. After that, the subjects shared their computer screen with the researcher so that the screen activities could be seen and recorded for the analysis purpose.

During the testing, the subjects were asked to complete four specific tasks, which would help the researcher to identify the issues on the platform. As the subjects performed the tasks, they also thought out loud, and their voice was recorded along with their screen activities. The researcher also took important notes of the durations and steps the subject took to complete each task. After the completion of each task, the researcher asked the subjects to provide their opinions on their performance of the task and the score for task difficulty. It is necessary to note in this section that the first task, navigating the homepage, was mainly for the researcher to see if the homepage reflected the purpose and functionalities of the platform based on the subjects’ feedback. Therefore, no task difficulty score was collected for this task.

After the completion of the four tasks, the subjects were asked to complete a short post survey. This survey collected the subjects' opinions on the design layout, navigation, and the use of Khmer language in the platform. The six-point Likert scale questions were used in this survey instead of the five-point scale questions to prevent the subjects from providing neutral responses. Finally, before the conclusion of the session, there was a short post-interview to collect more in-depth feedback from the subjects regarding their experience on the platform.

After the usability testing with the subjects, the researcher went through each recording and noted down the responses from the subjects. (See Appendix H for a data log worksheet.) The researcher then used the notes from the six tests to identify the problems in the platform. In doing
so, the researcher used Neilsen’s (1995) five-level scale for usability problem severity to rate each problem the researcher identified. Based on the nature of each problem and its severity level, the researcher started fixing the problem using an appropriate solution before moving to the next round.

**Results**

**Round 1 Usability Issues**

Using the responses in the usability testing, post-survey, and post-interview, and personal observation, the researcher identified thirty-two problems with different levels of severity in the platform. (See Appendix I for the complete list of problems with screenshots.)

For the task of navigating the platform’s homepage, the major problems were with the layout of the platform. Those included some parts of the texts being hidden on the screens with smaller resolutions and the header area not responsive to different sizes of the windows. On the positive side, the subjects provided affirmative feedback for the design and the use of colors and graphics on the homepage. When asked what could be done on the platform based on what they saw on the homepage, most of the subjects did not mention the teaching functionality in their response. This told that the homepage did not fully reflect the purpose and functionalities of the platform.

For the task of creating an account on the platform, the task was easy with the average task difficulty score of five on the six-point scale. The average duration to complete this task was 3.83 minutes, which was considerably long for such a task. The major issue was to do with the ambiguity of text field labels, which caused the subjects to stop and think for a while. Moreover, more than half of subjects did not notice the activation message at first after they submitted the registration form.

Searching and registering for a course was the student subject’s task. For this task, the average task difficulty score was five, suggesting that the task was easy. This task took an average of 2.67 minutes. The only major problem in searching for a course was with the action button on the homepage banner, which was intentionally linked to the course directory. In their feedback, the subjects mentioned that the label of this button did not tell clearly about the destination of the link.

For the task of navigating a course’s page, the student subjects spent an average of 7.5 minutes to briefly take a course consisting of two text and multimedia units and a two-question quiz. The subjects took this much time to complete the course because they failed to notice and click on the MARK THIS UNIT COMPLETE and FINISH COURSE buttons, which were important requirements to complete each course. On average the subjects rated the task difficulty at 4.67, which was between somewhat easy and easy.

For the task of requesting to become a teacher, which was a teacher subject’s task, the teacher subjects spent approximately two minutes to find and complete the form. A large amount of this time was spent on finding the right button to navigate to the teacher registration page from the homepage. In addition to other smaller issues, the researcher noticed that the form was not fully
responsive as the subjects resized the screen. For this task, the average task difficulty score was four, implying that the task was somewhat easy.

Another important task for the teacher subjects was creating a basic course containing two units and a two-question quiz on the platform. Necessary information for the course including course short and long descriptions, contents, and multimedia was provided to the subjects before the task began. None of the subjects could complete this task due to the complexity of creating and saving the quiz questions. Other major problems were with visibility of the objects on the course creator page. Some objects were hidden until the subjects placed the cursor on particular locations of the page, which made it hard for the first-time users. Although the subjects did not manage to complete this task, they rated it at 3.33 (somewhat difficult) for its difficulty considering they could still put together some units and published the course without the quiz.

Figure 4 presents the scores and the durations for the tasks in the first round of the usability testing. The total average score for task difficulty was 4.4, which told that the platform was somewhat easy to use.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Creating an account</th>
<th>Searching and registering for a course</th>
<th>Navigating the course's page</th>
<th>Requesting to become a teacher</th>
<th>Creating a course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duration (min)</td>
<td>Score /6</td>
<td>Duration (min)</td>
<td>Score /6</td>
<td>Duration (min)</td>
</tr>
<tr>
<td>Student #1</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Student #2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>11.5</td>
</tr>
<tr>
<td>Student #3</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Teacher #4</td>
<td>3</td>
<td>5</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Teacher #5</td>
<td>2</td>
<td>6</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Teacher #6</td>
<td>3</td>
<td>4</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Average</td>
<td>3.83</td>
<td>5.00</td>
<td>2.67</td>
<td>5.00</td>
<td>7.50</td>
</tr>
<tr>
<td>Total average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1=very difficult; 2=difficult; 3=somewhat difficult; 4=somewhat easy; 5=easy; 6=very easy; NA=not applicable; IN=incomplete

**Figure 4.** Task Durations and Task Difficulty Scores in the First Round

In terms of the use of Khmer language on the platform, the researcher found out from the subjects’ feedback that some words were vague and too technical, especially those on the registration form and the course creator page.

Figure 5 summarizes the quantitative data from the post survey. Individual average, standard deviation, and section average were calculated. The average score for each section was between
5 and 6. Such rating told that the platform was well designed visually, that it was easy to navigate, and that Khmer language was used properly in most parts of the platform.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Statements</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
<th>#6</th>
<th>Avg.</th>
<th>Std.</th>
<th>Sec. Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design layout</td>
<td>1. The home page layout is easy to understand.</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5.5</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. The text is clearly written.</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.17</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. The images are interesting.</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5.5</td>
<td>0.55</td>
<td>5.37</td>
</tr>
<tr>
<td></td>
<td>4. The website is visually appealing.</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>5.67</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. The organization of the site is logical and easy to follow.</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5.04</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Navigation</td>
<td>1. The website is easy to navigate.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5.17</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Number of buttons/ links is reasonable.</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4.83</td>
<td>0.75</td>
<td>5.04</td>
</tr>
<tr>
<td></td>
<td>3. Labels are clear and concise.</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.17</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Links are consistent and easy to identify.</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5.04</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Khmer language</td>
<td>1. Khmer terms are clear and easy to understand.</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4.83</td>
<td>0.75</td>
<td>5.29</td>
</tr>
<tr>
<td></td>
<td>2. Khmer terms are used consistently on the website.</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5.33</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. The texts on the website are grammatically correct.</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5.5</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. The texts on the website are correctly spelled.</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5.5</td>
<td>0.55</td>
<td></td>
</tr>
</tbody>
</table>

1=strongly disagree; 2=disagree; 3=somewhat disagree; 4=somewhat agree; 5=agree; 6=strongly agree; Avg.=Average; Std.=Standard Deviation; Sec. Avg.=Section Average

**Figure 5.** Rating scores for the design layout, navigation, and Khmer language in the first round

**Round 1 Revisions**

The researcher managed to fix and improve all the thirty-two issues within two weeks by starting from the issues with the highest level of severity as indicated in Appendix I. This section will only highlight some of the major changes. (See Appendix J for complete descriptions and screenshots of all the changes.)

The researcher made many changes on the homepage mainly to make it fully reflect the purpose and functionalities of the platform and to make it responsive to different screen sizes. The keywords “.Learn .Teach .Connect” were added on the header banner to indicate the main functionalities of the platform. The researcher also included a new section which reflected the teaching component of the platform (Figure 6). Additionally, the media query rules were also
used in the main stylesheet of the platform to target different screen sizes including large desktop computers, laptops, iPads, and smartphones.

![TEACH COURSES](image)

**Figure 6.** Teaching section on the homepage

To improve the registration process, in addition to changing the ambiguous labels, the researcher revised the registration page by adding concise description underneath each text field to let the users know what they should input in each field. The researcher also introduced an option to register using social ID such as Facebook, Twitter, and Google Plus to speed up the registration process as suggested by the subjects. The researcher also revised the activation page to make it shorter and noticeable by adding a big bright attention icon (Appendix J).

There were also major revisions of the layout of the course’s page. The width of the page was enlarged to 95% of the screen’s width. The header, top footer, and menus were removed to prevent the distractions when the students go through the unit content. Furthermore, to make the MARK THIS UNIT COMPLETE button noticeable to the users, the researcher increased the font size of text on the navigation bar by two points. The color of the FINISH COURSE button was changed to orange to differentiate it from the other buttons.

To make requesting to become a teacher easier, the researcher placed the BECOME A TEACHER buttons in three common places in the platform: homepage, drop-down menu, and course directory. More importantly, the teacher registration form got a completely new design since the previous design contained too many unfixable issues. The form was at this point shorter and responsive and looked consistent with the rest of the platform.

The researcher also made several changes on the course creator page, the most important of which was the fix in quiz saving. The new JavaScript from the new plugin update forced the users to edit question one at a time, which therefore allowed them to save one question at a time and eventually save the whole quiz. Like course’s page, this course creator page was enlarged to 95% of the screen’s width to improve visibility of the text on this page. The researcher also removed the hover effects from buttons and links in the Course Curriculum section of the course creator page to make them constantly visible to the users.
Round 2 Usability Issues

In the second round of the usability testing, the researcher identified thirteen issues. (See Appendix K for the complete list of problems with screenshots.) Among those issues, the most serious ones were observed and reported during the performance of tasks to navigate the course’s pages and to create a course.

On the course’s page, none of the student subjects noticed the MARK THIS UNIT COMPLETE button as they navigated to the next unit in the course. This implied that the change in the previous round of testing by increasing the font size of text in the navigation bar did not resolve the problem.

On the course creator page, the researcher found that the changes in the PHP code in the previous round had caused the course short description text field to not display the input text although the text had been saved. Another important issue the researcher learned from the teacher subjects’ feedback was that when multiple pages in the quiz creating section opened up on top of one another, it caused confusion to which page was which and which one to close first before closing the next.

In terms of the use of Khmer language, some text labels on the course creator page, which the researcher failed to notice in the first round of testing, caused confusion to the subjects while creating the course. Although the subjects managed to create a course as intended, it took them a while to figure out where to place their given content due to the ambiguity of the labels.

Figure 7 presents the task difficulty scores and the durations for the tasks in the second round of testing and compares the results in both rounds. The results showed an overall improvement in the usability of the platform. For the task of creating an account, the task difficulty score increased by half a point to 5.5, and the subjects took about a minute less in completing the task. For searching and registering for a course, the task duration decreased to just one minute, and the task became very easy as indicated by the rating score of 6. Navigating the course’s page, on the other hand, saw no improvement in the task difficulty score, and the subjects took about a minute longer to complete. This implied that the revisions for this task in the first round were not effective. In requesting to become a teacher, the task difficulty score improved remarkably from 4 to 5.67, suggesting that the task had become very easy for the teacher subjects. The duration for this task also decreased by 50 seconds. Finally, for creating a course, while none of the subjects completed the task in the first round, two of the three subjects did in the second round in an average duration of 39.5 minutes, while the other subject experienced a technical issue which prevented him from completing the task. In terms of task difficulty, the task remained between somewhat difficult and somewhat easy for the subjects although there was a slight increase from 3.33 to 3.67 in the score. Overall, an increase in the task difficulty score from 4.40 to 5.03 suggested that the platform had improved from being somewhat easy to easy.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Creating an account</th>
<th>Searching and registering for a course</th>
<th>Navigating the course's page</th>
<th>Requesting to become a teacher</th>
<th>Creating a course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duration (min)</td>
<td>Score /6</td>
<td>Duration (min)</td>
<td>Score /6</td>
<td>Duration (min)</td>
</tr>
<tr>
<td>Student #7</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>NA</td>
</tr>
<tr>
<td>Student #8</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Student #9</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Teacher #10</td>
<td>2.5</td>
<td>5</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Teacher #11</td>
<td>5</td>
<td>5</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Teacher #12</td>
<td>1.5</td>
<td>6</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Average in 2nd Round</td>
<td>2.67</td>
<td>5.50</td>
<td>1.00</td>
<td>6.00</td>
<td>8.67</td>
</tr>
<tr>
<td>Average in 1st Round</td>
<td>3.83</td>
<td>5.00</td>
<td>2.67</td>
<td>5.00</td>
<td>7.50</td>
</tr>
<tr>
<td>Total Average in 2nd Round</td>
<td>5.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Average in 1st Round</td>
<td>4.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1=very difficult; 2=difficult; 3=somewhat difficult; 4=somewhat easy; 5=easy; 6=very easy; NA=not applicable; IN=incomplete

**Figure 7.** Task durations and task difficulty scores in the second round

Figure 8 in the following page summarizes the quantitative data from the post survey in the second round compared to those in the first round. Like in the previous round, individual average, standard deviation, and section average were calculated. In the initial analysis, the researcher noticed an outlier among the rating scores which caused a large standard deviation in each set of data (as large as 1.33/6). The researcher removed the outlier and redid the analysis. The data in Figure 8 reflects the new analysis. Overall, the data show very slight differences in the rating for the design layout, navigation and the use of Khmer language in the platform between the two rounds. Interestingly, the section for the use of Khmer language saw a slight decrease in the average score from 5.29 to 5.2. Further investigation into the collected data suggested that the revision done in the first round on the homepage had caused the Khmer terms to be more confusing and inconsistent.
### Design layout

<table>
<thead>
<tr>
<th>Statements</th>
<th>Subjects</th>
<th>Avg.</th>
<th>Std.</th>
<th>Sec. Avg. 2nd Round</th>
<th>Sec. Avg. 1st Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The home page layout is easy to understand.</td>
<td>#7 #8 #9 #10 #11 #12</td>
<td>5.8</td>
<td>0.45</td>
<td>5.48</td>
<td>5.37</td>
</tr>
<tr>
<td>2. The text is clearly written.</td>
<td>5.4</td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The images are interesting.</td>
<td>5.6</td>
<td>0.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The website is visually appealing.</td>
<td>5.6</td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The organization of the site is logical and easy to follow.</td>
<td>5</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Navigation

<table>
<thead>
<tr>
<th>Statements</th>
<th>Subjects</th>
<th>Avg.</th>
<th>Std.</th>
<th>Sec. Avg. 2nd Round</th>
<th>Sec. Avg. 1st Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The website is easy to navigate.</td>
<td>5.4</td>
<td>0.55</td>
<td>5.1</td>
<td>5.04</td>
<td></td>
</tr>
<tr>
<td>2. Number of buttons/links is reasonable.</td>
<td>5.2</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Labels are clear and concise.</td>
<td>4.6</td>
<td>0.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Links are consistent and easy to identify.</td>
<td>5.2</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Khmer language

<table>
<thead>
<tr>
<th>Statements</th>
<th>Subjects</th>
<th>Avg.</th>
<th>Std.</th>
<th>Sec. Avg. 2nd Round</th>
<th>Sec. Avg. 1st Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Khmer terms are clear and easy to understand.</td>
<td>4.4</td>
<td>0.55</td>
<td>5.2</td>
<td>5.29</td>
<td></td>
</tr>
<tr>
<td>2. Khmer terms are used consistently on the website.</td>
<td>5</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The texts on the website are grammatically correct.</td>
<td>5.6</td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The texts on the website are correctly spelled.</td>
<td>5.8</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1=strongly disagree; 2=disagree; 3=somewhat disagree; 4=somewhat agree; 5=agree; 6=strongly agree; Avg.=Average; Std.=Standard Deviation; Sec. Avg. =Section Average

**Figure 8.** Rating scores for the design layout, navigation, and Khmer language in second round

**Round 2 Revisions**

The revisions in the second round mainly aimed to improve the clarity of the Khmer language, especially on the homepage and course creator page and to make the important navigation elements more noticeable to the users. (See Appendix L for a complete list of changes in the second round.) On the homepage, in particular, the Khmer wording had been shortened and revised to make them more concise, consistent and formal based on the subjects’ suggestions. On the pages where some important elements were not previously noticeable, the researcher introduced different attention-seeking animations triggered by either page loading or hovering actions. For example, in the unit page, the shaking animation was added to the MARK THIS UNIT COMPLETE button. What it does is when the users hover the mouse anywhere on the navigation bar, the MARK THIS UNIT COMPLETE button shakes for about one second to get user’s attention. (Click here to see the animated screenshots.) The researcher also introduced box-shadow in this second round revision. That is, shadows were added to box elements to create
depths to those elements to make it easy for the users to tell if multiple layers are on top of one another.

The revisions in this round also involved making available self-accessed tips, examples, and instructions for different tasks throughout the platform. For instance, the researcher added a help button on the top right corner of every section of the course creator page. When the users click on this button, a short tutorial video for that section will pop-up on top of the current window as seen in Figure 9.

![Figure 9](image_url) Figure 9. A tutorial video pops up after the user clicks on SEE HOW button.

**Discussion and conclusions**

The results from the two rounds of testing suggested that there was an improvement in the overall usability of the platform. It is safe to say that the platform is now easy to use based on the overall rating score of 5.03 out of 6. However, what does it mean for the individual tasks with task difficulty score of lower than five including the task of navigating the course’s pages with the score of 4.33 and the task of creating a course with the score of 3.67? To answer this question, it is necessary to consider the nature of the tasks. Unlike the tasks of creating an account and requesting to become a teacher, which are one-time tasks, the tasks of navigating the course’s page and creating a course are repeatable, and they should get easier as the users become familiar with the tasks. The researcher, for instance, observed that the teacher subjects spent a relatively shorter time in creating the second unit than they did for the first unit. It is a similar case when the student subjects navigated the course’s pages. Once the subjects realized that they were supposed to click on the MARK THIS UNIT COMPLETE button before moving on to the next unit, navigating through pages became easier and took shorter time. The subjects also expressed in their feedback during the interview that they were confident they could do the tasks faster in the future now that they became familiar with the process. Therefore, the lower scores might not signify exactly that the tasks were difficult, and in the future the researcher should focus less on revising the platform but more on providing relevant and easily accessible tips, examples and instructions to better familiarize inexperienced users with the platform.

The researcher also learned that the design of the platform was the most favorable quality of platform based on the subjects’ responses, and although the use of Khmer language was the least favorite side by the subjects, the subjects were proud to have a learning platform in their own
It is important to also clarify here that, as pointed out by the subjects, there was nothing wrong in the language, but the fact that it was their first time using a learning platform in Khmer language made it somewhat challenging.

The outcomes of this study are extremely important for Khmer-speaking community. Open School will be one of the very first open and free platforms for lifelong learning in Cambodia. As agreed by the study participants, it will solve some, although not all, of the educational related issues. Moreover, since the platform is open, and its contents are to be contributed by the platform users, it will be up to the users’ participation to determine whether the platform will grow and be sustained in the future. The tasks of the researcher did not end when this study completed; this is just the beginning. There is still a lot to be done including encouraging the users’ participation and contribution in the platform and teaching the teacher members to create effective and efficient instructional modules. This study and the future development of the Open School project are and will be a notable example and reference to educators and policymakers, especially in non-English speaking communities, who are trying to find a suitable solution to the problems similar to what has been addressed in this study.

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Appendix A: List of plugins used in this platform

<table>
<thead>
<tr>
<th>N</th>
<th>Plugin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Ajax Search Lite</strong></td>
<td>The lite version of the most powerful ajax powered search engine for WordPress. It is used to create a live course search tool.</td>
</tr>
<tr>
<td>2</td>
<td><strong>bbPress</strong></td>
<td>bbPress is forum software with a twist from the creators of WordPress.</td>
</tr>
<tr>
<td>3</td>
<td><strong>BuddyDrive</strong></td>
<td>A plugin to share files, the BuddyPress way!</td>
</tr>
<tr>
<td>4</td>
<td><strong>codecogs latex equation editor</strong></td>
<td>Adds codecogs latex equation popup editor to WordPress TinyMCE editor. It is used to create math equations.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Contact Form 7</strong></td>
<td>Just another contact form plugin. Simple but flexible. It is used to create a teacher registration form.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Crayon Syntax Highlighter</strong></td>
<td>Supports multiple languages, themes, highlighting from a URL, local file or post text. It is used to control the appearance of the codes in the pages/posts.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Default to GD</strong></td>
<td>Sets GD as default WP_Image_Editor class. This plugin is used to fix the image upload issue.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Duplicate Page</strong></td>
<td>Duplicate Posts, Pages and Custom Posts using single click.</td>
</tr>
<tr>
<td>9</td>
<td><strong>Duplicator</strong></td>
<td>Create a backup of your WordPress files and database. Duplicate and move an entire site from one location to another in a few steps. Create a full snapshot of your site at any point in time.</td>
</tr>
<tr>
<td>10</td>
<td><strong>Flamingo</strong></td>
<td>Flamingo manages the contact list submitted through Contact Form 7 on WordPress.</td>
</tr>
<tr>
<td>11</td>
<td><strong>LayerSlider WP</strong></td>
<td>LayerSlider is the most advanced responsive WordPress slider plugin with the famous Parallax Effect and over 200 2D &amp; 3D transitions. It is specifically used in this platform to create the banner on the homepage.</td>
</tr>
<tr>
<td>12</td>
<td><strong>Loco Translate</strong></td>
<td>Translate themes and plugins directly in Wordpress.</td>
</tr>
<tr>
<td>13</td>
<td><strong>Open School</strong></td>
<td>I created this plugin myself to enable the BECOME A TEACHER/CREATE COURSE button.</td>
</tr>
<tr>
<td>14</td>
<td><strong>qTranslate-X</strong></td>
<td>Adds user-friendly and database-friendly multilingual content support. This plugin is used to enable the language switch and to create bilingual content.</td>
</tr>
<tr>
<td>15</td>
<td><strong>Super Socializer</strong></td>
<td>Provides all the social features like Social Login, Social Commenting, Social Sharing and more. It is used to enable social ID login option.</td>
</tr>
<tr>
<td>16</td>
<td><strong>Supreme Google Webfonts</strong></td>
<td>Enables more Google fonts in the WordPress editor.</td>
</tr>
<tr>
<td></td>
<td>Plugin Name</td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>17</td>
<td>TinyMCE Advanced by Andrew Ozz</td>
<td>Enables advanced features and plugins in TinyMCE, the visual editor in WordPress.</td>
</tr>
<tr>
<td>18</td>
<td>Vibe Course Module by Mr.Vibe</td>
<td>This is the Course module for WPLMS WordPress Theme by VibeThemes.</td>
</tr>
<tr>
<td>19</td>
<td>Vibe Custom Types by Mr.Vibe</td>
<td>This plugin creates Custom Post Types and Custom Meta boxes for WPLMS theme.</td>
</tr>
<tr>
<td>20</td>
<td>Vibe ShortCodes by Mr.Vibe</td>
<td>Creates unlimited shortcodes.</td>
</tr>
<tr>
<td>21</td>
<td>WordPress Access Control by Brandon Wamboldt</td>
<td>Manages the page/post/widget restriction based on user roles and status. This plugin is used to restrict the teacher users from seeing the teacher registration form once they already submit the form.</td>
</tr>
<tr>
<td>22</td>
<td>WP QuickLaTeX by Pavel Holoborodko</td>
<td>Displays Latex document and TikZ graphics in the page/post /comment content.</td>
</tr>
<tr>
<td>24</td>
<td>WPLMS Front End by VibeThemes</td>
<td>FRONT END Content Creation plugin for WPLMS.</td>
</tr>
</tbody>
</table>
Appendix B: Platform interface before the testing

Figure B.1. Homepage
Figure B.2. Account registration page
Figure B.3. User profile page
Figure B.4. Course directory
Figure B.6. Sample Course Page
Exposure and Rendering

Brownie cheese cake powder lemon drops lemon drops cotton candy gingerbread brownie.

Sesame snaps


Applicake chupa


Donut


Figure B.7. Sample unit page
Final Quiz for the course

The quiz

Which metal is heavier, silver or gold?
Type Answer

What is Aurora Borealis commonly known as?
- Northern Lights
- Eastern Lights
- Western Lights
- Southern Lights
Type Answer

Which is the smallest ocean in the world?
Type Answer

Country that was called as Land of Rising Sun
Type Answer

The planet nearest to the Sun is
- Venus
- Mercury
- Jupiter
- Saturn
Type Answer

Figure B.8. Sample quiz page
Figure B.9. Member directory
Figure B.10. Group page
Figure B.11. Discussion forum page
Figure B.12. Front-end course creator page
Figure B.13. Information board
Appendix C: Presurvey

Appendix C: Presurvey

The purpose of this survey is to collect the subject's information which might be associated with the results of the study. Such information includes your demographic information, your experience on the web, your online habits, your computer skills, and your experience with e-Learning. This survey will take about 5-10 minutes. Thank you!

* Required

1. បង្កើតវិធីប្រើប្រាស់ម៉ាស៊ីនប្រព័ន្ធកុំុប្រយុទ្ធការសិក្សាទូទៅសម្រាប់សិក្សាស្រុកដ៏ប្រសើរគ្នាទៅកាន់ការសិក្សាព្នែកនឹងអាជីវកម្ម (ប្រសើរ) ដោយប្រឈ្មុះប្រឹក្សាព័ត៌មាននិងសំណង់ប្រការ (៦) ចំនួនធំបំផុតដែលមានប្រសើរសំខាន់ក្នុងសិក្សាព្នែកនឹងអាជីវកម្ម។

   * Required

All responses you will provide in this survey will be kept confidential and will only be used for the purpose of this research study. By choosing “agree” below, you confirm that your information is correct and agree to let your information be used for this research study.

Mark only one oval.

☐ ឱរសមស្រ (Agree)
☐ ឱយសារសមស្រ (Disagree)  Stop filling out this form.

2. ប្រភាព *
   Gender
   Mark only one oval.

☐ ប្រូន (Male)
☐ ប្រូត (Female)

3. អាយុ *
   Age
   Mark only one oval.

☐ 18 បី និង 17 ឆ្នាំ
☐ 18-22
☐ 23-29
☐ 30-39
☐ 40-49
☐ 50 បី និង 59 ឆ្នាំ

4. ប្រុសប្រុង *
   Occupation
5. จังหวัด (province/city) *

6. ถ้าคุณสามารถพูดภาษาอื่นใดบ้าง พลิกหน้ามาตอบด้วย *

Other languages you know besides Khmer
Check all that apply:

☐ ภาษาอังกฤษ English
☐ ภาษาฝรั่งเศส French
☐ ภาษาจีน Chinese
☐ ภาษาไทย Thai
☐ ภาษาญี่ปุ่น Japanese
☐ ภาษาเกาหลี Korean
☐ Other:

7. คุณมีปริญญาใดบ้าง **

Your highest educational qualification (COMPLETED)
Mark only one oval.

☐ ปริญญามัธยมศึกษาตอนปลาย (สู門ส ] ต) ซีเดนท์สคิว Social studies
☐ ปริญญามัธยมศึกษาตอนปลาย (สู่มส] ต) ซีเดนท์สคิว Social studies
☐ ปริญญายุศการศึกษาประถมศึกษา Baccalaureate Bachelor's degree
☐ ปริญญายุศการศึกษาปริญญาตรี Master's degree
☐ ปริญญายุศการศึกษาปริญญาโท Doctoral degree

8. ความคุ้นเคยภาษาอังกฤษ (เพียงบุคคลที่มีในข้อมูล) *

Your current level of English
Mark only one oval.

☐ ไม่มี (None)
☐ ระดับต้น (Beginner-Elementary)
☐ ระดับกลาง (Pre-intermediate-Intermediate)
☐ ระดับสูง (Upper-intermediate-Advanced)

ขั้นตอนที่ท่านนั้นต้องดำเนินการในวิเคราะห์การจัดการ Indicate how skillful you are in the following tasks.

(1=Not at all skilled; 2=Not very skilled; 3=Average level of skill; 4=Skilled; 5=Very skilled)
9. သ. စမ်းသပ်ခြင်းနှင့်ကူးကျင်းရေး  *
Starting a computer application
Mark only one oval.

1 2 3 4 5

10. သ. စီစဉ်ဆောင်ရွက်ခြင်း  *
Transferring files between computers.
Mark only one oval.

1 2 3 4 5

11. သ. လေ့လာခြင်း  *
Searching for documents and information on the Internet
Mark only one oval.

1 2 3 4 5

12. ဒ. ဒေါ်လာခြင်း  *
Downloading and storing files from the Internet in a computer
Mark only one oval.

1 2 3 4 5

13. ဒ. ကျင်းရေး  *
Sending an email
Mark only one oval.

1 2 3 4 5

14. ဒ. ရိုက်ခွန်ခြင်း  *
Recording your voice on a computer
Mark only one oval.

1 2 3 4 5
15. ⁴. ឃ្លាយប្រាថ័យក្នុងពេធ *  
Messing  
Mark only one oval.

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16. ⁵. កិច្ចប្រជែងសុីវតិ *  
Audio chatting  
Mark only one oval.

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17. ⁶. កិច្ចប្រជែងសុីវតិ *  
Video chatting  
Mark only one oval.

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18. ⁷⁰. រំខានកិច្ចប្រជែងដែលមានលេខ三亚 Microsoft Word *  
Preparing a document using Microsoft Word  
Mark only one oval.

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19. ⁷¹. រំខានកិច្ចប្រជែងដែលមានលេខ三亚 Google Docs *  
Preparing a document using Google Docs  
Mark only one oval.

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20. ⁷⁶. រំខានកិច្ចប្រជែងថេរមូលដែលមានលេខ三亚 Microsoft Powerpoint *  
Preparing a presentation slide using Microsoft Powerpoint  
Mark only one oval.

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|  |  |  |  |  |  រាយអនុញ្លះ  


21. វត. ប្រការការប្រឈមសំណួរ Google Slide *
Prepping a presentation slide using Google Slide
Mark only one oval.

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22. វត. ការរកប្រព័ន្ធជាមួយមកដល់ Google Drive, Box, ឬ Dropbox *
Storing files in the cloud using either Google Drive, Box, or Dropbox
Mark only one oval.

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ដូច្នេះទិន្នន័យមិនអាចប្រឈមបានជាច្រើនសម្រាប់ការប្រឈមក្នុងក្នុងការប្រឈមកើតទៅឬសូវប្រឈមបាន?

(1=Never; 2=Rarely; 3=S occasionally; 4=Often; 5=Always)

23. វ. នៃអះអាងប្រឈម *
Internet data on my smartphone
Mark only one oval.

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24. វ. ចាស់ប្រព័ន្ធផ្សេង *
Home internet
Mark only one oval.

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25. វ. នៃអះអាងប្រឈមប្រព័ន្ធរោង៖ *
School wireless internet
Mark only one oval.

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26. តារារមានសេវាកម្មក្នុងក្រុមហ៊ុន

*Internet service provided in the computer lab at school
Mark only one oval.

1 2 3 4 5

ជីវ្រួស

27. របាយការណ៍ក្នុងអង្គភូមិប្រតិបត្តិការ

*Internet at work
Mark only one oval.

1 2 3 4 5

ជីវ្រួស

28. របាយការណ៍ក្នុងសេវាកម្មឥនុយន៍ITU

*Internet at the Internet Café
Mark only one oval.

1 2 3 4 5

ជីវ្រួស

29. ការរួមមានសេវាកម្មក្នុងមហាវិថី, សេវាកម្មក្នុងអាជីវកម្ម, ក្នុងសេវាកម្មតូចមនោស័យ

*Free internet in a mall or restaurant
Mark only one oval.

1 2 3 4 5

ជីវ្រួស

30. ការពិតព្រះសិក្ដិតតារារ

*Looking up information with a search engine
Mark only one oval.

1 2 3 4 5

ជីវ្រួស
31. ကိုယ်တိုင် ကျွန်ုပ်တို့ ကုန်ကျစရာ နေထိုင်မှုကို တိုးတက်အောက် မျှဝေမှု *
   Reading news
   Mark only one oval.
   1 2 3 4 5 နိုင်သည်

32. ကိုယ်တိုင် ကျွန်ုပ်တို့ ကုန်ကျစရာ နေထိုင်မှုကို တိုးတက်အောက် မျှဝေမှု *
   Entertaining: watching videos, listening to music and playing games
   Mark only one oval.
   1 2 3 4 5 နိုင်သည်

33. ကိုယ်တိုင် ကျွန်ုပ်တို့ ကုန်ကျစရာ နေထိုင်မှုကို တိုးတက်အောက် မျှဝေမှု Facebook ခွဲငါး *
   Keeping in touch with friends and family on social networking sites such as Facebook, etc.
   Mark only one oval.
   1 2 3 4 5 နိုင်သည်

34. ကိုယ်တိုင် ကျွန်ုပ်တို့ ကုန်ကျစရာ နေထိုင်မှုကို တိုးတက်အောက် မျှဝေမှု *
   Communicating with other people via email for work or school-related purposes
   Mark only one oval.
   1 2 3 4 5 နိုင်သည်

35. ကိုယ်တိုင် ကျွန်ုပ်တို့ ကုန်ကျစရာ နေထိုင်မှုကို တိုးတက်အောက် မျှဝေမှု *
   Shopping
   Mark only one oval.
   1 2 3 4 5 နိုင်သည်

36. ကိုယ်တိုင် ကျွန်ုပ်တို့ ကုန်ကျစရာ နေထိုင်မှုကို တိုးတက်အောက် မျှဝေမှု Facebook ခွဲငါး ကျွန်ုပ်တို့တွင် ကျွန်ုပ်တို့ကို မျှဝေမှု *
   How many HOURS do you typically spend on the Internet in a week?
   1 2 3 4 5 နိုင်သည်
37. Have you taken any online courses?

Mark only one oval.

☐ Yes
☐ No

38. Please select the e-learning course providers you have known or heard of. Check all that apply.

☐ Coursera
☐ EdX
☐ Udacity
☐ Linda.com
☐ Khan Academy
☐ Code Academy
☐ Khmor Academy
☐ Other: ____________________________

39. Have you created an online course?

Mark only one oval.

☐ Yes
☐ No
Appendix D: Usability protocol for student subjects

Usability Test Protocol A
(For Student Subjects)

Developing and evaluating an open web-based eLearning platform for Khmer-speaking users

Hello! How are you doing today? My name is Thearith. I'm so happy to have you with us for this usability study. I will be moderating the session and helping you with the test today.

Before we begin, I will be going over what you will be asked to do today. Please feel free to stop me if you have any questions.

The purpose of this test is to evaluate the ease of use of a website which we have been developing. To do that you will be asked to do some tasks on the website. As you use the website, I will be asking that you think out loud as much as possible: to say what you're looking at, what you're trying to do, and what you're thinking. We will be using Google Hangouts and the screen sharing feature. We're also going to use a screen recorder to record your actions on the computer screen and verbal comments made during the session. Don't worry; we won't trade those recordings to anyone. In addition, you will be asked to complete a short post-test survey after the session has concluded. I also may ask for additional feedback during a quick interview once the session is over. Please remember is that we are evaluating the WEBSITE and not you. There are no right or wrong answers, so please be honest with your feedback, whether good or bad as it will help us to improve the website. The entire session should not take more than 45-60 minutes.

Any questions so far?

So before we begin, I will post links to our consent form and short survey in the chat box located in the bottom right hand corner of the hangout screen. Please open up the links and take a few moments to complete the forms. It's important that you start with the consent form and then the short survey. Let me know if you have questions or when you're done.

Awesome! Thank you! Now, I'm posting another link to the instructions on how to share your screen on Google Hangout. If you've ever done this before, just disregard the link and go ahead and start sharing your screen with me. I'll then walk you through the next step.

Great job! Now I can see your computer screen. Shall I start the screen recorder now?

Sweet! Now, from your browser, please enter this address: www.openschoolcambodia.com. This is the website we'll be testing today.

[Start the screenrecorder]
Task #1: Navigating the platform’s homepage

Alright! What you’re seeing here is the testing website’s homepage. First, I am going to ask you to scan and scroll through the page and tell me what you see. If you point your cursor to where your eye is on the page, we can follow along as you look. You can scroll around with your mouse, but please don’t click on anything just yet. As you do so, please think aloud as you reflect upon the following questions:

- What do you notice first? What strikes you about it?
- What are your initial impressions about the layout of this page and what do you think of the colors, graphics, photos, etc.?
- What are your thoughts of the text on this page?

Feel free to move around the page. Without clicking on anything yet, please describe the options you see on the homepage and what you think they do.

When you are done exploring the homepage, please let me know.

Thank you!
- What do you think this website is about? Why do you think so?
- Whom is it for? What makes you think so?
- What do you think people can do on this website? How can you tell so?
- If you were allowed to click on something on this homepage, where would you click first?

Thank you! Do you have any other comments for this homepage?

Task #2: Creating an account

In order to access this website’s contents and main functionalities, the users need to register an account. So the next thing I would like to ask you to do is to create an account for yourself on this website. Please start from the homepage and again as you navigate around, please think aloud and tell us what you do and see.

Thank you! What do you think about this task in terms of its difficulty? On the scale from 1 to 6, with 1 being very difficult and 6 being very easy, how would you rate this task? Why?

1  2  3  4  5  6
Very difficult  Difficult  Somehow  Somehow  Easy  Very easy
difficult
difficult

What do you think we should do to make creating an account on this website very easy? While creating your account, did you notice any terms or sentences that were confusing? How?
Thank you! Do you have any other comments for this task in particular?

**Task #3: Searching and registering for a course**

Okay, let’s pretend that you would like to take an art class, something related to Digital Photography. How do you go about registering for that class? Please start from the homepage and again as you navigate around, please think aloud and tell us what you do and see.

Thank you! What do you think about this task in terms of its difficulty? On the scale from 1 to 6, with 1 being very difficult and 6 being very easy, how would you rate this task? Why?

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<td>Very difficult</td>
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<td>Somehow difficult</td>
<td>Somehow easy</td>
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</table>

What do you think we should do to make registering for a course very easy?
While completing this task, did you notice any terms or sentences that were confusing? How?
Thank you! Do you have any other comments for this task in particular?

**Task #4: Navigating a course’s page**

For this final task, I would like to ask you to complete the course you have registered for earlier. Just to clarify this, you don’t need to read and/or watch everything you see. We just want you to move from one page to another to complete the whole course. Again as you navigate around, please think aloud and tell us what you do and see.

Thank you! What do you think about this task in terms of its difficulty? On the scale from 1 to 6, with 1 being very difficult and 6 being very easy, how would you rate this task? Why?

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<td>Very easy</td>
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</table>

What do you think we should do to make navigating a course’s page very easy?
While completing this task, did you notice any terms or sentences that were confusing? How?
Thank you! Do you have any other comments for this task in particular?

That was the last task for the website. It would be great if you could spend a minute or two looking around at the pages you have not seen yet on the website.
Thank you, [name]. You can stop sharing screen on your Google Hangout from now. I have posted the link to our post-test survey in the chatbox. Please take a few moments to click on the link and answer the survey.

Please let me know when you’re done.

Awesome! Thank you very much. I have some more questions to ask you before we wrap up the session.

1. What did you like best about the site?
2. What did you like least about the site?
3. What was your overall impression about navigating the website? Easy or difficult? Why? Can you give me some examples?
4. What is your overall opinion about the use of Khmer words in this website? What is your suggestion particularly for the use of Khmer words here?
5. Would you recommend this website to your friends and colleagues? Why or why not?
6. Do you have any suggestions to improve the website? Do you have any other comments?

I just want to say thank you very much for your time today. If you do have any questions about the study moving forward, please feel free to email me. If you don’t have any more questions right now, I’m going to go ahead and conclude our research today.

Thank you!

[Stop the screenrecorder]
Appendix E: Usability protocol for teacher subjects

Note: Sample course module resources are available here.

Usability Test Protocol B
(For Teacher Subjects)
Developing and evaluating an open web-based eLearning platform
for Khmer-speaking users

Hello! How are you doing today? My name is Thearith. I’m so happy to have you with us for this usability study. I will be moderating the session and helping you with the test today.

Before we begin, I will be going over what you will be asked to do today. Please feel free to stop me if you have any questions.

The purpose of this test is to evaluate the ease of use of a website which we have been developing. To do that you will be asked to do some tasks on the website. As you use the website, I will be asking that you think out loud as much as possible: to say what you’re looking at, what you’re trying to do, and what you’re thinking. We will be using Google Hangouts and the screen sharing feature. We’re also going to use a screen recorder to record your actions on the computer screen and verbal comments made during the session. Don’t worry; we won’t trade those recordings to anyone. In addition, you will be asked to complete a short post-test survey after the session has concluded. I also may ask for additional feedback during a quick interview once the session is over. Please remember is that we are evaluating the WEBSITE and not you. There are no right or wrong answers, so please be honest with your feedback, whether good or bad as it will help us to improve the website. The entire session should not take more than 30-45 minutes.

Any questions so far?

So before we begin, I will post links to our consent form and short survey in the chat box located in the bottom right hand corner of the hangout screen. Please open up the links and take a few moments to complete the forms. It’s important that you start with the consent form and then the short survey. Let me know if you have questions or when you’re done.

Awesome! Thank you! Now, I’m posting another link to the instructions on how to share your screen on Google Hangout. If you’ve ever done this before, just disregard the link and go ahead and start sharing your screen with me. I’ll then walk you through the next step.

Great job! Now I can see your computer screen. Shall I start the screen recorder now? Sweet! Now, from your browser, please enter this address: www.openschoolcambodia.com. This is the website we’ll be testing today.

[Start the screenrecorder]
Task #1: Navigating the platform's homepage

Alright! What you're seeing here is the testing website's homepage. First, I am going to ask you to scan and scroll through the page and tell me what you see. If you point your cursor to where your eye is on the page, we can follow along as you look. You can scroll around with your mouse, but please don't click on anything just yet. As you do so, please think aloud as you reflect upon the following questions:

- What do you notice first? What strikes you about it?
- What are your initial impressions about the layout of this page and what do you think of the colors, graphics, photos, etc.?
- What are your thoughts of the text on this page?

Feel free to move around the page. Without clicking on anything yet, please describe the options you see on the homepage and what you think they do.

When you are done exploring the homepage, please let me know.

Thank you!
- What do you think this website is about? Why do you think so?
- Whom is it for? What makes you think so?
- What do you think people can do on this website? How can you tell so?
- If you were allowed to click on something on this homepage, where would you click first?

Thank you! Do you have any other comments for this homepage?

Task #2: Creating an account

In order to access this website's contents and main functionalities, the users need to register an account. So the next thing I would like to ask you to do is to create an account for yourself on this website. Please start from the homepage and again as you navigate around, please think aloud and tell us what you do and see.

Thank you! What do you think about this task in terms of its difficulty? On the scale from 1 to 6, with 1 being very difficult and 6 being very easy, how would you rate this task? Why?

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</tbody>
</table>

What do you think we should do to make creating an account on this website easier? While creating your account, did you notice any terms or sentences that were confusing? How?
Thank you! Do you have any other comments for this task in particular?

**Task #3: Requesting to become a teacher**

Okay, let’s pretend that you would like to become a teacher to have the permission to create a course on this site. How would you go about doing that? Please start from the homepage and again as you navigate around, please think aloud and tell us what you do and see.

Thank you! What do you think about this task in terms of its difficulty? On the scale from 1 to 6, with 1 being very difficult and 6 being very easy, how would you rate this task? Why?

1 2 3 4 5 6
Very difficult Difficult Somehow difficult Somehow easy Easy Very easy

What do you think we should do to make this task easier?
While completing this task, did you notice any terms or sentences that were confusing? How?
Thank you! Do you have any other comments for this task in particular?

**Task #4: Creating a course**

For this final task, I would like to ask you to create a course on this website using the teacher account you have just created. Don’t worry about the contents for your course. I have prepared everything for you in a folder, [Here is the link](#) (placed in the chatbox) to download that folder. Once you’re done downloading the folder, open the folder and open a file named “Open me first.” Go through it and let me know if you have any questions before you start creating the course.

Thank you! What do you think about this task in terms of its difficulty? On the scale from 1 to 6, with 1 being very difficult and 6 being very easy, how would you rate this task? Why?

1 2 3 4 5 6
Very difficult Difficult Somehow difficult Somehow easy Easy Very easy

What do you think we should do to make creating a course easier?
While completing this task, did you notice any terms or sentences that were confusing? How?
Thank you! Do you have any other comments for this task in particular?

That was the last task for the website. It would be great if you could spend a minute or two looking around at the pages you have not seen yet on the website.
Thank you, [name]. You can stop sharing screen on your Google Hangout from now. I have posted the link to our post-test survey in the chatbox. Please take a few moments to click on the link and answer the survey.

Please let me know when you're done.

Awesome! Thank you very much. I have a few more questions to ask you before we wrap up the session.

1. What did you like best about the site?
2. What did you like least about the site?
3. What was your overall impression about navigating the website? Easy or difficult? Why? Can you give me some examples?
4. What is your overall opinion about the use of Khmer words in this website? What is your suggestion particularly for the use of Khmer words here?
5. Would you recommend this website to your friends and colleagues? Why or why not?
6. Do you have any suggestions to improve the website? Do you have any other comments?

I just want to say thank you very much for your time today. If you do have any questions about the study moving forward, please feel free to email me. If you don’t have any more questions right now, I’m going to go ahead and conclude our research today.

Thank you!

[Stop the screenrecorder]
Appendix F: Post-survey

**General Feedback**

1. ដែលកម្មវិធីដែលមានសិទ្ធិសម្របសួរមិនប្រសើរទោសឬជាកូនុងអ្វី? *
   
   What features of the website were vague or confusing to you, if any?

2. ដែលអ្នកចង់បញ្ជូនឱ្យមានអត្ថបទបន្ទាប់មកបំផុតនៃអំពីអ្វី? *
   
   What else should be included on the website?

3. តើអ្នកចង់បានអត្ថបទបន្ទាប់មកពីការប្រការការសម្រាប់អំពីអ្វី? ប្រញាប់ប្រញាប់ថាជាដំណើរការ? ស្ថិតិភាពប្រញាប់ប្រញាប់? *
   
   Do you think people would have problems using the website? What kinds of people? What kinds of problems?

**Design Layout**
1. I strongly disagree
2. I disagree
3. Somewhat disagree
4. Somewhat agree
5. Agree
6. Strongly agree

4. The home page layout is easy to understand.
Mark only one oval.

5. The text is clearly written.
Mark only one oval.

6. The images are interesting.
Mark only one oval.

7. The website is visually appealing.
Mark only one oval.

8. The organization of the site is logical and easy to follow.
Mark only one oval.
Navigation

1. I strongly disagree
2. I disagree
3. Somewhat disagree
4. Somewhat agree
5. Agree
6. I strongly agree

9. The website is easy to navigate.
   *Mark only one oval.

10. Number of buttons/links is reasonable.
    *Mark only one oval.

11. Labels are clear and concise.
    *Mark only one oval.

12. Links are consistent and easy to identify.
    *Mark only one oval.

Khmer language

1. I strongly disagree
2. I disagree
3. Somewhat disagree
4. Somewhat agree
5. Agree
5- មិនមានទុប
6- មានទុបទឹក

13. តើការបង្កើតសម្រាប់វិបត្តិនិងទូរស័ព្ទត្រូវបានចាត់ទុកជាក្រុមការត្រូវបានចាត់ទុកជាក្រុម។
   Khmer terms are clear and easy to understand.
   Mark only one oval.

   1   2   3   4   5   6

   (ឈុតស្ពី) [ ] [ ] [ ] [ ] [ ] [ ]

14. តើការបង្កើតសម្រាប់វិបត្តិនិងទូរស័ព្ទត្រូវបានប្រឈមប្រាយតាមគៈពន្ធប្រព័ន្ធដែលប្រឈមប្រាយ
   Khmer terms are used consistently on the website.
   Mark only one oval.

   1   2   3   4   5   6

   (ឈុតស្ពី) [ ] [ ] [ ] [ ] [ ] [ ]

15. គៈពន្ធប្រព័ន្ធជាក្រុមការត្រូវបានប្រឈមប្រាយតាមគៈពន្ធ
   The texts on the website are grammatically correct.
   Mark only one oval.

   1   2   3   4   5   6

   (ឈុតស្ពី) [ ] [ ] [ ] [ ] [ ] [ ]

16. គៈពន្ធប្រព័ន្ធជាក្រុមការត្រូវបានប្រឈមប្រាយតាមគៈពន្ធ
   The texts on the website are correctly spelled.
   Mark only one oval.

   1   2   3   4   5   6

   (ឈុតស្ពី) [ ] [ ] [ ] [ ] [ ] [ ]
Appendix G: Consent form

Consent Form

Please read and answer the questions below. Thank you!

* Required

Informed Consent

University of Hawai‘i
CONSENT TO PARTICIPATE IN RESEARCH PROJECT
Developing and Evaluating an Open Web-based eLearning Platform for Khmer-speaking Users

Hello! My name is Sokuntheath Makara, and I am a student at the University of Hawai‘i at Mānoa. I am conducting this research project as a component for a Master’s degree in Learning Design and Technology. The purpose of this usability study is to develop and evaluate the ease of use of an open web-based eLearning platform for Khmer-speaking users to create and take online courses for free. I am asking you to participate because you speak and read Khmer and have adequate technology to fully participate in this study. Your participation in this study will help determine the changes to be implemented on the platform to improve user experience.

Activities and Time Commitment

With the help of Google Hangout, we will conduct
the usability study at your place of residence. The study will take less than one hour to complete. We will send you an email with the link to complete the study. You will be asked to provide your consent before participating. You can stop the study at any time without any inconvenience. We appreciate your contribution to our research.
Participation will be completely online through a Google Hangout with the researcher. If you participate, first you will be asked to complete a short pre-survey, which aims at collecting your demographic information, your experience on the web, your online habits, your experience with e-Learning, as well as your computer skills. Then you will be asked to navigate through the platform while being prompted by a series of tasks. These tasks are intended to evaluate the ease of use of the platform. You will be asked to share your thoughts out loud as you navigate the website, which will assist the researcher in gaining further insights into the user experience. Your screen actions and verbal comments will be screen captured and recorded using Camtasia Studio. Once all tasks are completed, the researcher may ask follow up questions as needed. You will be asked to complete a post-survey after participating. The post-survey is intended to gather your feedback pertaining to the ease of use of the learning platform as a whole. A short interview will be conducted after completion of the post-survey to gain further understanding of your experience. The entire usability study, including both surveys and interview, will last about 45-50 minutes.

**Confidentiality and Privacy**

The data taken from your participation in this study will be used solely for the purpose of this usability study. The data will be stored securely on a password-protected computer. When I report the results of my research project, I will not use your name or any other personal information that would identify you. The recordings from this study will be transcribed to determine commonalities from all participants. Once the research is complete, all recordings will be destroyed.

**Voluntary Participation**

Participation in this research project is strictly voluntary. You are free to choose to participate or not to participate in this project. You may withdraw your permission or discontinue participation at any time without penalty or loss of benefits.

**Questions**

Please be prepared to ask questions during the project.
If you have any questions regarding your participation in this research study, please contact me via email at smakara@hawaii.edu.
You may also contact Faculty Adviser Catherine Fulford at fulford@hawaii.edu. If you have any questions about your rights in this project, you can contact the University of Hawaii, Human Studies Program, by phone at (808) 956-5007 or by email at uhhrb@hawaii.edu.

**Participation**

I have read and understood the above information, and agree to participate in this usability study. I understand that I can change my mind about being in the project at any time by notifying the researcher.

**Audio Recording**

I understand that my verbal responses and screen activity will be recorded as I participate in this usability study. Those audio recordings will only be accessed by the researcher and will be destroyed once the research is complete.

1. **Date: Please enter today’s date**
   Example: December 15, 2012

2. **Name: Please enter your name**

By submitting this form, you consent to participate in the study AND to have the session audio recorded.
Appendix H: Data log worksheet

Observation/Interview Sheet A
(for student subject)

Student subject’s name: ___________________________ Test date: __________
Starting time: ___________________________ Ending time: ___________________________
Operating System: ___________________________ Browser and Version: ___________________________
Screen Resolution: ___________________________ Screenrecord file name: ___________________________

☐ Check this box if the consent form has been signed.

Task #1: Navigating the platform’s homepage
What do you notice first? What strikes you about it?

What are your initial impressions about the layout of this page and what do you think of the colors, graphics, photos, etc.?

What are your thoughts of the text on this page?

What do you think this website is about? Why do you think so?

Whom is it for? What makes you think so?

What do you think people can do on this website? How can you tell so?

If you were allowed to click on something on this homepage, where would you click first?

Other comments

_________________________

_________________________

_________________________
Task #2: Creating an account
Steps taken to complete the task

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Duration to complete the task: __________________________ (min)

Task difficulty by the subject:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very difficult</td>
<td>Difficult</td>
<td>Somehow difficult</td>
<td>Somehow easy</td>
<td>Easy</td>
<td>Very easy</td>
</tr>
</tbody>
</table>

Rationale for the rating
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Suggestion to improve this task
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Comments on the use of Khmer terms/sentences
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Other comments
________________________________________________________________________
Task #3: Searching and registering for a course
Steps taken to complete the task

Duration to complete the task: ______________________ (min)

Task difficulty by the subject:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very difficult</td>
<td>Difficult</td>
<td>Somehow difficult</td>
<td>Somehow easy</td>
<td>Easy</td>
<td>Very easy</td>
</tr>
</tbody>
</table>

Rationale for the rating

Suggestion to improve this task

Comments on the use of Khmer terms/sentences

Other comments
**Task #4: Navigating a course's page**

Steps taken to complete the task

---------------------------------------------------


Duration to complete the task: ______________________ (min)

Task difficulty by the subject:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very difficult</td>
<td>Difficult</td>
<td>Somehow difficult</td>
<td>Somehow easy</td>
<td>Easy</td>
<td>Very easy</td>
</tr>
</tbody>
</table>

Rationale for the rating

---------------------------------------------------


Suggestion to improve this task

---------------------------------------------------


Comments on the use of Khmer terms/sentences

---------------------------------------------------


Other comments

---------------------------------------------------
General Questions

1. What did you like best about the site?

2. What did you like least about the site?

3. What was your overall impression about navigating the website? Easy or difficult? Why? Can you give me some examples?

4. What is your overall opinion about the use of Khmer words in this website? What is your suggestion particularly for the use of Khmer words here?

5. Would you recommend this website to your friends and colleagues? Why or why not?

6. Do you have any suggestions to improve the website? Do you have any other comments?

More comments
Appendix I: List of problems in the first round

<table>
<thead>
<tr>
<th>ID</th>
<th>Task: Navigating the platform’s homepage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Users only noticed the learning side of the platform by looking at the homepage.</td>
</tr>
<tr>
<td>1.2</td>
<td>Some parts of the texts on the footer overflow, therefore hidden, on the small resolution screen.</td>
</tr>
<tr>
<td>1.3</td>
<td>There is too much text on the homepage.</td>
</tr>
<tr>
<td>1.4</td>
<td>The homepage banner and header are not responsive.</td>
</tr>
<tr>
<td>Task: Creating an account</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td></td>
</tr>
</tbody>
</table>

### 2.1 Username doesn’t accept period (.)

<table>
<thead>
<tr>
<th>Username (required)</th>
</tr>
</thead>
</table>

**ACCOUNT DETAILS**

This prevents user from creating an account. Critical, but easy to fix.

### 2.2 Users spend a large amount of time typing in the bio field, and do not notice that it’s not required.

<table>
<thead>
<tr>
<th>Bio</th>
</tr>
</thead>
</table>

It mainly causes by the user’s attention to detail. Minor changes to draw attention of the user might fix the issue.

### 2.3 Upon registration, users do not notice the activation message.

User activation is an important
process in creating an account. However, fixing is not complicated.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4</td>
<td>The platform prevents users logging in from different devices or browsers at the same time.</td>
<td>0</td>
</tr>
<tr>
<td>2.5</td>
<td>No option to login via social ID and mobile phone considering target audience are not acquainted with email usage.</td>
<td>1</td>
</tr>
</tbody>
</table>

**Task: Searching and registering for a course**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>The action button on the homepage does not provide obvious direction to where it leads the users to. (In Khmer)</td>
<td>0, 1</td>
</tr>
</tbody>
</table>
**Task: Navigating a course’s page**

| 4.1 | The texts on the course navigation buttons are too small and some are too long. Sometimes they are not noticeable. | 1 | 4 | One of the navigation buttons, MARK THIS UNIT COMPLETE, is important for indicating the course progress and completing the course. |

4.2 “Finish this course” button on the right side of the screen is not obvious. | 1 | 4 | Clicking on this button is the requirement to complete the course. |
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4.3</strong></td>
<td>The quiz submit and save buttons are too small.</td>
<td>I</td>
<td>3</td>
</tr>
<tr>
<td><strong>4.4</strong></td>
<td>The text in the unit content section is too small.</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td><strong>4.5</strong></td>
<td>Users do not understand the purpose of the progress bar.</td>
<td>I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>The progress bar is an important indicator whether or not the student can click on the FINISH COURSE button; therefore, they need to know what it is. However, a line of text might fix the issue.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4.6</strong></td>
<td>Users do not understand how the course review works: review title, and the review text.</td>
<td>0, I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Course Review is an important tool for the developer of the platform to identify a poor course. It</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
has to be simple and make sense to the users.

<table>
<thead>
<tr>
<th>Task: Requesting to become a teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1  Users takes a while to find the “teacher registration” button.</td>
</tr>
<tr>
<td>5.2  The 3 fields--username, full name, and email address in the request form are not required since the users already provided this info.</td>
</tr>
<tr>
<td>5.3  Teacher form appears underneath the header logo.</td>
</tr>
</tbody>
</table>
### Task: Creating a course

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Image upload takes too long.</td>
<td>I, O</td>
</tr>
</tbody>
</table>

5.4 The background in the teacher request page is not consistent with the rest of platform.

5.5 Teacher form is not responsive on different screen sizes.

![Image](image_url)
| 6.2 | Text editor doesn't load in one of the subjects’ Chrome browser. | O | 0 | User might have altered the default configuration of his browser, which prevents the text editor from loading correctly. |
| 6.3 | Users are unable to notice the plus sign for adding new elements to the course curriculum. | O | 4 | Adding elements to the course is critical in the process of creating a course. |
| 6.4 | Users are unable to notice the edit sign to edit the course elements. | O | 4 |
| 6.5 | Users are unable to save the questions in the quiz. (Save button disable). | O | 4 |

**Use of Khmer language**

| 7.1 | Some words are ambiguous  
- Registration page: Username, Location, Fullname, and Bio  
- Course creator: Course Short Description, Course Long Description, Disable/Enable for | I | 3 |
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>the switch button, course instructions, question title</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Activation page: Activate your account</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Change profile picture</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Some strings require translation such as</td>
<td>O 2</td>
</tr>
<tr>
<td></td>
<td>• Username or Email Address on the WP login screen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Error: Users already logged in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Quiz Passing Mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Please complete the unit</td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>The Khmer fonts do not render correctly for the words with multiple consonant clusters.</td>
<td>I 1</td>
</tr>
</tbody>
</table>

**Others**

| 8.1 | Page loading is slow.  | I 2 |
| 8.2 | Custom login page is not responsive.  | O 3 |

*Nielsen's (1995) 5-level scale for usability problem severity*

0 = I don't agree that this is a usability problem at all
1 = Cosmetic problem only: need not be fixed unless extra time is available on project
2 = Minor usability problem: fixing this should be given low priority
3 = Major usability problem: important to fix, so should be given high priority
4 = Usability catastrophe: imperative to fix this before product can be released

**Reference is when/where the problem is identified.**

L = literature review
O = observation
I = interview
S = survey
Appendix J: List of changes after the first round

[For the purpose of this paper, the screenshots of the English version have been used although the actual tests were done on the Khmer version. Both English and Khmer versions were revised as indicated following.]

### Task: Navigating the platform's homepage

#### Problem #1.1
Changes:
Another section highlighting the teaching side of the platform was included in the homepage. Also a button which links to a teacher request form (if logged in as student) or to course creator (if logged in as teacher) was also included in the new section.

![Teaching section on the homepage](image)

Keywords .learn .teach .connect were added to the banner to emphasize the major functionalities of the platform.

![.learn .teach .connect keywords on the banner](image)

#### Problem #1.2
Changes:
The problem occurred as a result of the incorrect media query code in CSS. The revision of the media query code responsible for the width of the layout resolved this issue.
Problem #1.3
Changes:
The description of each section of the homepage was reduced by 50%. The title of each section was also rephrased to convey a clearer meaning.

**TAKING COURSES**
All courses in Open School are FREE for everyone. We group our courses into field categories and levels so that you can easily find the courses that matter most to you.

**TEACH COURSES**
Knowledge is never lost when shared. Anyone can be a teacher and create a course at Open School regardless of their teaching experience.
Problem #1.4
Changes:
Four arrangements of the homepage banner were made for PC screen, laptop, ipad and smartphone to ensure its responsiveness.
Problem #1.5
Changes:
Menu items were placed in the mobile menus.
Task: Creating an account

Problems #2.1 and #2.2
Changes:
A short description was added below each text field to help the users. Some labels were also reworded to avoid ambiguity. The word “optional” was uppercased to make it more visible.

Registration form with added description below each field

Problem #2.3
Changes:
The activation message was redesigned by adding a large attention logo and bigger message to draw attention of the users.

New activation message with added attention icon

Problem #2.4
Changes:
This problem was fixed by enabling multiple session sign-in option in the back-end of the platform.

Problem #2.5
Changes:
Option to login or register with social ID was added by using Super Socializer plugin by Team Heatoer.

**Registration Form**

Registering for Open School is easy. Just fill in the fields below, and we’ll get a new account set up for you in no time.

— OR —

Connect with your social ID

Facebook, Twitter, Google Plus

---

**Task: Searching and registering for a course**

**Problem #3.1**

Changes:
The label of the main action button on the banner was changed to “FIND A COURSE” and a search icon was also added to emphasize the function of the button.

**Task: Navigating a course’s page**

**Note:** There was a major revision of the layout of the course’s page. The width of the page was enlarged to 95% of the screen’s width. The header, top footer, and menus were removed to prevent the distractions when the students go through the unit content.

---

New course’s page layout which emphasizes the course content
Problems #4.1 and 4.3
Changes:
The font size of the labels was increased by 2 points.

Problem #4.2
Changes:
The color of the “FINISH COURSE” button was changed to orange to distinguish it from other buttons so as to make it noticeable to the users.
Problem #4.4
Changes:
The researcher agreed with the subject on English text, but not Khmer text. Lato font family is narrowed-width, so it appears to be smaller than normal-width fonts. Therefore, changing the font family to Varela Round resolved the issue.

Problem #4.5
Changes:
A label was added above the progress bar.

Problem #4.6
Changes:
Placeholders were added to the text fields to provide users explanation and example.

Task: Requesting to become a teacher

Problem #5.1
Changes:
The teacher request buttons were placed in multiple places including the homepage, Classroom submenu, and Course Directory page to make it obvious and convenient to the users. All of these buttons change to Create Course button when the users are logged in as teachers.
Problems #5.2, #5.3, #5.4 and #5.5
Changes:
The teacher registration form was redesigned to solve the issues.
Task: Creating a course

Note: There was a major revision of the layout of the course creator's page. The width of the page was enlarged to 95% of the screen's width. The header, top footer, and menus were removed.
Problem #6.1
Changes:
The problem was caused by the image compressing plugin. It took some time to compress the image. Removing the plugin solved the issue.

Problem #6.2
Changes:
The problem only occurred on one of the six subjects. The researcher decided that this is not to be resolved.

Problem #6.3
Changes:
The researcher made the buttons for adding new elements to the course curriculum permanently visible even without mouse’s hovering.

Add section, add unit and add quiz buttons on the course curriculum section of the course creator

Problem #6.4
Changes:
The researcher made the buttons for editing course elements permanently visible even without mouse’s hovering.

Edit, Preview, Remove and Delete buttons made permanently visible

Problem #6.5
Changes:
This was a bug in the plugin. The save button was disabled when multiple quiz questions were edited at the same time. The new update fixed the issue. It force-closes the current quiz window when the new one opens.

Use of Khmer language

Problem #7.1
Changes:
Registration page:
- Username → Username (Username without space or special characters (e.g. chuonnath))
- Location → Current Location (Your province/city in Khmer or English (OPTIONAL))
- Bio → Additional Info (Anything you want us to know about you (OPTIONAL))
• Activate your account → Please verify it is you!

Course Creator:
• The labels were kept the same. However, new tooltips and placeholders were added to help guide the users.

Profile page:
• Change profile picture → Change your picture (**only Khmer translation was changed**)

---

**Problem #7.2**
Changes:
The strings were translated.

**Problem #7.3**
Changes:
The Khmer font family was changed from "Noto Sans Khmer UI" to "Noto Sans Khmer".

---

![Difference between regular (left) and UI (right) fonts for Noto Sans Khmer](image)

---

**Others**

---

**Problem #8.1**
Changes:
In the initial design the researcher used a page load animation which covered the page until the page loaded completely. The subject might have wrongly perceived the loading speed of the page, which in fact is the same with or without page loading animation. However, to speed up the page load a little bit, the graphics and backgrounds were replaced by compressed versions.

**Problem #8.2**
Changes:
New login dropdown is used instead of a full-width login page.
New login dropdown with option to connect with social ID
Appendix K: List of problems in the second round

<table>
<thead>
<tr>
<th>ID</th>
<th>Problem description</th>
<th>Ref.</th>
<th>Severity</th>
<th>Reason for rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Task: Navigating the platform’s homepage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Banner background does not reflect the purpose of the website.</td>
<td>I</td>
<td>1</td>
<td>It’s not a usability problem and requires just simple fixing.</td>
</tr>
<tr>
<td></td>
<td><strong>Task: Creating an account</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Subjects do not notice the option to link their social ID.</td>
<td>I, O</td>
<td>2</td>
<td>It doesn’t affect the usability of the platform. However, using this option can speed up the registering process to just 15 seconds.</td>
</tr>
</tbody>
</table>
### Task: Searching and registering for a course

**No Issue**

### Task: Navigating a course’s page

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I, O, S</td>
<td>4</td>
</tr>
<tr>
<td>4.1</td>
<td>Users do not notice the Mark This Unit Complete button.</td>
<td>Users won't be able to finish the course without clicking on this button.</td>
<td></td>
</tr>
</tbody>
</table>

### Task: Requesting to become a teacher

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>2</td>
</tr>
<tr>
<td>5.1</td>
<td>The form submission success message is not noticeable.</td>
<td>This does not affect the performance of the task very much.</td>
<td></td>
</tr>
</tbody>
</table>

### Task: Creating a course

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>O</td>
<td>4</td>
</tr>
<tr>
<td>6.1</td>
<td>Course Short Description is saved, but does not reappear as the subject refresh the course creator.</td>
<td>Users can be confused and</td>
<td></td>
</tr>
<tr>
<td>6.2</td>
<td>Subjects do not notice the tooltip icons even when they need help. (Blue question marks)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.3</td>
<td>Some quiz and unit settings are too advanced and not necessary for current target users.</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

- [Course Short Description](#): Briefly describe this course.

- [Course Title](#): **ENTER A COURSE TITLE**

- [Course Category](#): Select a Course Category

- [Course Level](#): Select a Course Level

- [Course Language](#): Select a Course Language

- [Course Image](#)

- [Course Short Description](#): Briefly describe this course.
<table>
<thead>
<tr>
<th></th>
<th>The fact that quiz creation pages open up on top of one another confuses the subjects.</th>
<th>I</th>
<th>4</th>
<th>Fixing this could save the users’ time in creating quiz.</th>
</tr>
</thead>
</table>

**Use of Khmer language**

<table>
<thead>
<tr>
<th></th>
<th>Khmer language in the activation email is somewhat technical such as “to activate”.</th>
<th>I</th>
<th>1</th>
<th>Not a usability issue but worth fixing</th>
</tr>
</thead>
</table>
| 7.2 | Some labels in Khmer language on unit content creation page are not clear.  
- Title (unit title?),  
- Content (unit content?) | 0, I | 4 | These have to be clear so that users do not waste their time figuring out the meaning of each label. |
| 7.3 | Some labels in Khmer language on quiz content creation page are not clear.  
- Title (quiz title?),  
- Content (quiz instructions?),  
- Quiz subtitle (quiz description?),  
- Questions (Adding Questions?),  
- Reference title (New Question ID?),  
- Title (Question ID?),  
- Content (Question Content?) | 0, I | 4 | These have to be clear so that users do not waste their time figuring out the meaning of each label. |
| 7.4 | Khmer language on the homepage is informal and vague.  
- Do more  
- Connect  
- Levels  
- Take courses  
- Community-building platform  
- Learning resources | I | 1 | The language already makes sense. It’s optional to fix. |

**Others**

|   | Subjects cannot clearly differentiate buttons from other box items since they are flat. | I | 2 | It can stem from the fact that the users did not pay attention or not familiar with the platform. Fixing is optional. |
*Nielsen's (1995) 5-level scale for usability problem severity
0 = I don't agree that this is a usability problem at all
1 = Cosmetic problem only: need not be fixed unless extra time is available on project
2 = Minor usability problem: fixing this should be given low priority
3 = Major usability problem: important to fix, so should be given high priority
4 = Usability catastrophe: imperative to fix this before product can be released

**Reference is when/where the problem is identified.
L = literature review
O = observation
I = interview
S = survey
Appendix L: List of changes after the second round

[For the purpose of this paper, the screenshots of the English version have been used although the actual tests were done on the Khmer version. Both English and Khmer versions were revised as indicated following.]

**Task: Navigating the platform’s homepage**

**Problem #1.1**  
Change:  
The banner background was replaced by a new background which reflects education and technology.

![New banner background on the homepage](image)

**Task: Creating an account**

**Problems #2.1 and #2.2**  
Change:  
An attention-seeking animation was added to the object. After the registration page finishes loading, the Social ID login object is animated twice to draw the user's attention.

![Animated Social ID login object](image)
Task: Navigating a course’s page

Problems #4.1
Changes:
An attention-seeking animation was added to the Mark This Unit Complete button. The animation is triggered when the user hovers the cursor on the unit navigation bar.

Additionally, default course instructions were also created. Every time the user starts a new course, the instructions show up. The instructions also include the requirement to click on the Mark This Unit Complete after each unit and to click on Finish Course button to submit the course when it is complete.
Task: Requesting to become a teacher

Problem #5.1
Changes:
The message was re-formatted, and an animation was also added to the message.

![Congratulations! Now you can start creating a course.](image)

New teacher registration form submission success message

Task: Creating a course

Problem #6.1
Change:
The php file associated with the course short description has been revised to enable input retrieving.

![Course Short Description](image)

Problem #6.2
Change:
The tooltip icons are not hidden. A tooltip icon for a particular item only appears when the user hovers the mouse over that particular section. Once appearing, the icon is also animated to draw the attention of the user. The researcher also changed the color of the icons to orange to differentiate them from other items on the page.

![Tooltip icon for Course Image appears when the mouse on the course image section while other icons for other sections are hidden](image)
Problem #6.3
Changes:
The following sections/features have been removed from the unit and quiz settings.

- Unit Forum (course forum is already available)
- Unit Access Date (course drip feed is already available)
- Unit Access Time (course drip feed is already available)
- Connected Course (not necessary)
- Dynamic Quiz (not applicable in the context of this project)
- Question Type in Questions (repetitive)
- Unit Description (let the instructor include this directly in the unit content)
- Quiz Subtitle (let the instructor include this directly in the quiz instructions)

Problem #6.4
Changes:
Shadow has been added to each layer to create depth/level of that layer.

Layers with box-shadow

Use of Khmer language

Problem #7.1
Changes:
The body text of the activation email has been changed.
Problem #7.2
Changes:
The labels on the unit content creation page have been changed. The translation of new labels has also been added.
- Title → Unit Title
- Content → Unit Content

Problem #7.3
Changes:
The labels on the quiz content creation page have been changed. The translation of new labels has also been added.
- Title → Quiz Title,
- Content → Quiz Instructions,
- Questions → Quiz Questions,
- Reference title → Question ID (e.g. Test1_Q1),
- Title → Question ID,
- Content → Question Content

Problem #7.4
Changes:
The translations have been revised to make it clearer and more formal.

Problem #8.1
Changes:
All buttons now have box-shadow and a hover effect to differentiate them from other page elements.
Hover effect is active on FINISH COURSE button