EMBEDDED SCHEME OF WORK STRUCTURE INTO LEARNING MANAGEMENT SYSTEM

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Abstrak

Kajian ini berkaitan dengan integrasi automatik Rancangan Pengajaran (TP) atau Skima Rancangan Mengajar (SRM) ke dalam Moodle; perisian pengurusan kursus popular (CMS). SRM adalah dokumen yang disediakan oleh guru-guru akademik untuk memperincikan pelan kursus sepanjang tempoh pengajaran. Ia membantu untuk menguruskan aktiviti-aktiviti pelajar seperti kuiz, peperiksaan, topik, dan lain-lain untuk menjadikan ia lebih tersusun. Walaubagaimanapun, kebanyakan jabatan-jabatan seperti Pusat Pengajian Pengkomputeran (SOC) biasanya menyediakan dokumen secara manual. Moodle membolehkan kursus akan diuruskan dengan berkesan walaupun penggunaan perkhidmatan web. Terdapat beratus-ratus ciri yang disediakan oleh Moodle untuk membantu dalam pengajaran. Moodle membahagikan tempoh mengajar mengikut tarikh pra-set. Buat masa sekarang, SOW perlu ditambah secara manual ke dalam seksyen SOW di Moodle. Kajian ini mendapati bahawa kebanyakan dokumen-dokumen dalam SOW pensyarah tidak sama dengan kandungan Moodle mereka dan dengan itu mereka perlu mengubah suai dengan sewajarnya. Ini adalah disebabkan oleh kemasukan manual untuk SOW dalam sistem Moodle yang mengambil masa dan agak rumit. Kajian ini membentangkan penyelesaian yang berpotensi dalam struktur SOW yang boleh disepadukan secara automatik mengikut aktiviti mingguan, seperti tugasan dan kuiz melalui penggunaan plugin yang dibangunkan dalam kajian ini. Kaedah yang digunakan dalam kajian ini terdiri daripada lima langkah, iaitu kesedaran tentang masalah, cadangan, pembangunan, penilaian dan kesimpulan. Berdasarkan penilaian yang dijalankan melalui persampelan, plugin yang dibangunkan melalui kajian ini mempunyai nilai yang signifikan dengan menjimatkan masa berharga dalam membantu tugas ahli akademik mengemaskini dan menggunakan Moodle, khususnya yang berkaitan dengan SOW.

Kata kunci: Sistem Pengurusan Pembelajaran (LMS), tertanam, Skim Work (SOW), Moodle, Perisian Pengurusan Kursus (CMS)

Abstract

This research is related to the automatic integration of the Teaching Plan (TP) or Scheme of Work (SOW) into Moodle; a popular course management software (CMS). SOW is a document prepared by academic teachers to detail out a plan of the course throughout the teaching duration. It helps to better manage student activities such as quizzes, exam, topics, and etc. However, most departments like the School of Computing (SOC) normally prepare the document manually. Moodle allows for course to be managed effectively though the use of a web service. There are hundreds of features provided by Moodle to assist in teaching. Moodle divides the teaching duration according to pre-set dates. Current Moodle practice is that the SOW needs to be added manually into the SOW section of Moodle. This study found that most of the time, the lecturers' SOW documents are not the same with their Moodle content and thus would have to modify accordingly. This is due to the manual entry for the SOW in the Moodle system that takes time and becomes cumbersome. This study presents a potential solution and describe show the SOW structure can be integrated automatically according to the weekly activities, like assignments and quizzes, by using a plugin developed in this study. The methodology used in this study is made up of five steps, namely, the awareness of the problem, suggestion, development, evaluation, and conclusion. Based on the evaluation performed through sampling, the plugin developed through this study has significant value by saving precious time in assisting the academician's task of updating and using Moodle, specifically related to the SOW.

Keywords: Learning Management System (LMS), embedded, Scheme of Work (SOW), Moodle, Course Management Software (CMS)

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In The Name of Allah, The Most Gracious and The Most Merciful, and Him Alone worthy of all praise

Alhamdulillah, I finished my thesis for master degree.

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Table of Contents

List of Tables

List of Figures

List of Appendices

List of Abbreviations

UUM : Universiti Utara Malaysia

ICT : Information Communication Technologies

LMS : Learning Management System

VLM : Virtual Learning Management

OUM : UUM Online Learning

SOW : Scheme of work

MQA : Malaysian Quality Agency

LCMS : Learning Content Management System

WWW : World Wide Web

CMS : Course Management System

OSS : Open Source Software

VLE : Virtual Learning Environment

MMLS : Multimedia Learning System

OUM : Open University Malaysia

CHAPTER ONE
INTRODUCTION

1.1 Background

The Malaysian Quality Agency (MQA) has its own standardised of Scheme of Work (SOW), so academic staff like lecturers in any university in Malaysia, like Universiti Utara Malaysia (UUM), must follow the rules from the MQA because SOW is one of the MQA mandatory requirements. Currently, UUM Online Learning (UOL) has been developed as a medium or interface for linking the lecturer and their students via the Internet. In UOL, course notes and related media are uploaded into the system by the lecturer for the students to use. Assessments, such as quizzes and assignments can also be uploaded and run at predetermined times. SOW is a very important document used by lecturers in UUM because it assists in informing the lecturers as well as students alike about the upcoming events of the course, since it is the blueprint for the course. In the area of academic field, SOW is more important for the lecturers because SOW serves as a guideline or reference for the lecturers to be prepared with the materials and assessments in advance, well before the course commences. However, the UUM implementation of SOW is still in the manual form, where the lecturer manually types the information into a document or a form and printed on the paper before the start of every semester. In order to move towards a paperless environment, this manual operation of SOW implementation can potentially be computerised to save time and money.

According to Blanco and Ginovart (2010), there are so many alternative ways to reduce using paper in the academic field, like using Moodle. According to Jonathan

(2011), Moodle is an open source software application, which means that it is free and the user can provide the source code independently as well to others, because Moodle is an Object Oriented Dynamic Learning Environment. Nowadays, Moodle is quite popular among users, especially the educator, because Moodle can be used as a virtual learning environment. Moodle can also be used with an integrated quiz module, like in Technical University of Catalonia (UPC) in Spain. Additionally, the Moodle platform also can be used to download notes as well as implement online quizzes. From this preliminary investigation, it was observed that there has not been any SOW integration embedded into Moodle previously. The Moodle platform has a lot of resources, activities, and GUI. For this research, it has focused on embedding one specific activity into Moodle, namely the SOW integration.

This chapter is organised as follows; the first section is the background, followed by the statement of the problem and research questions. The objectives of research will be described in the fourth section, followed by the scope of the research, research significance, research contribution, and research approach and methodology. Finally, the structure of the thesis will be highlighted.

1.2 Problem Statement

In the academic field, the Teaching Plan (TP) or Scheme of Work (SOW) is quite important.So much so, the MQA has made it a required document in any MQA certified course. It is also important because through SOW, the lecturers can have their own guidelines to follow for the whole semester.SOW implementation is now common practice in institutions of higher learning, and UUM is no exception where it has been put into practice for a long time. However, even though many of the

manual procedures, such as attendance, course evaluation, and lecture notes, have been computerised and put online, the issue of SOW online integration still has not been addressed. This means that all the lecturers in UUM still manually write their own SOW in hardcopy form.

Therefore, this study has attempted to develop a structure to assist the lecturers in UUM to reduce the time consuming problem of generating SOWs for each course before the commencement of every semester. There would be some common problems that they may face when writing their own SOW at the start of every new semester, such as deviating from the guidelines of SOW writing, which is more evident when teaching new courses or involving newly appointed lecturers. During these situations, they would create their own plan, without following the SOW that was perhaps written before by different lecturers and filed away in folders that are put in storage.

Another problem faced by lecturers in UUM is when using SOW in the UUM Online Learning (UOL) system, which is limited to just the uploading and downloading of documents as the basic feature. Because of such basic features, lecturers have to prepare their own SOW and each week, the lessons in UOL are updated manually (Trenas, 2011). Lecturers will have to spend their time to perform these tasks. Since the UOL does not have any interface for the lecturers to key-in their time-table, they would have to use their time-table or their SOW in manual form.

Nowadays, it is mandatory in UUM for lecturers to use UOL, since it is now moving towards the concept of blended learning implemented online. Figure 1 shows an

example of the UOL. In UOL, we can see that the lecturer can only key-in their data one by one and there is no scheme of work that can be generated automatically. This means that if the lecturer has a plan to teach all topics from week one until the end of the semester, they would have to struggle to key-in their planning step by step and one by one. This will cause lecturer to spend a lot of their time to key-in the data.

Figure 1.1. UUM Online Learning System

Another problem is the high possibility for the lecturers to key-in the repetitive data. This is because the lecturers in UUM are still using the manual form and sometimes they will write the same things like the same subject and the same date. To ensure that the work is more systematic, a system can be developed to detect and to avoid repetitive data (Trenas, 2011).

1.3 Research Questions

In relation to the problem statement above, three major research questions have been highlighted in this research. In order to investigate the problem statement above, the following questions had been identified:

1. How can a mechanism be designed for embedding scheme of work (SOW) into UUM Online Learning (UOL)?
2. How can a mechanism be developed for embedding scheme of work (SOW) into UUM Online Learning (UOL)?
3. How can the work structure be evaluated?

1.4 Research Objectives

The general objective of this research is to make it easier for the entire teaching faculty in UUM to use the UOL system and implement the SOW document automatically. In order to achieve this general objective, the following objectives have been identified:

1. to design an agent mechanism for embedding scheme of work (SOW) into UUM Online Learning (UOL),
2. to develop an agent mechanism for embedding scheme of work (SOW) into UUM Online Learning (UOL), and
3. to evaluate the work agent mechanism that can embed scheme of work (SOW) into UUM Online Learning (UOL).

1.5 Significance of the Research

This research study can have obvious benefits to all lecturers and students and for UUM specifically.

For the lecturers, this system will help them to implement the SOW automatically and not manually like before. This is because previously there has not been any automatic SOW system that has been embedded into the UUM Online Learning or any other online system, other than the normal manual upload and download of documents.

Additionally, this research could help the lecturers to manage their time-table more systematically because they will key-in all of the guidelines in this system during the commencement of the semester. This means that the lecturers could refer to their time-table or their SOW through this system without having to resort to manual procedures.

By using this system, lecturers can also minimise the redundancy of keying-in repetitive data. This is because if they are use the manually keying-in of data, the probability for them to have redundant data occurring would be high, i.e., keying-in data twice or more times will occur. Lecturers also can access their system wherever and whenever they want, via the network and the Internet.

Also, this system can help them to save time and energy in keying-in data all the time for every semester because when the SOW is already embedded into the UOL, the lecturers would just have to click a button in the system and the SOW will

automatically appear and they can use or edit it there if they want to utilise it for the next semester.

Meanwhile for students, there are benefits for them if they use this system. One of the benefits for students is that they can access this system anywhere and everywhere, like downloading notes, attempting quizzes, and observing the SOW by the lecturers for the duration of the semester. Obviously, the prerequisite here is that they must have access to the Internet or network. Students also can save their time and energy by using this system because they do not need to meet their lecturer to make a copy of the slides because all of the materials and activities have already been uploaded into their UOL. The students also can manage their time because they can view their subject for the duration of the semester.

For UUM specifically, the significant benefits that UUM will get is that by using this system, the requirement by the Malaysian Quality Agency (MQA) will be achieved because the guidelines set by the MQA will have been embedded automatically in the system and thus eliminate the variation in SOW and its format. This means that all of the academic staff like lecturers in any university would follow the rules of MQA.

1.6 Outcome Contributions

This research has contributed in producing the scheme of work (SOW) structure framework, developing a working SOW mechanism embedded into the UUM Online Learning (UOL), and testing the SOW mechanism.

Firstly, this research has produced a framework for embedded SOW plug-in agent. This is the first step in developing this system. This is because the framework can be a draft to the structure in order to reveal and resolve complex issues, like issues during installation of tools, components or any materials involved in this system. Normally, this framework development would start as white-box ideas and they will be changed to black-box ideas at the end. This framework will be documented using bottom-up approach methodology. The objectives will first be identified. This step is quite important because this step will examine the existing solutions and these solutions will be generalised. In actual fact, developing a framework is more difficult to achieve rather than to develop a system, because it involves many decisions in designing, thus the developer and the end user must understand all of the processes involved in the system.

To develop a working agent, a simple prototype will be involved here because the less complex part it has is better than a complicated one. This is because the simple prototype can help both the user and developer to understand the current situation by making it easy to understand the flow.

Lastly, this system will be tested and verified by the actual users of the system. This step will involve 15 UUM lecturers to see whether this system is user friendly or otherwise, as well as to see if the system fulfils the objectives of this study. If this system is user friendly and it is easy to understand by the staff, it will be judged to be complete. However, if this system does not satisfy the evaluation by the staff, this system will be adjusted again until it achieves the user requirements (Rubin, Chisnell & Spool, 2011).

1.7 Scope of the Research

There are two boundaries of this research. Firstly, this research is limited to the agent that will help the lecturers in UUM to reduce their time spent on the SOW activity, where it is quite important to develop a feasible and working SOW structure that will be embedded into UUM Online Learning.

By developing the SOW implementation, it will help the lecturers especially lecturers in UUM to prepare the SOW and embedded it into UOL without having to double their efforts and it can be used to reduce their time spent.

The next limitation is related to the structure, where the SOW was developed to be embedded into UOL. The structure was developed using a simple structure. This stage involved the expectations that were used to achieve the requirements for the end user. There were five components that the researcher must be aware of, namely the target for the audience, page design, structure of the course, content engagement and the usability.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Generally, this chapter will discuss about previous studies and issues regarding e-learning, specifically in the development of SOW through UOL using the Moodle platform. This chapter will also discuss about SOW or in other terms called Teaching Plan, and the Moodle platform which shall be used to demonstrate the embedded SOW system for achieving the objectives of this study.

2.2 E-Learning

Schlenker (2008) stated that E-Learning 2.0 is a system through peer collaboration and it is also is a digital connection that can make a new idea of learning increase by Web 2.0's technology. Users or learners have the authority to create, search, and collaborate, and to fulfil primary needs when learning new knowledge. It was mentioned that the Web 2.0, through the Internet via what is called the World Wide Web (WWW), can be used as an alternative way for users to virtually share everything online, like uploading, downloading, and also creating usernames, groups, communities, and so on.

Meanwhile, Mary and Allan (2008) said that e-learning is a system that can help students and lecturers to experience an efficient learning environment. This system provides a graphical user interface where on the screen will appear all of the related and media rich content.

Following the same argument, Philips, McNaught, and Kennedy (2012) found that e-learning is very important to discipline the education because e-learning combines together the different elements of information technology, engineering, and also media studies. E-learning also is a computer-based learning activity and it facilitates interaction between students and the educators by using text and other forms of media, such as graphics, animation, and video.

Due to the rapid growth of technology, e-learning nowadays becomes more popular and it is used by the vast majority of people to increase their learning everywhere and anywhere, at their own pace. E-learning combines the education and knowledge together to present a variably productive environment. E-learning also is an education via the Internet by using standalone computers, which was previously called "Internet-Based Training" because it usedthe Internet as the main platform for delivering content (Mahanta & Ahmed, 2012).

Meanwhile in medical field, e-learning involved virtual learning, like face-to-face meeting and materials constructed in electronic ways, and often provides a platform for interaction to share any ideas, materials, and information within a group of people (Frehywot et al., 2013).

Figure 2.1. Peer reviewed articles by faction of the human resources for health workforce.

Figure 2.1 shows the people that viewed articles as a form e-learning for their studies. From that pie-chart, it can be observed that the people in the field of medicine spent a lot of their time doing e-learning.

2.2.1 Characteristics of E-Learning

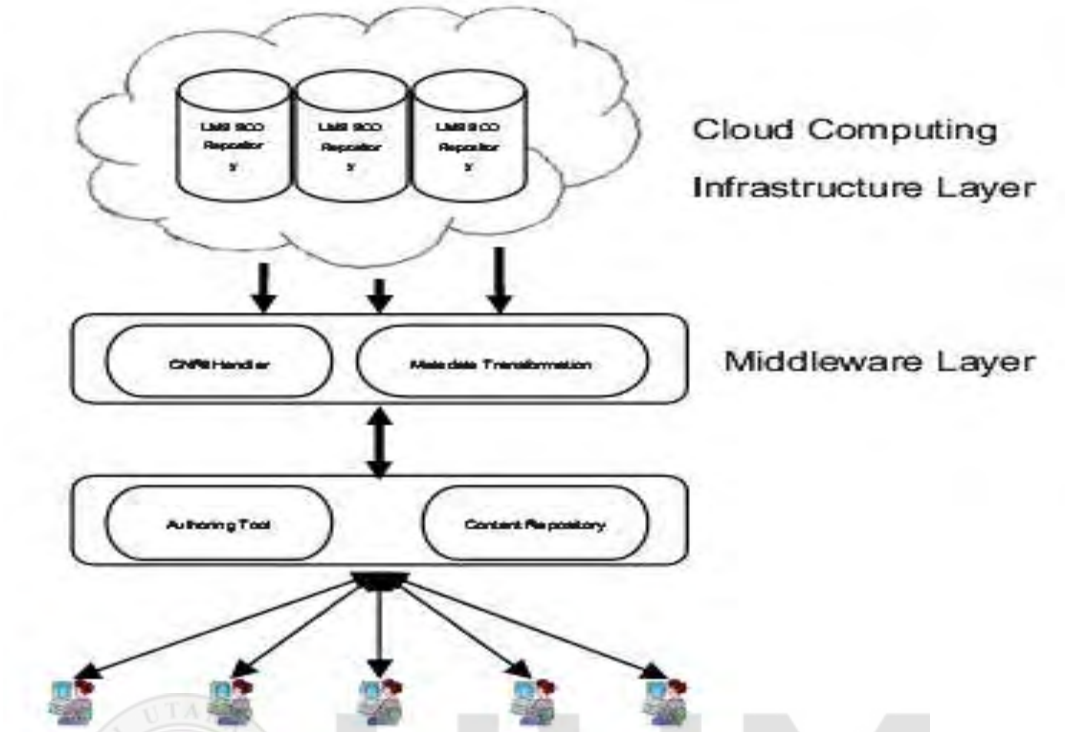


Figure 2.2. Architecture of a sharable e-learning based on cloud computing.

Wan, Pai and Yen (2011) did their research in relation to the architecture of a sharable e-learning, based on a cloud computing environment. The first layer was called the Infrastructure Layer, which is used as the e-learning resource pool that includes hardware and software virtualisation technologies to ensure the stability and reliability of the infrastructure. At the same time, this layer supplies the computing and storage capacity for the higher levels.

Next is the Middle Layer, which mainly supplies a sharable platform. The sharable platform consists of two modules, namely CNRI's (Corporation for National Research Initiatives) Handler System Module and Metadata Transformation System Module. The former is utilised to record the metadata description and physical

resources in teaching resources. The latter illustrates a flow chart of metadata transformation for a variety of e-learning standards.

The Application Layer is the final application platform to supply services for learners. At this layer, cloud computing provides convenient access to the e-learning resources, such as authoring tool and content repository.

2.2.2 Types of E-Learning Software

Table 2.1

Comparison between LMS (Kumar et al., 2011)

Tools	**Desire2 Learn 8.1**	**KEWL**	**ANGELe (7.1)**	**eCollege**	**The Blackboard**	**Moodle**	**Claroline**	**Dokeos 2.2.1**	**OLAT**	**Sakai**
Discussion Forum	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Discussion Management	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
File Exchange	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Internal Email	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Online Journal	Y	Y	Y	N	Y	Y	N	Y	Y	Y
Real-time Chat	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Video Services	N	N	N	N	N	Y	N	N	N	N

Whiteboard	Y	N	Y	Y	Y	Y	Y	Y	N	Y
Bookmarks	Y	N	N	N	N	Y	N	N	N	N
Calendar	Y	N	Y	Y	Y	Y	N	N	Y	Y
Orientation	Y	Y	Y	Y	N	N	Y	N	Y	Y
Searching Course	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Work Offline	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Group Work	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Community	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Student Portfolios	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Total Features	16	16	16	16	16	16	16	16	16	16
Total Available	15	12	14	13	13	15	10	11	12	15
Total Missing	1	4	2	3	3	1	6	5	4	1

Table 2.1 shows the comparison between Learning Management Systems (LMS) used around the world. From this comparison, we can see that Moodle software is a relatively good software application because Moodle has a lot of features that can

help lecturers and students in their daily life, such as chatting, discussion forum, calendar, and etc. (Kumar, 2012).

2.3 Moodle

According to William (2011), Moodle is an open source learning management system. Lecturers can easily conduct their teaching with their students using Moodle. Moodle also consists of a lot of activities like quizzes, projects, surveys, and forums as social elements to enable the lecturer and students to interact easier.

Similarly according to Kumar (2011), Moodle gives a lot of benefits to students and lecturers alike because in utilising Moodle, they can share a lot of documents like assignments and quizzes. Besides, Moodle is also called as a web-based Learning Content Management System (LCMS) and lecturers can create their quality time and their life will become more structured.

2.4 Status Implementation of e-Learning in Malaysian Institutions of Higher Learning

Malaysia has the effectiveness of using LMS in teaching and study. This is because it can be observed that e-learning will help lecturers and student to facilitate the learning communication in their daily life.

2.4.1 Malaysian Universitieswith E-Learning Implementation

Chee, Onn, and Hwa (2011) studied about universities in Malaysia that have already implemented e-learning in their teaching and learning system. However, they only highlighted several universities in Malaysia, such as Universiti Tunku Abdul

Rahman (UTAR) and Multimedia University (MMU). It was revealed that UTAR employed a Web-Based Learning Environment (WBLE) as their online learning system. There are a lot of advantages of using WBLE as an e-learning method, because WBLE providesmany features similar to Moodle, such as blog space for lecturers and students to use, format in weekly basis, result grading of students, and many more. However, WBLE has a weakness also. This is because WBLE is too user friendly and does not support further technical features and developments.

Meanwhile, MMU utilised another e-learning system called the Multimedia Learning System (MMLS). However, MMLS has a lot of similarities with WBLE regarding the features, like enabling students and lecturers to store their personal documents and so on. However, MMLS does not provide any blog space for the lecturers and students (Chee et al., 2011).

From their findings in Open Universiti Malaysia (OUM), it was observed that OUM had implemented myLMS as a tool because it consists of more information and features than MMLS and WBLE. From the myLMS implementation in OUM, the system provides email services, links to OUM's administration, and also the learning environment. All these value-added features make myLMS more useful than MMLS and WBLE (Chee et al., 2011).

From the above, it can be summarised that the majority of universities in Malaysia has not implemented the SOW element into their e-learning systems thus far. So with the existence of SOW embedded into an e-learning platform like Moodle, it will only

serve to improve the interface of the e-learning system and it would also increase the effectiveness and productivity of the working environment.

2.4.2 E-learning Implementation Overseas

There are numerous universities around the world that had successfully implemented Moodle in their respective LMS for their postgraduate and undergraduate students.

In the School of Mining Engineering, University of New South Wales (UNSW), Australia, they have been using Moodle software for more than seven years. Through this system, the students can enrol in any course suitable for them and they will be advised by the minimum requirements of the course and the expectation of the School or their faculty. In their system, there also have forums and group discussions. These would enable them to easily collaborate by having in depth discussions via discussion groups created through in their LMS environment (Saydam et al., 2013).

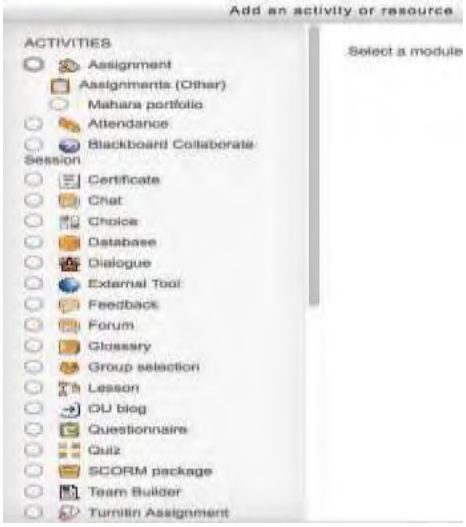


*Figure 2.3.*Resources and activities interface in Moodle.

Figure 2.3 shows a Moodle implementation in the LMS of University of New Wales (UNSW). This system provides a user friendly interface and most of the activities require the collaboration and interaction between lecturers and students. This LMS also shows that there are a lot of resources and activities available in UNSW, and it was revealed that the common activity that is always used in the Mining Engineering Programme is the forum. This is because in the forum, they can make any discussion related to their studies.

Meanwhile, the Department of Science and System Analysis in Miami University also implemented this type of Moodle into their LMS, called the Specialised Learning Management System (SLMS). SLMS has the standard functionality like forums, student enrolment, and etc.

2.5 UUM Online Learning

According to Ahmed et al. (2009), in 2000, the collaboration between UUM and an IT company resulted in the development of an online learning system called E-Learning. They used 12 modules with an array of innovative activities and strategies to ensure that they could enhance the conversation of face-to-face instruction using Moodle. Previously, UUM used to run the system over an integrated LAN with 5920 data points and a database of 150 megabyte size. The network capacity which supports the system is a 2 megabytes per second (Mbps) via Internet network, 10 Mbps via satellite and 1 gigabytes per second (Gbps) via intranet.

2.5.1 Logging into UUM Online Learning

Figure 2.4. Logging into UUM Online Learning.

*Figure 2.5.*Logged in screen.

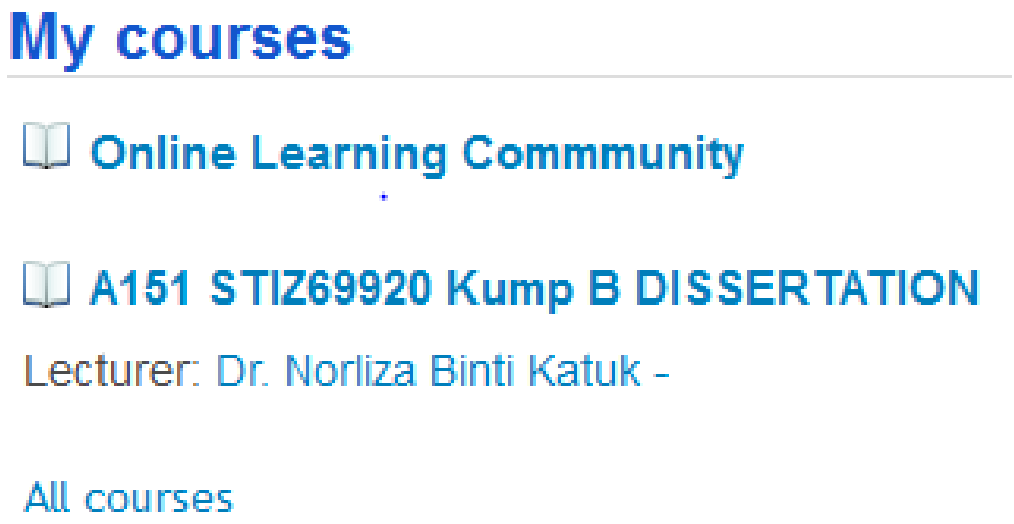


*Figure 2.6.*Registered courses.

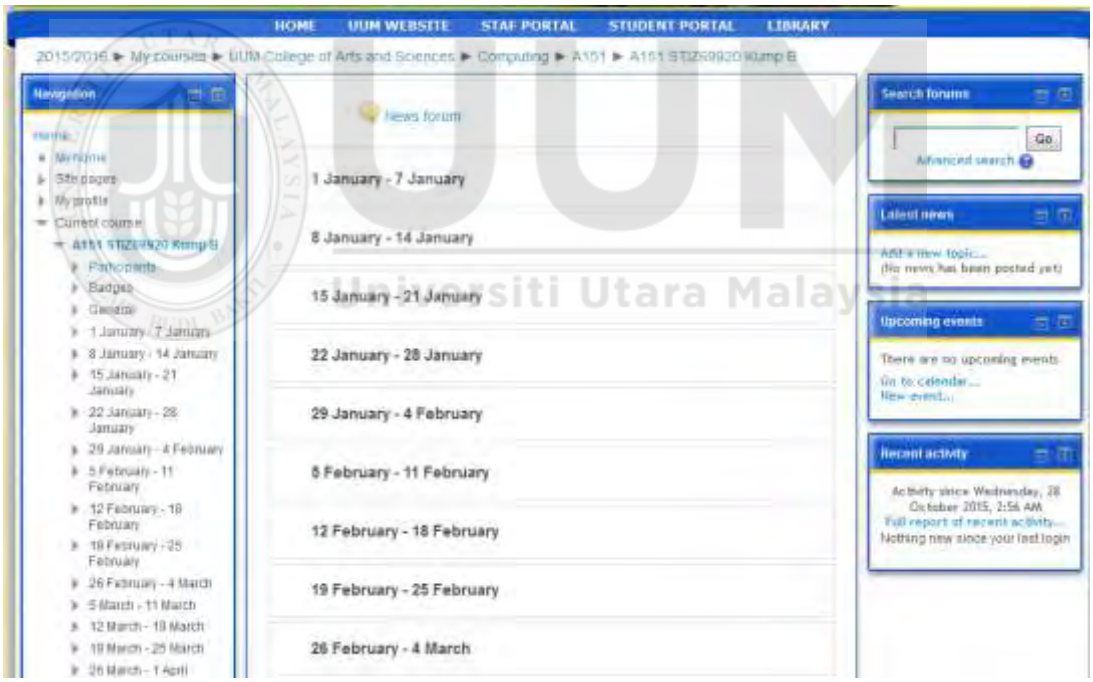


*Figure 2.7.*Teaching plan.

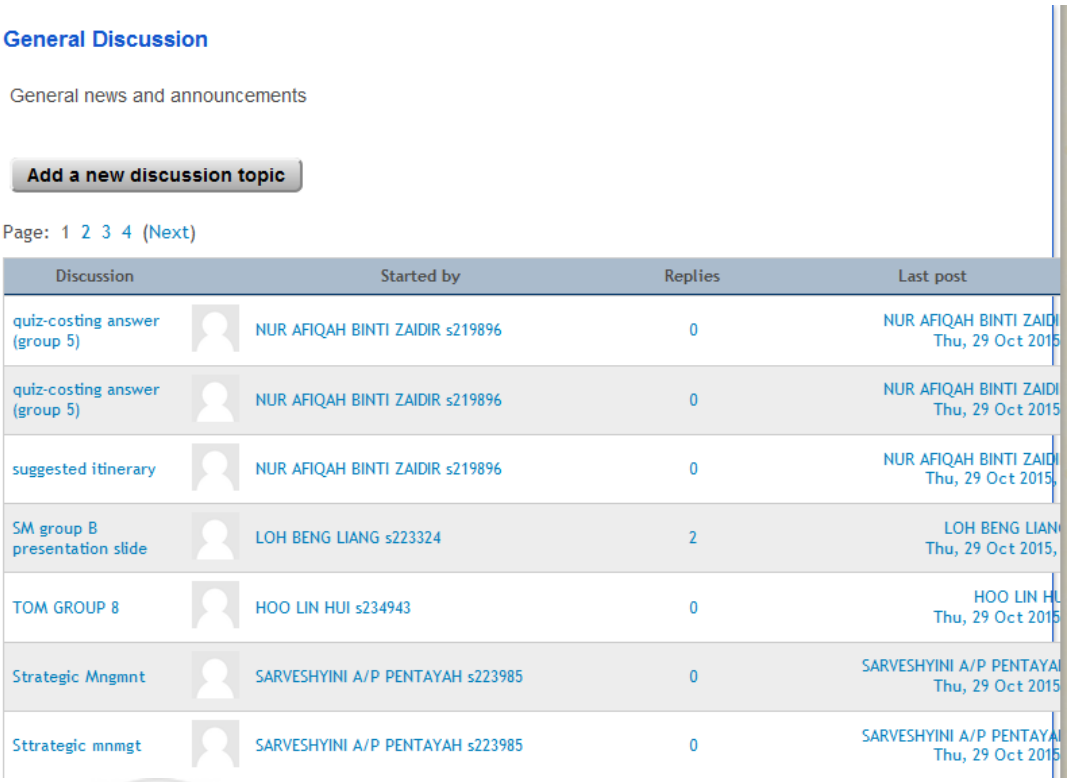
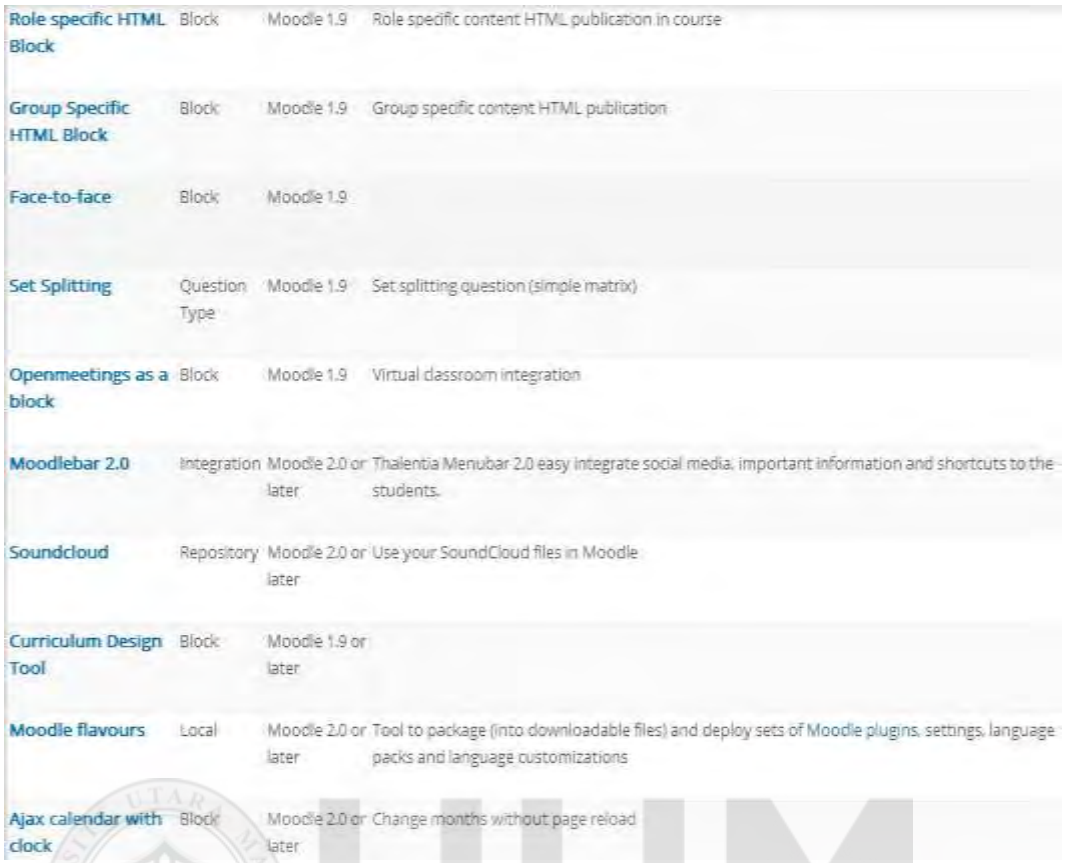


*Figure 2.8.*General discussion.

Figures 2.3 to 2.8 show the interface of the UOL used in UUM. This study has shown that Moodle hasmore numerous tools that exist in the interface than compared with another platform. Therefore, this author affirmed that Moodle has suitable tools that can be used to implement SOW and thus enable the researcher to fulfil the objectives of this study.

2.6 Moodle embedded plug-in

In Moodle, there are many plug-ins that one can use to download and embed into the Moodle LMS. There are many categories of plug-in for various usages such as new activity type, database, workshop and etc. User can download these plug-in and install easily into their current LMS.



Role specific HTML Block	Block	Moodle 1.9	Role specific content HTML publication in course
Group Specific HTML Block	Block	Moodle 1.9	Group specific content HTML publication
Face-to-face	Block	Moodle 1.9	
Set Splitting	Question Type	Moodle 1.9	Set splitting question (simple matrix)
Openmeetings as a block	Block	Moodle 1.9	Virtual classroom integration
Moodlebar 2.0	Integration	Moodle 2.0 or later	Thalentia Menubar 2.0 easy integrate social media, important information and shortcuts to the students.
Soundcloud	Repository	Moodle 2.0 or later	Use your SoundCloud files in Moodle
Curriculum Design Tool	Block	Moodle 1.9 or later	
Moodle flavours	Local	Moodle 2.0 or later	Tool to package (into downloadable files) and deploy sets of Moodle plugins, settings, language packs and language customizations
Ajax calendar with clock	Block	Moodle 2.0 or later	Change months without page reload

*Figure 2.9.*Moodle plug-in list.

Figure 2.9 shows examples of Moodle plug-ins that can be used to implement Moodle components in the LMS environment. However, all of these plug-ins have their own requirements. For example, if we want to have a group specific HTML content to be displayed in our Moodle system, we have to select and insert the plug-in named Group Specific HTML Block, as well as configuring and modifying it before using it. This means that all plug-ins have their own programmed behaviour.

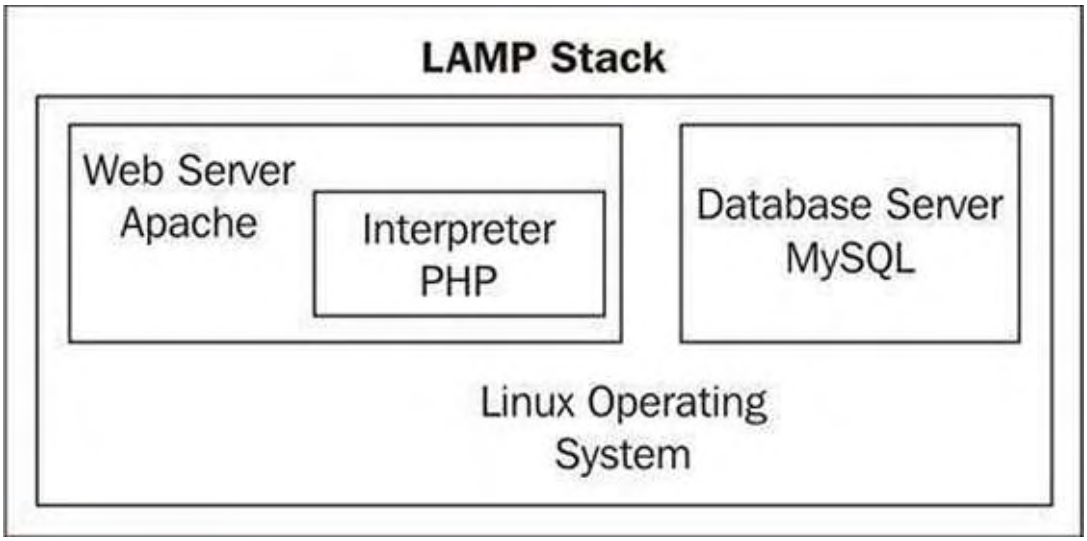


Figure 2.10. Lamp stack.

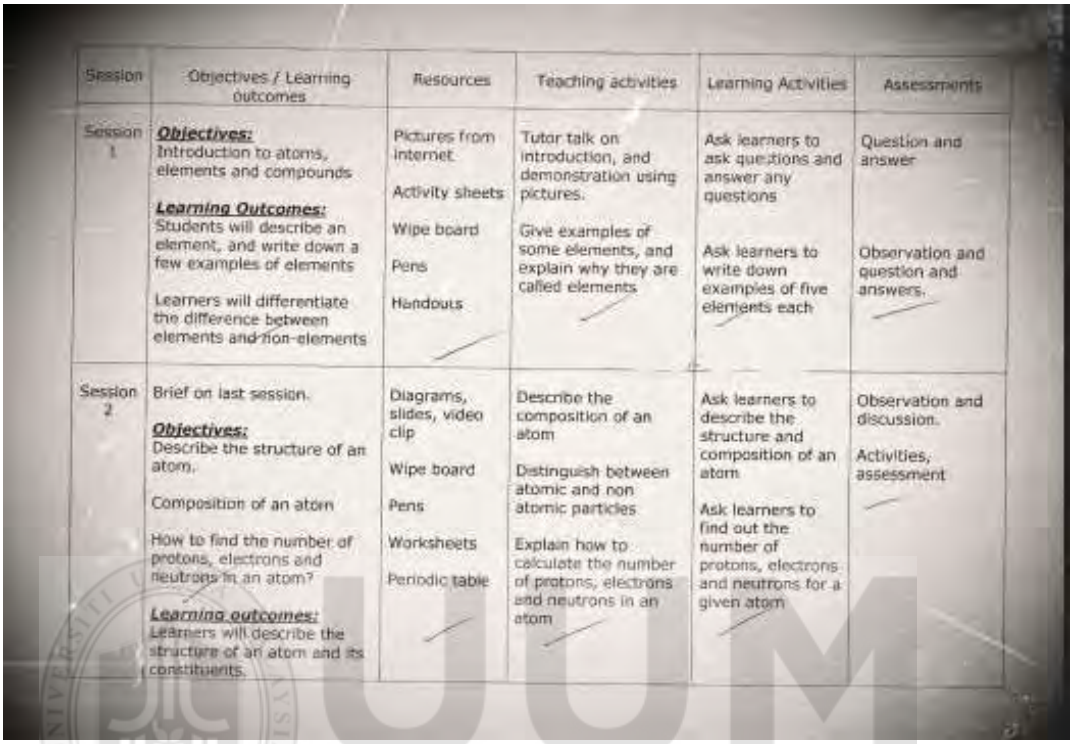
According to Moore (2009), in order to develop any plug-in component in Moodle, one must have three important things in place as the infrastructure, namely the web server (such as Apache), database server (such as MySQL), and operating system (such as Linux), e.g., as shown in Figure 2.10.

In conclusion, Moodle is the most appropriate tool for embedding SOW into UOL because Moodle has many features and the plug-insare suitable for customising the e-learning platform in accordance to the needs of the end user, which is the ultimate goal for developing any program.

2.7 Scheme of Work

According to Gearon (2010), scheme of work (SOW) is the grouping of the time-table or a manageable plan for the short term. SOW is quite important for the academic field to manage the time and planning so as to ensure that the course does not lack certain parts in relation to the teaching activities. SOW also determines all

the prerequisite and necessary topics and activities can be properly and adjectively comply and check. Make the subject more relevant and objectives.



Session	Objectives / Learning outcomes	Resources	Teaching activities	Learning Activities	Assessments
Session 1	***Objectives:*** Introduction to atoms, elements and compounds ***Learning Outcomes:*** Students will describe an element, and write down a few examples of elements Learners will differentiate the difference between elements and non-elements	Pictures from internet Activity sheets Wipe board Pens Handouts	Tutor talk on introduction, and demonstration using pictures. Give examples of some elements, and explain why they are called elements	Ask learners to ask questions and answer any questions Ask learners to write down examples of five elements each	Question and answer Observation and question and answers.
Session 2	Brief on last session. ***Objectives:*** Describe the structure of an atom. Composition of an atom How to find the number of protons, electrons and neutrons in an atom? ***Learning outcomes:*** Learners will describe the structure of an atom and its constituents.	Diagrams, slides, video clip Wipe board Pens Worksheets Periodic table	Describe the composition of an atom Distinguish between atomic and non atomic particles Explain how to calculate the number of protons, electrons and neutrons in an atom	Ask learners to describe the structure and composition of an atom Ask learners to find out the number of protons, electrons and neutrons for a given atom	Observation and discussion. Activities, assessment

Figure 2.11. Example of a Scheme of Work.

There are too many versions of SOW that is currently being used nowadays where each institution will put into place a version that meets the needs of the faculty, and one such example is as shown in Figure 2.11. Normally, the header and sub-headers show information about the institution, department, and current semester, followed by the lecturer's name and course code/name. The most important section for this research work is stated inside the table which contains various types of information regarding the subject matter.

The Teaching Plan (TP) or Scheme of Work (SOW) is already employed in education for quite some time. For example in literacy education, the SOW is used to

help the blind student to understand and be aware about what they will learn within a set period of time. The SOW for the blind literacy student is developed in a hardcopy version and written using patterns etched onto the paper (Braille), and not in words like for the normal students. This is because the blind student is unable to read directly from the words and they would use their own fingers and touch the SOW directly. The example of SOW for blind literacy students is shown in Figure 2.12 (Conner, 2013).

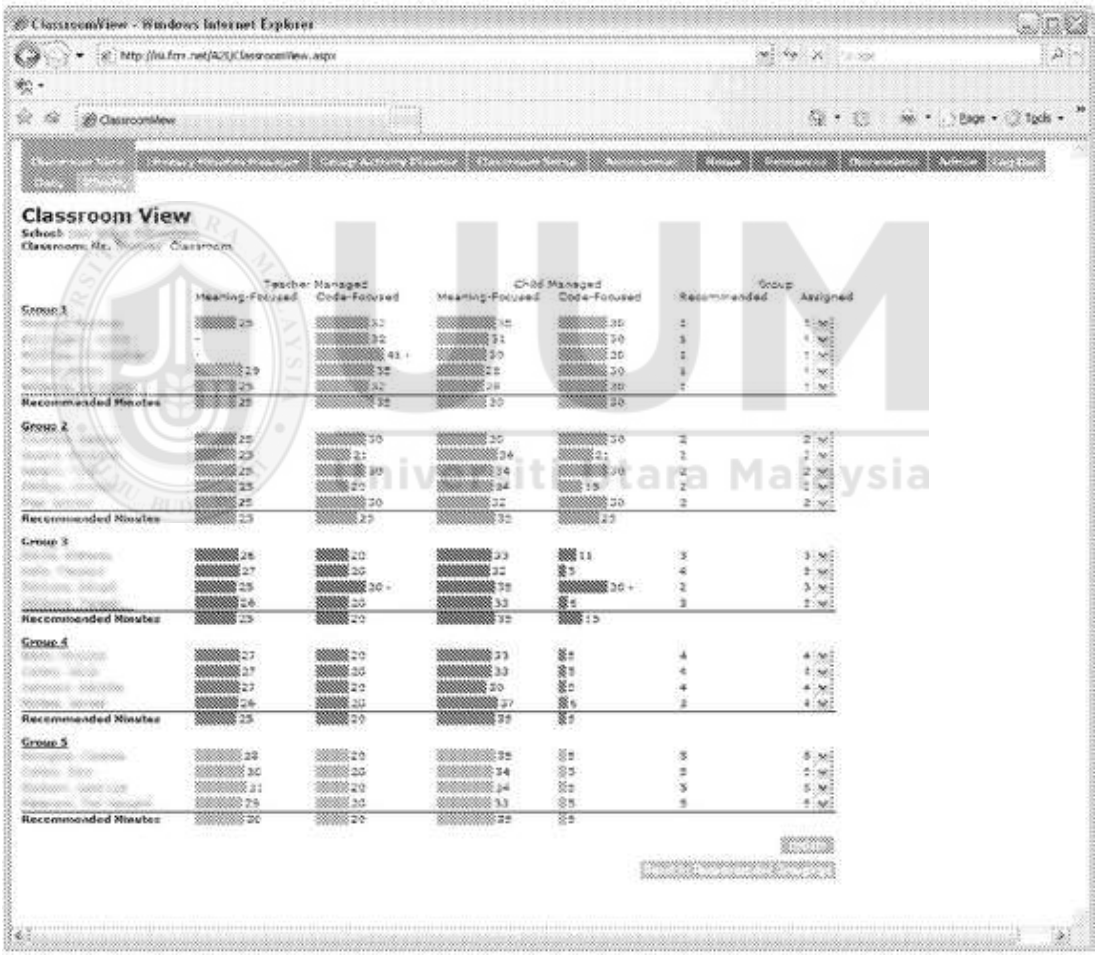


Figure 2.12. Teaching plan for literacy subject.

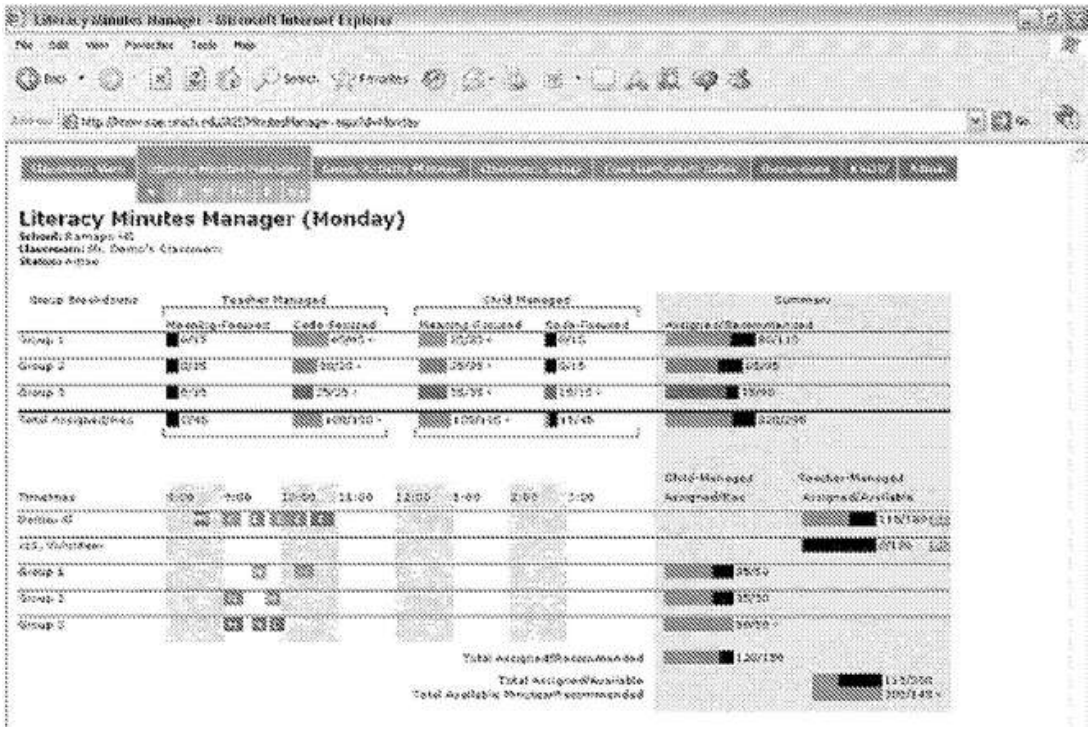


*Figure 2.13.*Literacy minutes manager.

From this literature review, it can be concluded that TP or SOW already exists a long time ago, but its existence is in a hardcopy form, which is time consuming to produce since it is generated manually. Therefore, embedding SOW into e-learning is quite reasonable and has its aforementioned benefits because it will give more time for lecturers to interact with the students more efficiently.

2.8 SOW implementation in LMS

Based on our literature survey and application testing, SOW provided by most LMS system such as is based on manual entry. User need to add each activity such as lecture notes, quiz, URL, video as manual entry and set all the required options for each. Such manual entry can be cumbersome and tedious for user thus making them having tendency not to follow the SOW.

2.9 Summary

Apart from this literature review, it can be surmised that e-learning is quite important nowadays. This is because e-learning assists individuals, especially those in the academic field, to easily communicate and interact, and when it is combined together with information technology, engineering, and media studies, it becomes a more effective and efficient way of learning since it eliminates the limitations associated with traditional learning performed in a classroom setting. E-learning is also a computer-based learning environment and it provides interaction between students and teachers by using text and other forms of media.

In Malaysia, it can also be observed that e-learning has been implemented using many platforms, like Moodle, Sakai, OLAT, and so on, and every platform have different tools; some of which are common for all, while others are implemented on certain platforms. For example, all platforms have a discussion forum, but not all of them have online journal access.

SOW has already been applied in the academic field in Malaysia before, but it exists in hardcopy form. SOW does not yet exist in softcopy form, which is the main aim of this study that was accomplished through demonstrating a SOW implementation that has been embedded in the UUM Online Learning system in order to assist academic staff to manage their time better.

SOW has always already been part of Malaysia academic curriculum before, but it exists in mostly in hardcopy or softcopy form. SOW automatic integration with the LMS does not yet exist, which is the main aim of this study that was accomplished

through demonstrating a SOW implementation that has been embedded in the UUM Online Learning system in order to assist academic staff to manage their subject better.

The next chapter will discuss about the methods and techniques employed in order to accomplish the research objectives of this study.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

According to Frijat and Al-Msiedeen (2010), they had found that in conducting a research, the research method is quite important to use as the plan of the research because it contains all the techniquesfor conducting the research in order to achieve the research objectives. These techniques include the instrument, data processing techniques, and data collection techniques. Besides, Kothari (2004) stated that the research methodology is a suitable way to resolve the research problem. This chapter shall discuss a suitable method that has been used in this research to achieve the objectives, which are:

1. to design an agent mechanism for embedding scheme of work (SOW) into UUM Online Learning (UOL),
2. to develop an agent mechanism for embedding scheme of work (SOW) into UUM Online Learning (UOL), and
3. to evaluate the work agent mechanism that can embed scheme of work (SOW) into UUM Online Learning (UOL).

3.2 Research Design

Many researchers in this field employ the Vaishnavi and Kuechler methodology because their methodology is very suitable for solving problems associated with the developing of a prototype. Besides, many researchers adopted the methodology by Vaishnavi and Kuechler (2008; 2015) in order to enhance their result because this methodology is flexible when it comes to implementation. This methodology contains five phases, namely awareness of problem, suggestion, development,

evaluation, and the last one is the conclusion. Every single stage is discussed in the following sections.

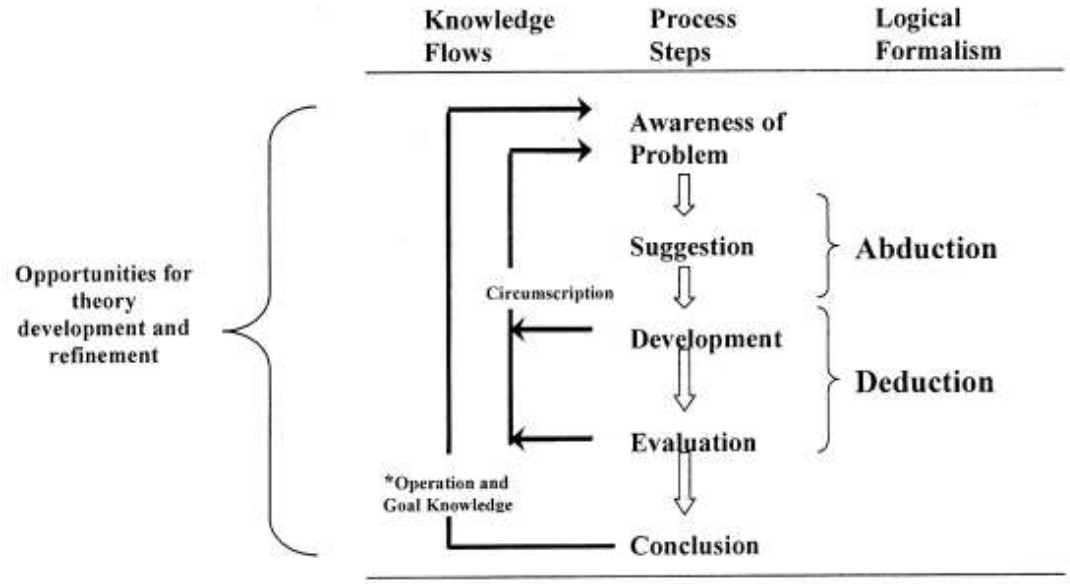


Figure 3.1. The general methodology of the design science research (Vaishnavi & Kuechler, 2008; 2015)

3.3 Awareness of Problem

For this study, the research procedures began by distinguishing the exploration of the problem. At this stage, an exploratory study is conducted to expose the researcher to achieve a better understanding of the key issues and formulate possible solutions for the problem. During this preliminary investigation, literature is reviewed in depth to explain the extent of usage of Moodle in Malaysia, in particular, and institutions around the world, in general. At this stage also, the system and user requirements of the system under investigation would have to be analysed. This will further expose the researcher to be familiar with the extent to which the system can be developed and implemented for the target user, depending on the requirements availability. The research would also analyse some models that have been developed so far on this

system with a view to evaluating them for possible improvement to achieve the design objectives of this research. System functionalities and requirements were very important elements for the developer to understand, especially the process of how to embed the agent for the SOW. System functionalities refer to an existing system or discipline. Requirements refer to the user and system needs when developing the prototype. For this part, the research and observation about the system performed to obtain information related to how to embed the agent from SOW into Moodle. After it is clearly defined, the system functionalities can be derived.

3.4 Suggestion

Suggestion is quite an important stage in any methodology because it involves the defining and modifying of the components and modules of SOW, whilst making the system interface and design to be satisfactory in order to meet the user requirements. Design had begun by constructing a model that positions the contents of the Moodle. Before developing a system, the design will be completed first because it serves a very important role as a guideline. This stage will involve the learning objectives components like the content, lesson planning, and the analysis of problem.

3.5 Development

This phase involves putting together all that have been learnt from analysis to design stages into a live system. The designed prototype would have to be transformed into a working model by combining necessary software and hardware components to work together. The first step is installing the Moodle software. Software development strategies are required for the process of developing the Moodle application in order for it to be used and evaluated. It involves very deep technical

knowhow of the system designer. Ideas and thoughts are transformed into reality in the generation of a working system prototype. All database structures and tables are transformed into their logical stage from the model in the previous stage. More so, codes are generated in a chosen language to link the interfaces with the database as the case may be. At the end of this stage, a working system is suitable for implementation in the recommended environment. Coding was involved during the development phase. Activities undertaken included the development of the database and user interface design. Then it was translated into the design of program code. If there is an error when running the system, modification will be done to overcome the erroneous code.

3.5.1 System Management

Moodle consists of two sides, which is the front end site and back end site. The front end is what a user of the system views while the back end is the pertaining to management of the environment.

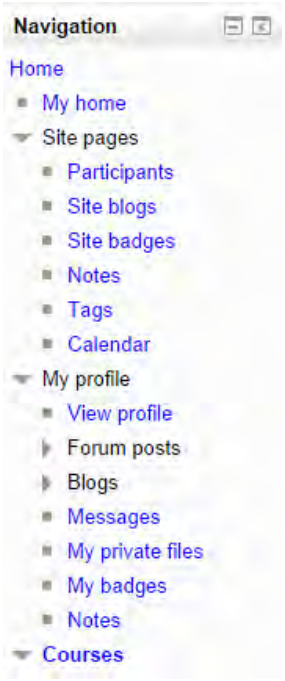


Figure 3.2. Navigation block.

System control panel configuration consists of two blocks which are navigation block and administration block. Navigation block is a block which is used to manage menus of the system as shown in Figure 3.2.

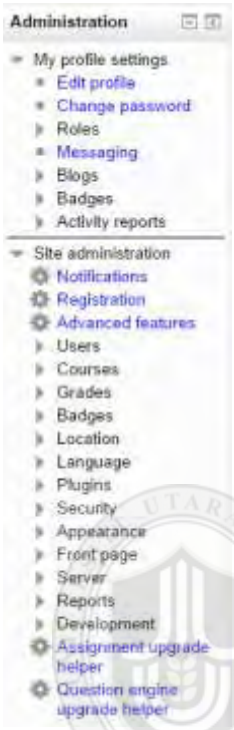


Figure 3.3. Administration block.

Meanwhile, Figure 3.3 shows how the administration block is used for managing and controlling back end activities of the system.

3.5.2 Requirement

This is the basic step of how to develop a Moodle application. Normally, Moodle was developed using PostgreSQL/ MariaDB/ MySQL, Apache, and PHP because it is a good combination to be used in a Linux operating system environment. The user also can use another option to install Moodle on his or her own laptop. The laptop also must have Microsoft Visual C++ and Visual Studio 2012 installed previously in order to run Moodle.

3.5.3 Hardware

Table 3.1

Recommended Hardware Space (www.moodle.org)

Hardware	Space	Recommended
Disk Space	160 MB	5GB
Processor	1GHz	2GHz
Backup	-	-
Memory	256 MB	1GB

Table 3.1 above shows the recommended hardware space that is required as the recommended minimum to install Moodle and to adapt SOW into the Moodle software.

3.5.4 Software

Table 3.2

Recommended Software (www.moodle.org)

Database	Minimum Version	Recommended
PostgresSQL	9.1	Latest
MySQL	5.5.31	Latest
MariaDB	5.5.31	Latest
Microsoft SQL Server	2008	Latest
Oracle Database	10.2	Latest

Table 3.2 above shows the recommended software space that needs to be used to install Moodle and to adapt SOW into the Moodle software. The latest software was

recommended to be used because the latest software has so many benefits,for example it can reduce the vulnerabilities, terminate unnecessary customisation, support optimisation of running efficiency, and ensure the compatibility of the latest technology.

3.5.5 Browser Support

Table 3.3

Browser Support (www.moodle.org)

Browser	Minimum Version	Recommended Version
Google Chrome	30.0	Latest
Mozilla Firefox	25.0	Latest
Apple Safari	6	Latest
Microsoft Internet Explorer	9	Latest

Table 3.3 above shows the recommended browser suitable for use to run the system. The latest version of the browser was recommended because the latest version can reduce the choice of browser add-ons and avoid complications.

3.5.6 Coding

PHP coding was involved during the development of the system. A new plug-in has been put into place during this phase, as well as the interface design and the development of database. During time when there were so many problems that the researcher was facing in running the system, troubleshooting and error correcting action were performed where modification was made to the code by replacing the

error in the code. An example of the coding used in the development of this agent is shown in Appendix A.

3.6 Scheme of Work Structure

UNIVERSITI UTARA MALAYSIA

COLLEGE OF ARTS AND SCIENCES (SCHOOL OF COMPUTING)
SCHEME OF WORK (SEMESTER 2: SESSION 2013/2014) (A132)

Lecturer's Name: | Course: STIA1014 INTRODUCTION TO PROGRAMMING

Week	TOPIC/SUB TOPIC	OBJECTIVES	HOUR	METHOD	AVA	REMARKS
1 7/09/14 – 11/09/14	**1.0 Introduction to Computer and Programming Languages** 1.1 Describing Computer Organization – Hardware & Software 'aining Programming Compilers &	Students should be able to: i. Explain the computer organization ii. Explain the hardware/software components of computer. iii. Understand the evolution of programming	2	Lectures and SDL	• Power Point Slides • Notes	• Distribute course syllabus • Explain course introductory, expectations & evaluations • Quiz 1 CT1,2,3

Figure 3.4. Teaching plan structure example.

Usually, the SOW is conducted on a weekly basis. The important thing to note is the date. The starting date and the final date need to be recorded. Then, it will be followed by the topics and subtopics. Topic and subtopic is quite important to be recorded because it will reflect the planned syllabus that the lecturer will teach for the duration of the semester. After that, the objectives were also recorded, which highlights what needs to be achieved after the students completed the topic and subtopic within a period of time. Audio Visual Aids (AVA) was also stated in the SOW, which is a list of methods that the lecturer will use during class throughout the semester. Every topic will be given a specific time to be covered. The final matter to be recorded is the remark. The remarks column will show anything related to the activities, such as what was conducted inside and outside the classroom. At this point, an activity like an assignment, quiz, project, and other assessment activities

will be stated here. This research had treated quizzes and other activities as common activities, and it was embedded in the mechanism process.

3.7 Embedding Mechanism

Figure 3.5 shows how the series of the process can be done.

SOW Embedding Mechanism Database E-Learning

*Figure 3.5.*Embedding mechanism process.

As shown in Figure 3.5, four element processes were used, namely the SOW structure, embedding mechanism, database, and the final one is e-learning. E-Learning that was chosen for this research was Moodle.

For the SOW structure, the SOW source file was converted into a flat file. In the flat file, only weeks and activities have been selected and it was only recorded for a week of activities. Initially, the remaining information was not considered.

For the embedding mechanism, the SOW structure that has been converted into a flat file will be embedded by updating the database structures that hold the e-learning information. The updating happened in four steps, which are reading data from the flat file, opening a connection to the database, sending SQL for updating the database, and closing the database connection.

The database structure is the storage space for maintaining any updating or authentication information originating from the embedding mechanism through e-learning. The database is quite important to be implemented because it will be automatically updated if there are any changes made through the e-learning or Moodle. Meanwhile, the e-learning structure is the platform to display the update of any database process.

3.8 Implementation

There were a few processes involved in the implementation process, which is described in greater detail in the following sections.

i) WAMPP Installation

The Wampp installer can be downloaded from the Internet. There are no charges since it is an open source software package. There were a few steps that needed to be taken to install WAMPP in the computer, which are as follows:

1. Double click to run setup wizard.
2. Click *Next*

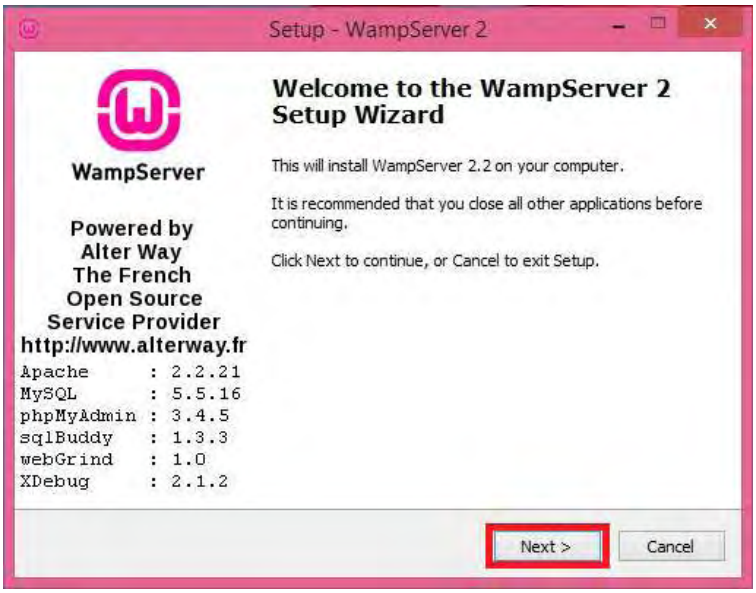


Figure 3.6. Main page of Wampp setup wizard.

Figure 3.6 shows the main page of the Wampp setup wizard. This is the first interface that appears when the developer installs the Wampp server.

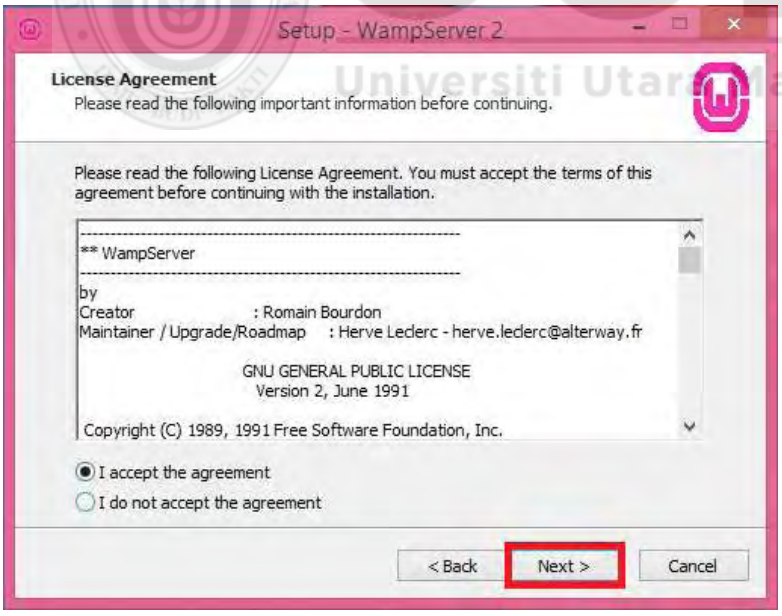


Figure 3.7: Accepting the agreement and clicking *Next*.

It is compulsory for the developer to accept the License Agreement in order to proceed with the installation. After developer reads and accepts the Agreement, he or she then needs to click the “Next” button, as shown in Figure 3.7.

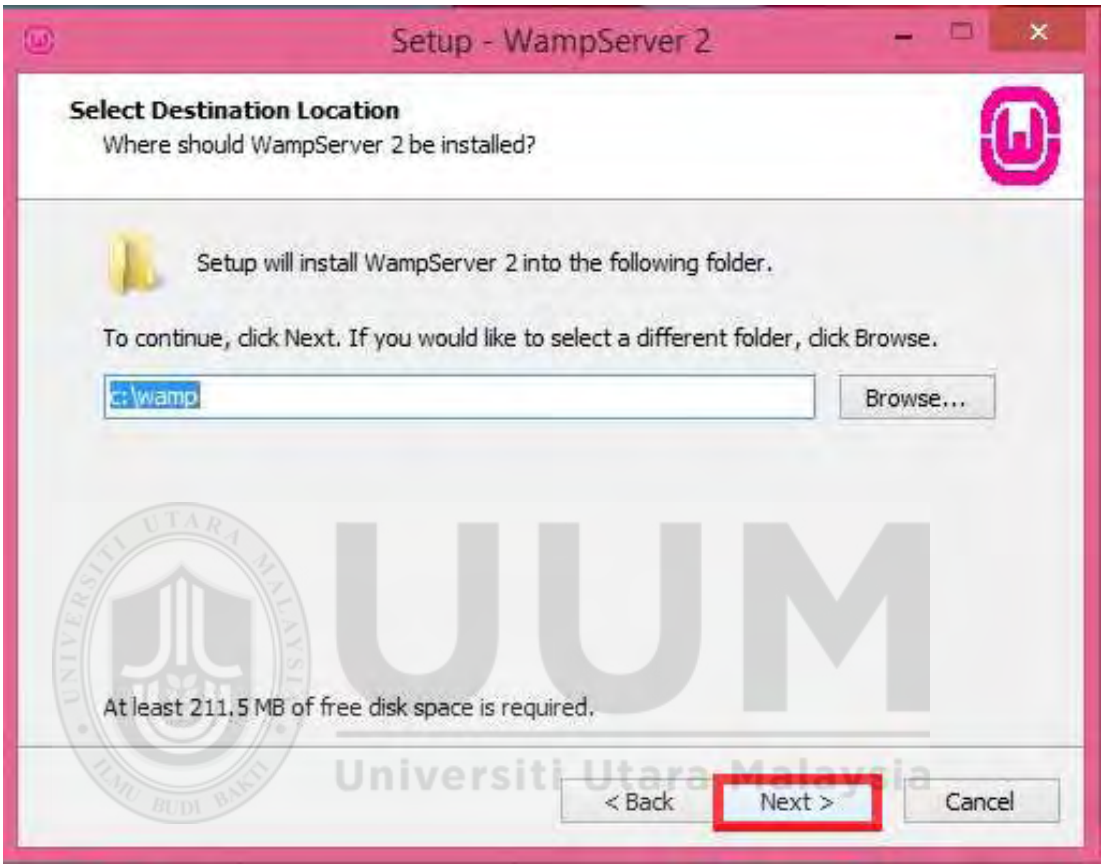


Figure 3.8. Wampp setup wizard:Selecting installation folder.

After developer clicks the “Next” button as shows in Figure 3.8, they will select the destination folder for the location of the file installation. This means that he or she has to choose where the Wampp server is to be installed and the setup will be installing the Wampp server into that selected folder. From here, at least 211.5Mb of free disk space is required. Otherwise, the developer cannot proceed to install the Wampp server.

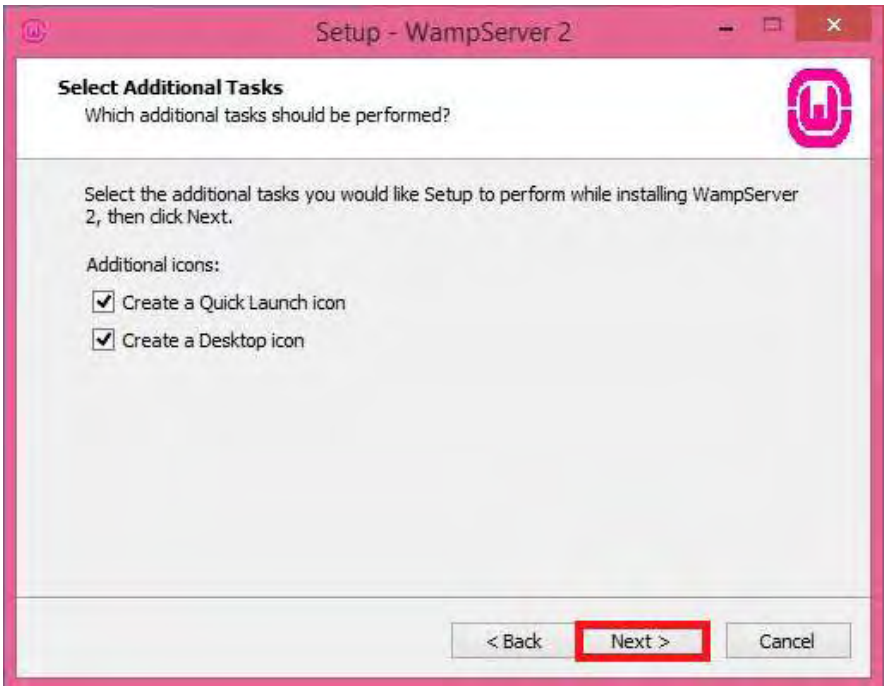


Figure 3.9. Select additional tasks.

After that, one pop-up message will appear. The developer has to select additional tasks that he or she would like the wizard to perform while installing the Wampp server before the "Next" button is clicked as shown in Figure 3.9.

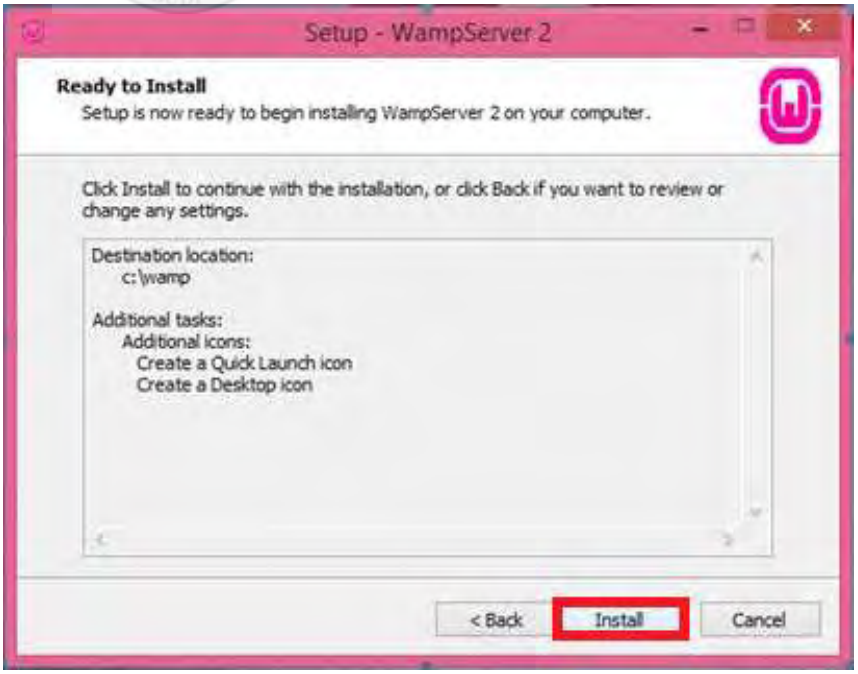


Figure 3.10. Ready to install.

Figure 3.10 shows the Wampp Server setup that is already to be installed into the computer. At this stage, the developer must click the “Install” button to continue with the installation or click the “Back” button if he or she wants to review or change any settings.

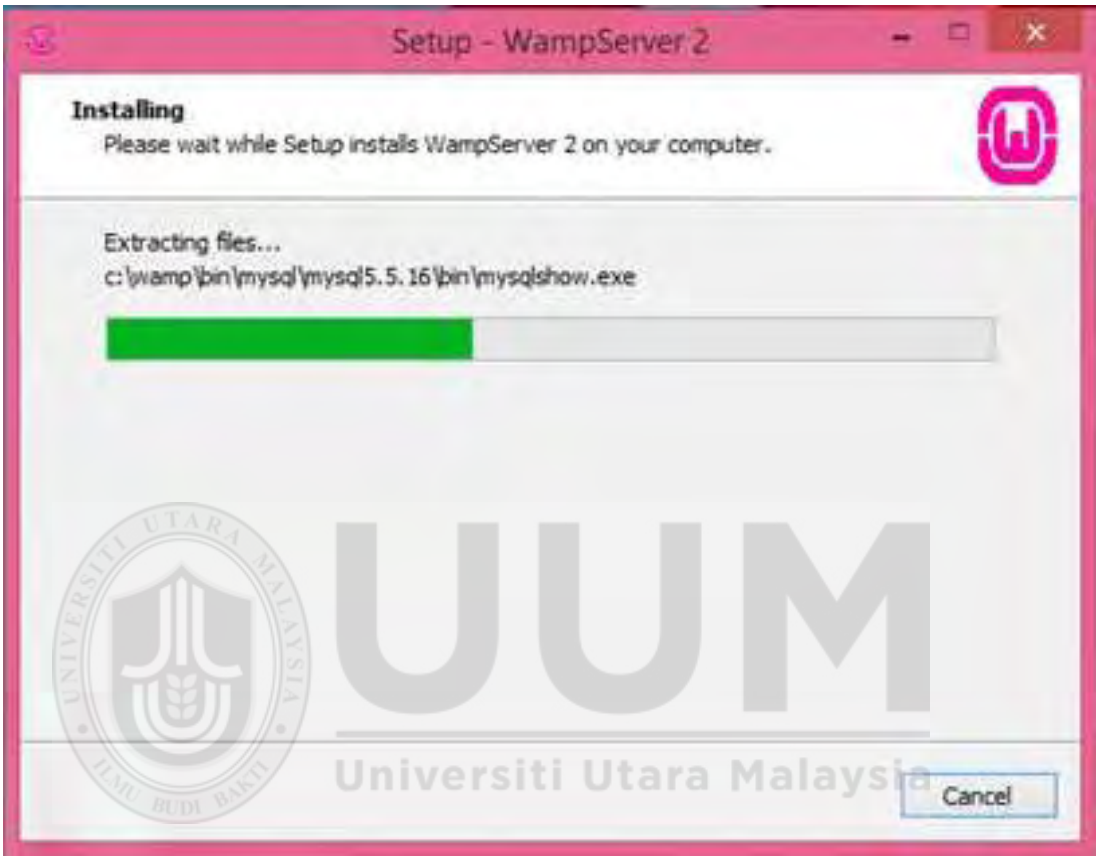


Figure 3.11. Wampp setup wizard beginning to install.

The WampServer setup then proceeded to install, as shown in Figure 3.11.The developer has to be patient with the installation because the files from the software need to be extracted from an archived file to the destination folder.

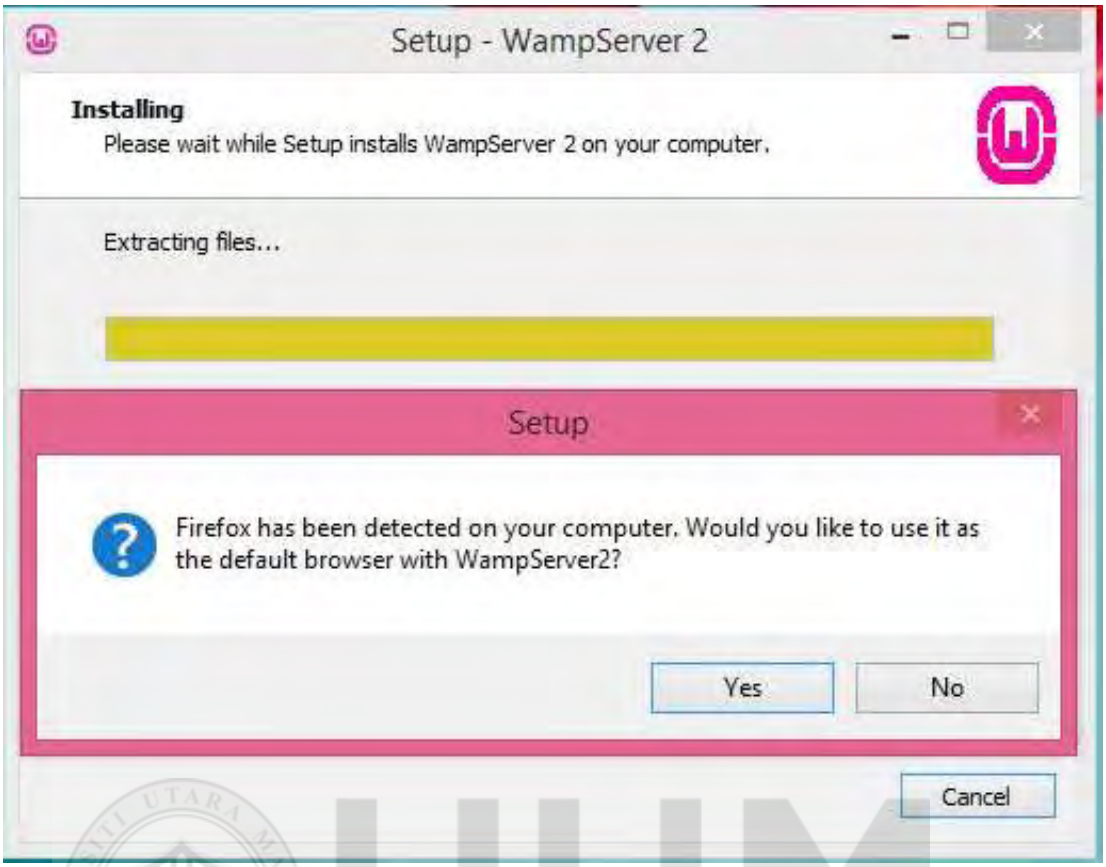


Figure 3.12. Installing the Wampp server.

Next, a single pop-up message would appear, where it will give information that Firefox had been detected in the computer and developer needs to click the "Yes" button if he or she wants to use Firefox as the default browser with Wampp Server, or click the "No" button if otherwise as shows in Figure 3.12.

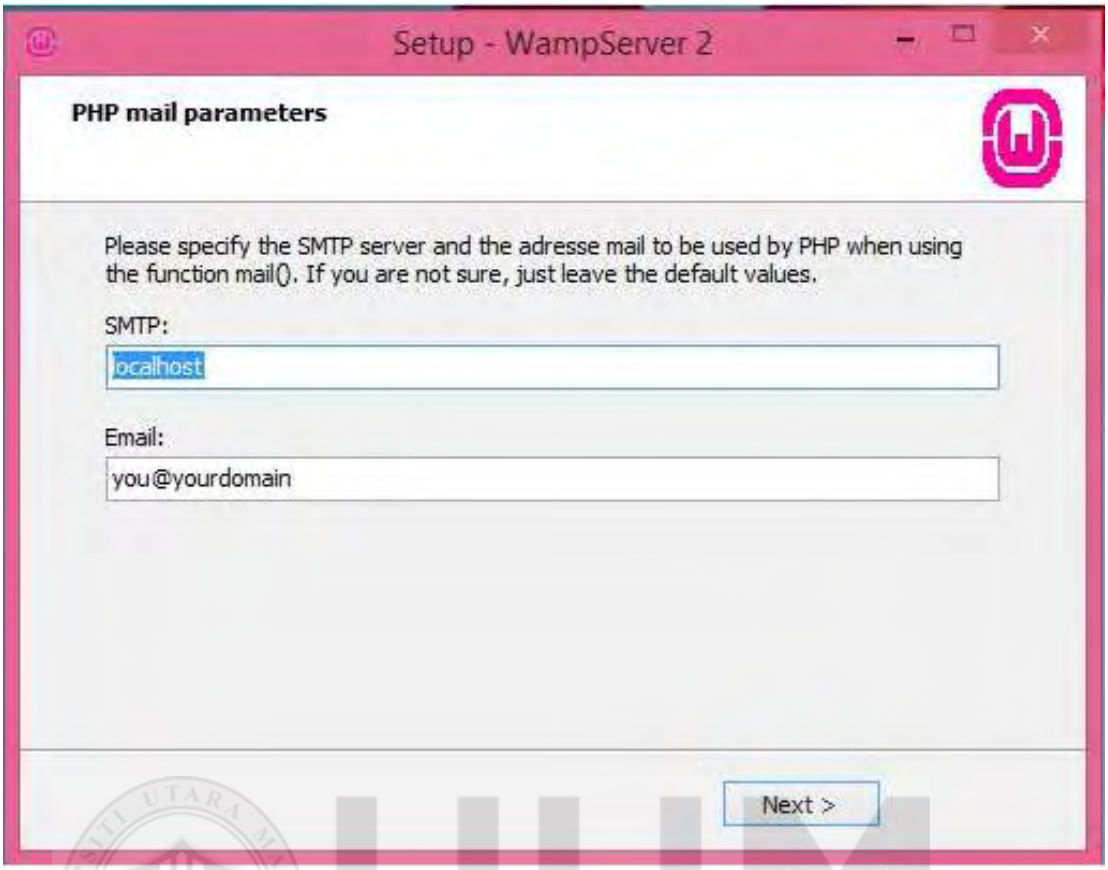


Figure 3.13. PHP mail parameters.

Figure 3.13 shows the PHP mail parameters window. At this stage, the developer had to specify the SMSOW server and the address mail to be used by PHP when using the function mail(). However, if the developer is unsure of which address to specify, this parameter can be left with the default values.

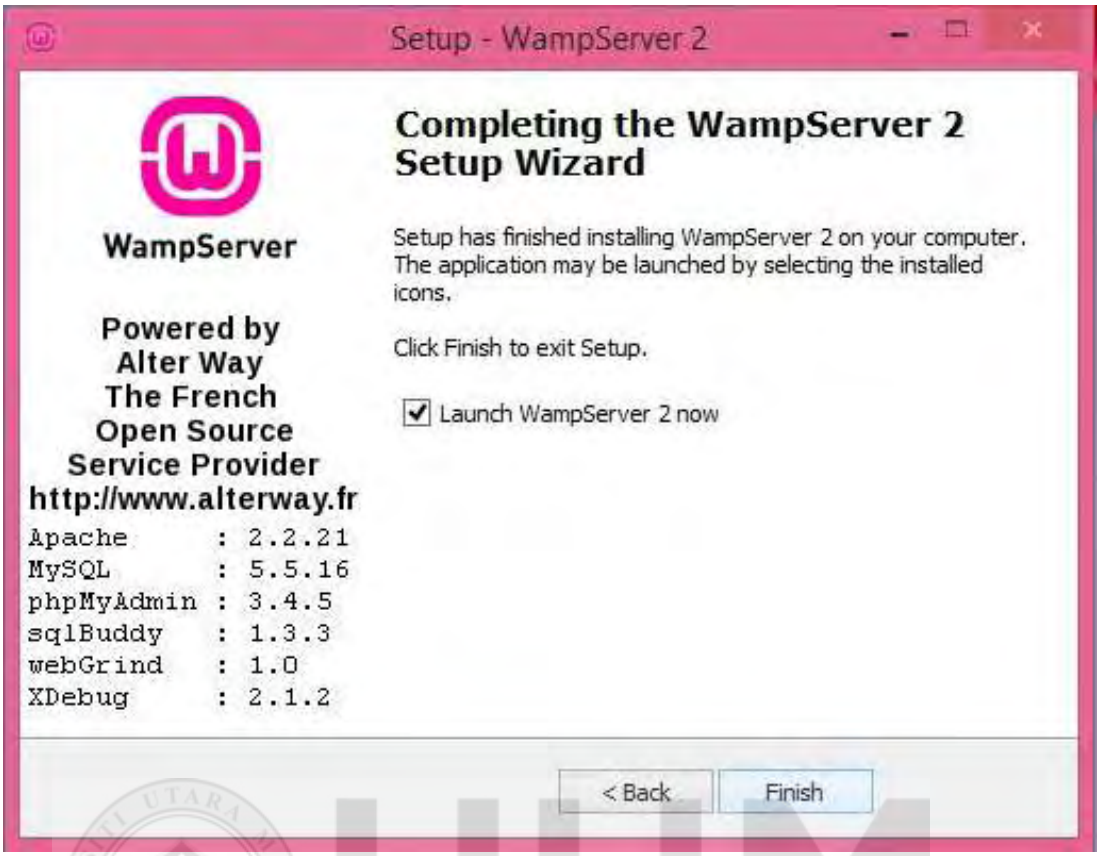


Figure 3.14. Completing the Wampp server setup wizard.

Figure 3.14 shows the final setup windows for the Wampp server. The developer would have to click the "Finish" button to end the process.

i. Wampp Server

Relating to the database, this project used the Wampp server to setup the environment under Windows. Normally, the Wampp server package is bundled with the Apache web server, PHP script server, and MySQL database. PHPMyAdmin also comes together with the package as it will help the user to easily manage the database. Here is an example to setup a Wampp server (Figure 3.15).

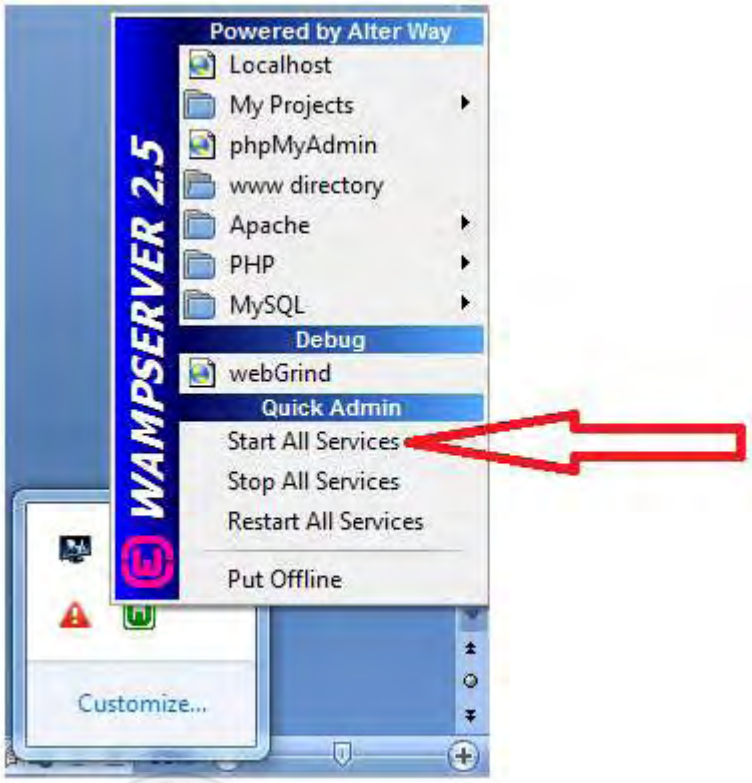


*Figure 3.15.*Start all services.

Figure 3.15 shows an example of the Wampp server. Firstly, the user has to launch all of the services. This is because when all services are running, the server will be up and running online, and the user can enter the system normally. The full steps on how to launch the server is shown in Appendix B.

3.9 Moodle Configuration

Once the back end environment has been launched, the Moodle site is now ready to be configured. The user needs to log in as the administrator using the username and password created during the installation of Moodle.

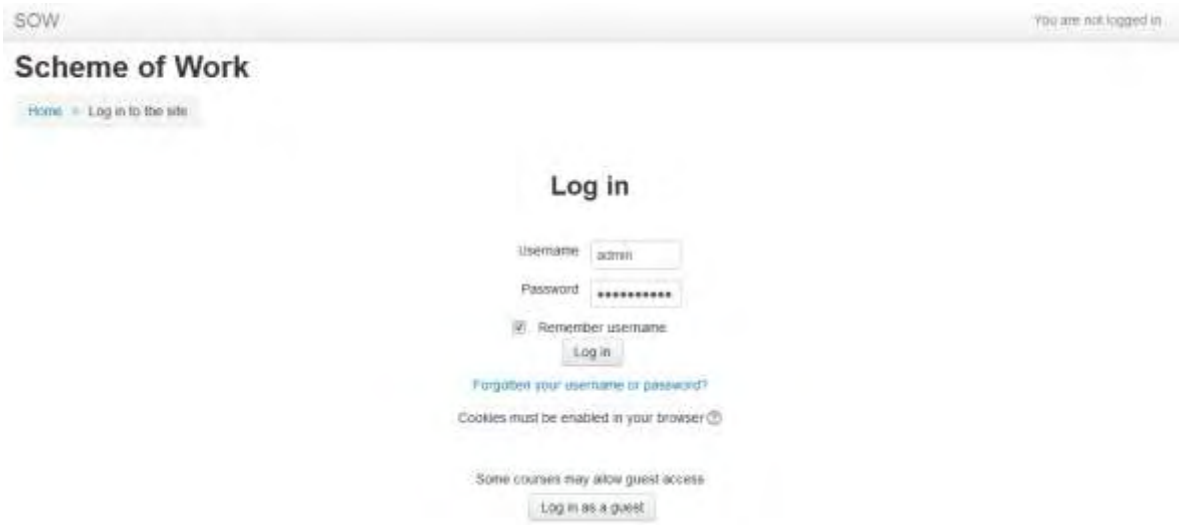


*Figure 3.16.*Admin log in form.

Figure 3.16 shows the administrator's log in form. The user, in this case the UUM lecturer, has to log in into the Moodle system first before he or she can enter the courses.

Figure 3.17. Main page of Moodle.

Figure 3.17 shows the main page of Moodle, which is the first page that the lecturer will view before they click on any courses.

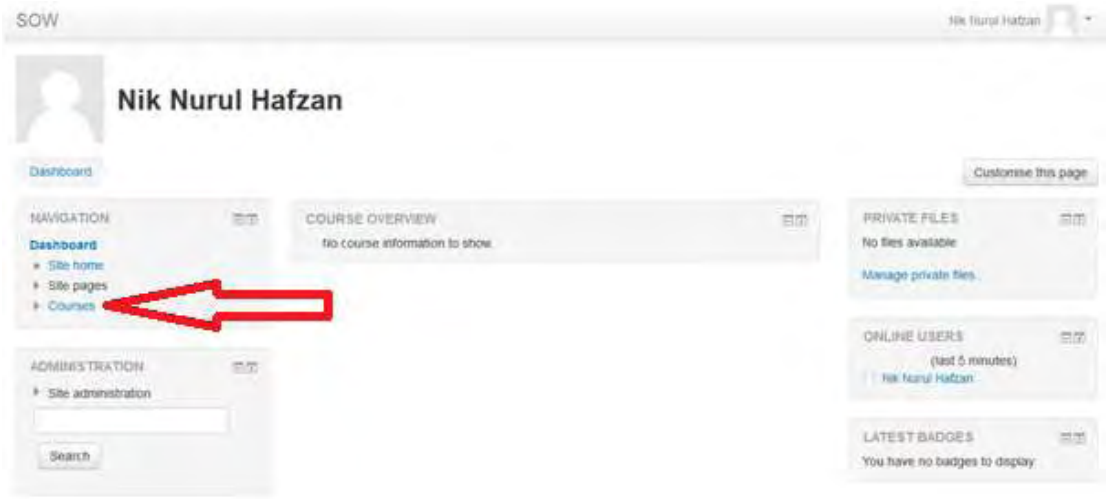


*Figure 3.19.*Select course.

Figure 3.19 shows the interface that the lecturers have to select from. Every lecturer has different courses that they teach. So, from here, they have to select which course belongs to them.

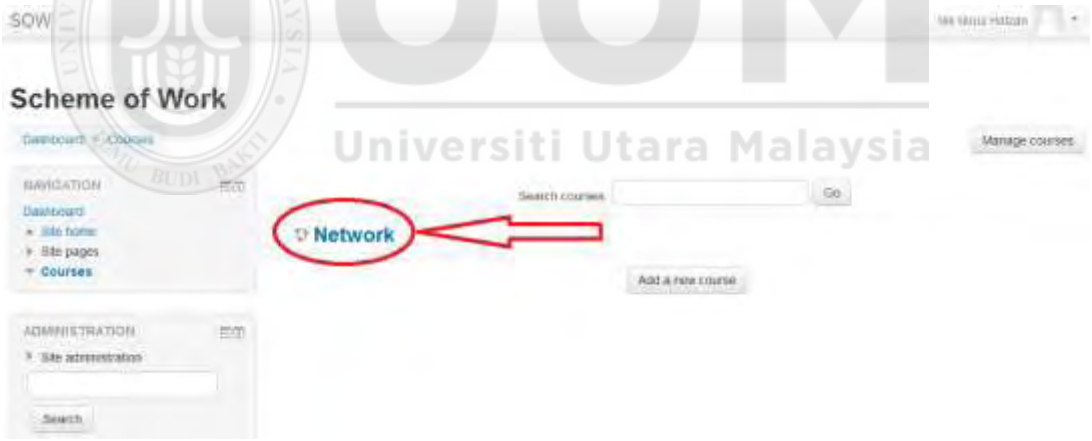


*Figure 3.20.*Select course "Network".

When the lecturer selects his or her own course, they would then have to select the course they want to upload the SOW, as shown in Figure 3.20.

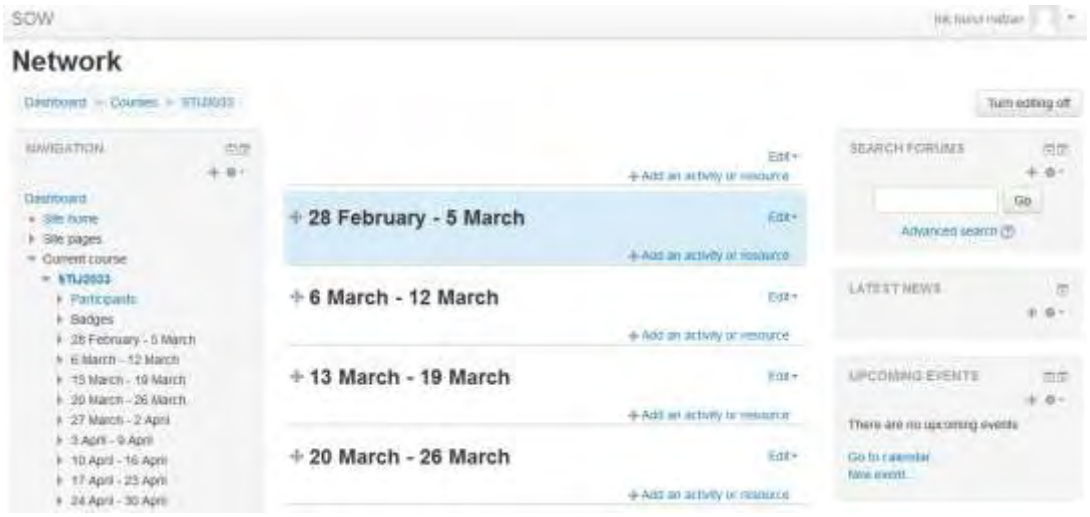


*Figure 3.21.*Weekly format.

Figure 3.21 shows the interface of Moodle by weekly format. This site can be view by lecturer before SOW uploaded into there.

*Figure 3.22.*Refresh Moodle site.

After SOW uploaded into Moodle, lecturers will refresh the Moodle site to view the result.

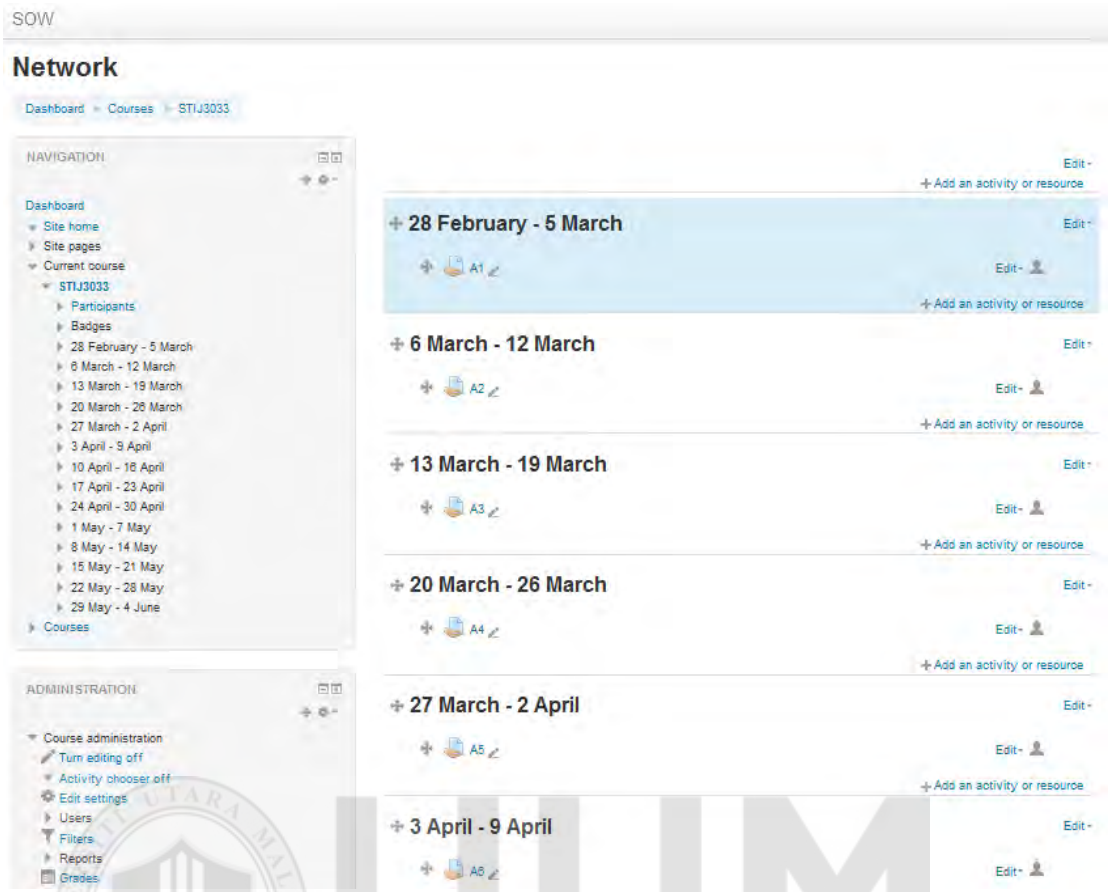


Figure 3.23. Result appears.

Now, the lecturers can view their SOW that they uploaded into the Moodle platform as shown in Figure 3.23.

3.10 Evaluation

Evaluation represents the final stage of the methodology. This evaluation is quite important to use in any research because it could be determine whether this project is useful or otherwise.At this stage, a questionnaire was used to collect information about the usability. The evaluation involved the System Usability Scale (SUS) as an instrument that had been proposed by Kortum, Bongor, and Miller (2008). This evaluation was performed by 13 respondents who are lecturers from various Schools in UUM. They tested this system directly as a user, and completed the questionnaire

after they had satisfactorily tested the prototype system. The importance of this evaluation is to observe the level of satisfaction and the level of operability of the system (Rubin, Chisnell, & Spool, 2011).

3.11 Summary

The methodology served as a guideline to further the research toward completion. The method used was to identify each process and to check whether the research is on the right track. The methodology itself consisted of analysis, development, and evaluation of the activity structures involved in Moodle. Building a new model requires an analysis of the existing model, while the development phase provided steps for building the prototype. Evaluation was used to identify which parts needed to be modified. The next chapter shall present the results of this study.

CHAPTER FOUR

EVALUATION OF EMBEDDING STRUCTURE

4.1 Introduction

This chapter discussed the testing of the prototype using the testing and evaluation from the developer to the system and the developer will evaluate this system whether this system are friendly user and easy to use or not. The prototype testing uses structural testing or unit testing which is known identified as "white-box testing". The result will be used as the basis for the constructing a new SOW model. This chapter is divided into two phases; conducting the white-box testing and conducting the usability testing. White-box testing was conducted by the researcher while usability was tested on the users, which are the lecturers in UUM. As mentioned before, the test will be evaluated using "Fast" which has been stated in the Moodle before. The system says that the system is targeted to deliver the most responses to user requests within five seconds; the simplest analysis should take more than one second after the lecturer or the staffs purge the system.

4.2 UML Diagram

This section describes the UML design of this structure. Some of the points are not included and this might indicate an area for future work. The UML design consists of use case diagram and sequence diagram.

4.2.1 Use Case Diagram

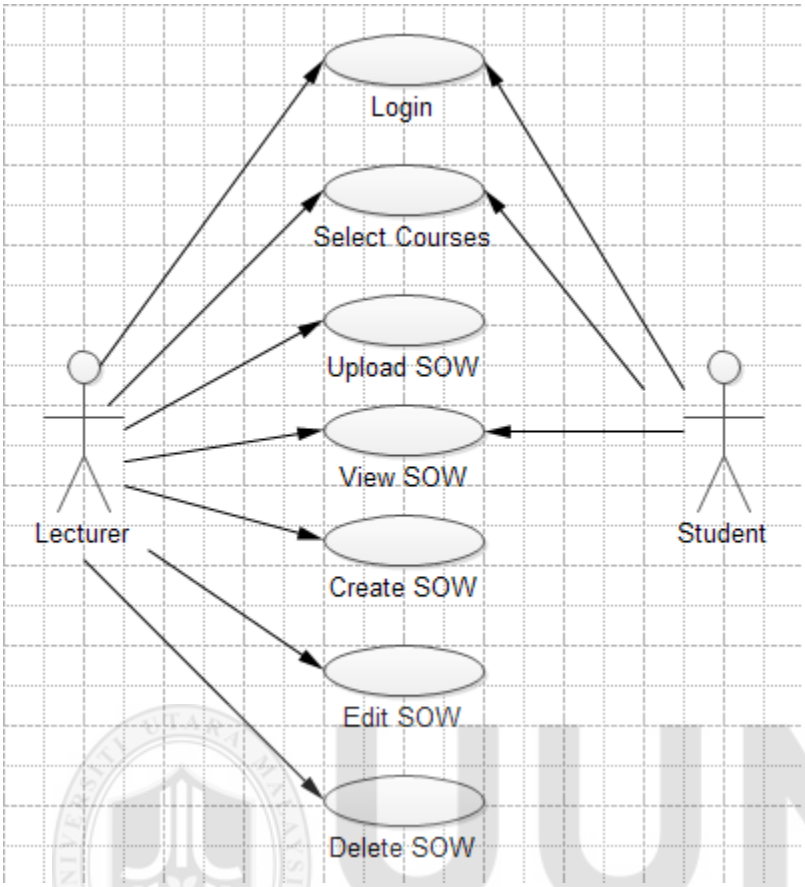


Figure 4.1. Use Case Diagram

Figure 4.1 shows the use case diagram that involved by the lecturers and the students. Lecturers can do all of the process involved like Login into the system, select courses that they are belongs to, upload SOW, edit SOW, view SOW that already uploaded into the system and they also can create their own SOW. But, the students can only view the SOW, select courses and view SOW.

4.2.2 Sequence Diagram

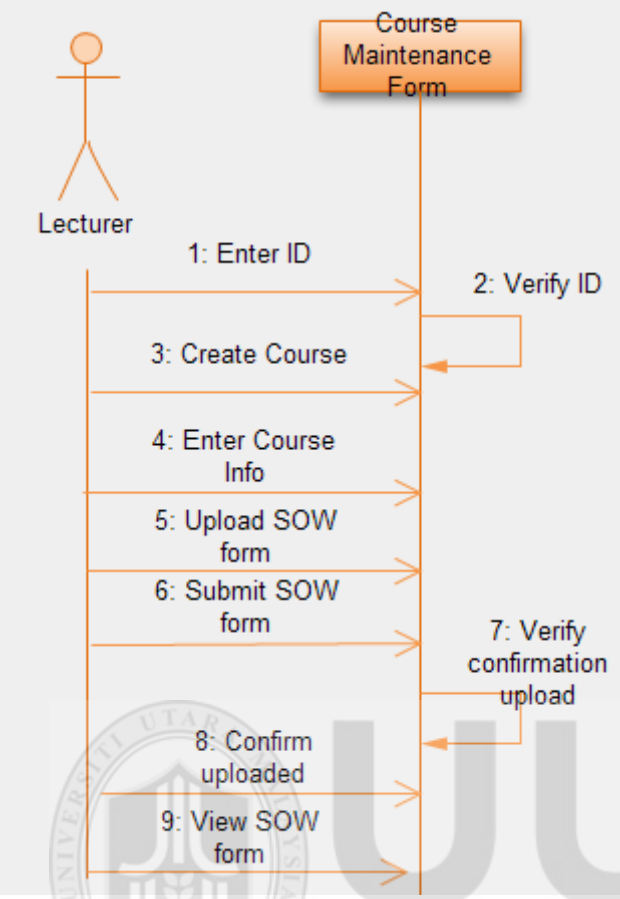


Figure 4.2. Sequence Diagram

Figure 4.2 shows the sequence diagram. Sequence diagram is a flow or step that we can see when the lecturers do the process. When lecturers enter ID, the system wil verify that ID. After the verification was ok, lecturer can create course, upload SOW form and so on.

4.3 Testing

The prototype structure was tested by 15 lecturers from different school and faculty in UUM. The testing will be shown as follows. For testing purposes, respondents were asked to follow the step from the list that was provided by developer.

Figure 4.2. Select "Network"

Firstly, the respondents have to enter the link; http://localhost/moodle/course/index.php. This is because this link provided the interface of the Moodle. After the respondents click that link, they have to select the "courses" as shown in Figure 4.3 above.

Figure 4.4. Go to link : http://localhost/testupload/upload.html

The second step is when the respondents select which one the course that belongs to them, they have to go to another link; http://localhost/testupload/upload.html. This link will appear the new interface as shown as Figure 4.4 above.

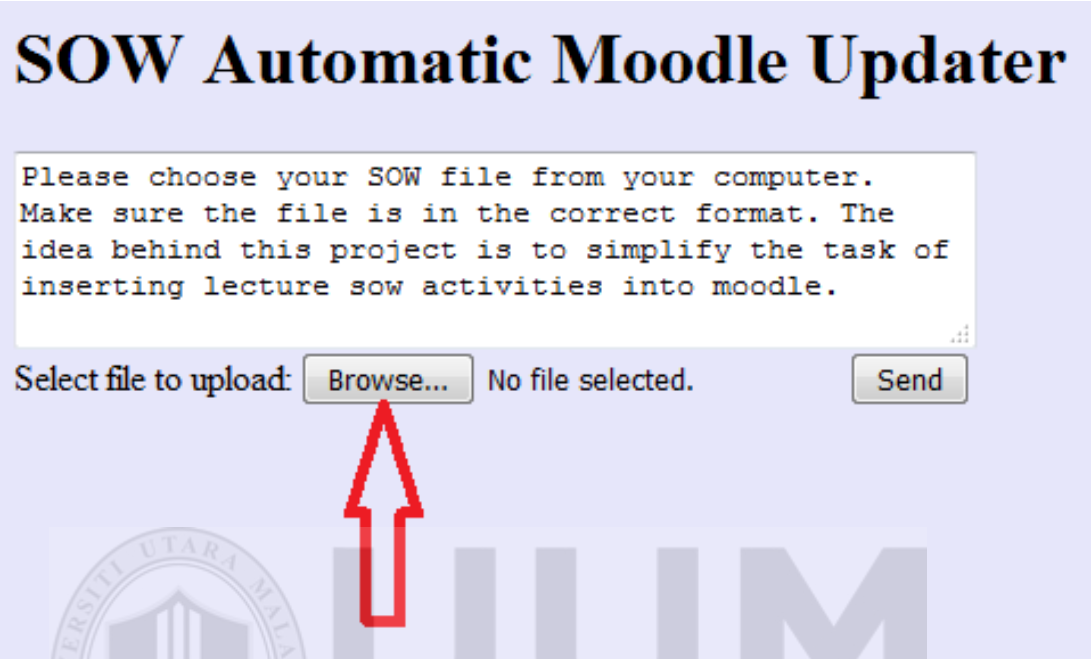


Figure 4.5. Choose "realsow" file.

After the respondents see the interface, they have to click "browse" to choose SOW file from computer. They have to click the "browse" radio button because they have to upload their SOW into the server. The example as shown in Figure 4.5.

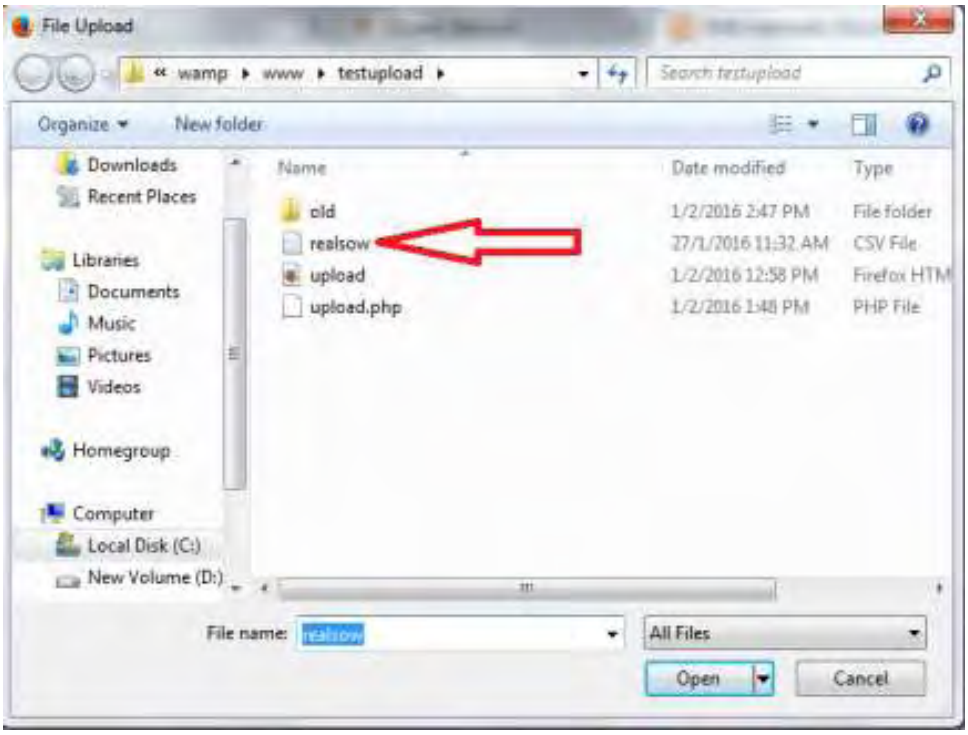


Figure 4.6. Choose the data

After the respondents browse the button, they have to choose which one they want the data that they want to upload into the system as shown in Figure 4.6.

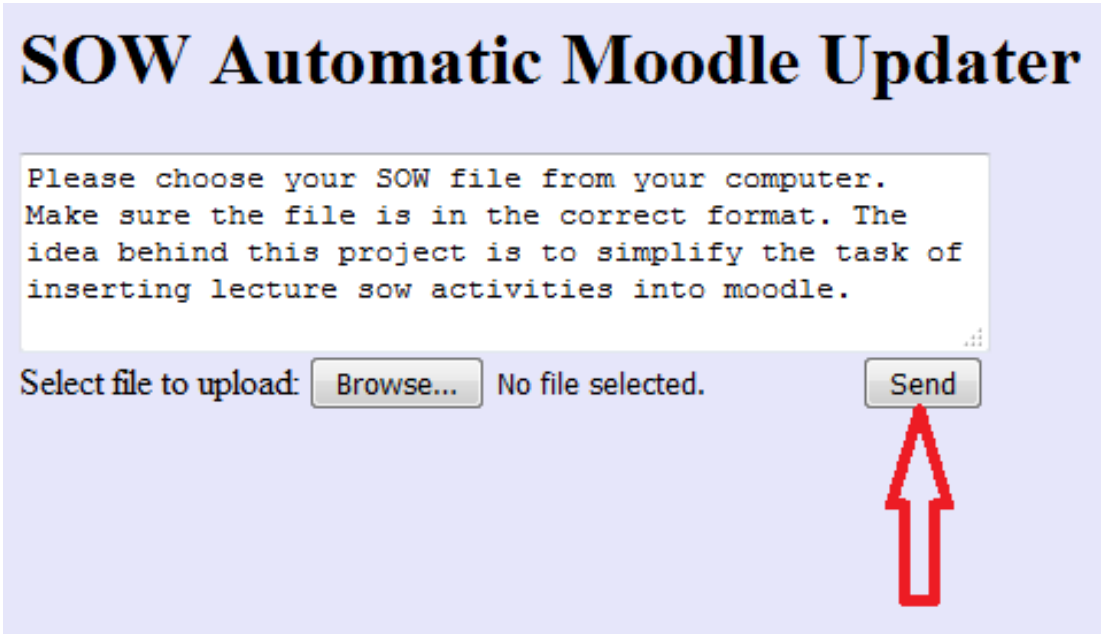


Figure 4.7: Refresh link: http://localhost/moodle/course/view.php?id=2

Next, the respondents have to click “send” button to upload the notes that already choose before as shown as Figure 4.7.

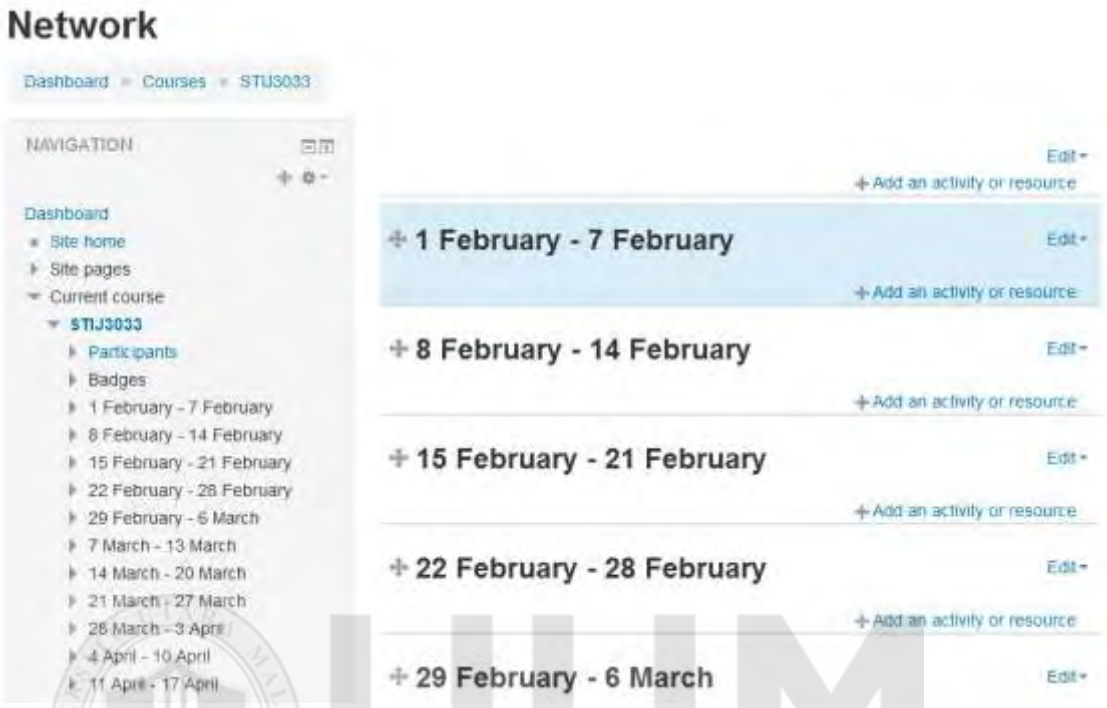


Figure 4.8: Refresh link.

Figure 4.8 shows the respondents have to do. Here, respondents have to refresh their link; http://localhost/moodle/course/view.php?id=2.

4.4 Analysis

Once the testing phase was completed, the respondents were asked to complete a set of questionnaire that related to their experience of using the Moodle and TP agent.

4.4.1 Findings

The questionnaire sets were prepared to gain some knowledge about the structure in terms of its usability, functionality, reliability, adaptability, maintainability, and efficiency. The findings of the surveys conducted with the lecturers involved were shows as below.

a) Usability

Table 4.1

Usability Testing

No	Item	Mean
1	It is easy to understand the concept and applications.	1
2	It is easy to perform its functions.	1
3	It is easy to learn how to use.	1
4	It is easy to operate and control.	0.8

Table 4.1 findings reveal that the respondents agreed that the concept of structure is easy to understand, smooth in performing its functions, easy to learn and it is also easy to operate or control.

b) Functionality

Table 4.2

Functionality testing

No	Item	Mean
1	The structure does what is appropriate.	0.87
2	The structure has available all the functions required for its	0.93

	execution.	
3	The structure does what was proposed correctly.	0.87
4	The structure is precise in executing its functions.	0.93
5	The structure is precise in its results.	1
6	The structure interacts with the specified modules.	0.93
7	The structure has capacity for multiuser processing.	0.8

Table 4.2 proved that this structure has its own functionality because this structure is precise in executing in its result.

c) Reliability

Table 4.3

Reliability testing

No	Item	Mean
1	The structure has frequent failures.	0.33
2	The structure reacts appropriately when failures occur.	0.6
3	The structure informs the respondents concerning invalid data entry.	0.93

As we can see from Table 4.3, the respondents noted that the structure informs the respondents concerning invalid data entry with the mean of 0.93. It is assumed that the respondents were concerning the redundant data.

d) Maintainability

Table 4.3

Maintainability testing

No	Item	Mean
1	It is easy to find a failure when it is occurs.	0.73
2	It is easy to modify and adapt.	0.87
3	There is great risk when changes are made.	0.07
4	Changes are easy to test.	0.8

Based on the explanation given, their own experience using the structure, the respondents generally agreed that this structure is quite easy to modified and adapt. This is because they have to modify their TP if they want to change it as shown in Table 4.3.

e) Adaptability

Table 4.5

Adaptability testing

No	Item	Mean
1	It is easy to adapt to other environments.	1
2	It is easy to install in other environments.	1

For this category as shown in Table 4.5, it has been found that the respondents generally agree that it is adaptable in various environments and platform like Moodle latest or for the oldest version.

f) Efficiency

Table 4.6

Efficiency testing

No	Item	Mean
1	The structure's response time is appropriate.	1
2	The structure's execution time is appropriate.	1

The finding from table 4.6 shows the respondents agreed that this structure has a good response and execution time. That means, the lecturers will not have to wait for a long time to upload their TP into Moodle platform.

4.5 BAR CHART

From this evaluation as shown from Appendix C, this project gave a lot of benefits for the staff especially for the lecturers because embedding SOW into Moodle platform were helped the lecturers to prepare the teaching activities. One of the benefits that lecturers will get is they will save their time and energy to key-in the data repetitively like before.

For the experience using Moodle, all of the lecturers in UUM were mentioned before on how to use Moodle. They have done used Moodle in their daily life while they were teaching. This is because from this analysis, all of the 15 lecturers in UUM that have been evaluated this project were experienced using Moodle because UUM Online Learning System in were using Moodle as the platform while teaching.

Lecturers in UUM also often using Moodle. Majority of them will use Moodle between 1 to 5 times a week. But, in 15 lecturers that evaluated this system, only one lecturer using Moodle less than once a week. This happened because maybe that lecturer have their own blog and all of the data or activities like quizzes and assignments, they put in his own blog and their students access from that blog.

For Moodle, majority lecturers in UUM were give their opinion that Moodle is easy to use. From this analysis, 11 lecturers in UUM told that Moodle is easy to use, especially for the lecturer in IT field. For the lecturers in not-IT field, around 4

lecturers choose “medium” to use Moodle. This is because maybe some of them are not interested using Moodle in their daily teaching.

Activities in Moodle like to upload notes, assignment or quizzes, around 9 lecturers in UUM said that it is medium to find the new activities there and 6 lecturers found that it’s quite hard to find new activities in Moodle, especially for the lecturers who are not in IT field. This is because lecturers in IT field were always use Moodle to upload any activities.

15 lecturers said that they have to spend more time and effort to add new activities in Moodle. This is because activities like assignment, quizzes and notes, they have to key-in one by one for the whole semester and for the one semester, and they have a lot of activities that lecturers have to key-in. This will make time consuming because they have to key-in repetitively for every semester. So that, this project will help the lecturers to less their time consuming by click one button only and all of their teaching will appear all automatically.

4.6 Summary

Using the database from localhost of the Moodle, it helped to minimized logic error for the final testing to ensure the prototype was reliable. The test was used to identify whether the SOW will help the academic staff in UUM to save their time or not. The tests also helped to reconstruct a proposed model accordingly. This is the finding of the research. It will be discussed in detail in Chapter 5.

CHAPTER 5

DISCUSSION OF RESULT AND CONCLUSION

5.1 Introduction

This chapter discusses the testing of the prototype by using the testing and evaluation from the developer to the system and the developer will evaluate this system whether this system are friendly user and easy to use or not. The prototype testing uses structural testing or unit testing which is known identified as "white-box testing". The result will be used as the basis for the constructing a new SOW model. This chapter is divided into two phases; conducting the white-box testing and conducting the usability testing. White-box is conducted by the researcher while usability is tested on the user.

The result will be used in the test procedure is referred to as MQA because MQA have their own standardize of SOW.

5.2 Process Embedding Scheme of Work

To embed the SOW softcopy into UUM Online Learning, there were flow that can followed as Figure 3 as below.

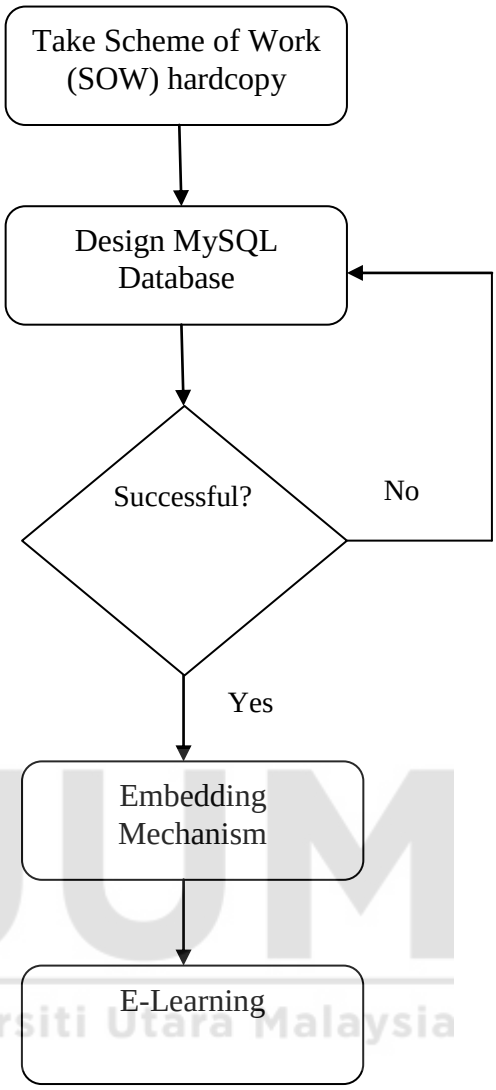


Figure 5.1. Embedding SOW Flow

For the Figure 5.1 above, the flow chart shown on how this study was achieved. Firstly, the lecturers will take the hardcopy of their SOW before and they will transfer it into softcopy. From that softcopy, developer will design MySQL of database. If successful, it will be embedded into E-Learning, but, if it is not successful, developer must have to re-design the database.

5.3 Problem

After the system was tested by the developer, the developer found that this system has to be more systematic and the academic staff like lecturers doesn't need to purge the system first.

5.4 Discussion

The chapter focuses on the results or findings of the research, the result discussion, conclusion and further recommended research. This research has come up with a new Model of SOW in the Moodle. The model was supported by two prototypes; the interface of Moodle and the database/localhost of Wamp Server. The overall research is highlighted in the conclusion and some future research issues are listed at the end of this chapter.

SOW Embedding Mechanism Database E-Learning

Figure 5.2. Embedding Mechanism

Today, the Internet is the technology used to bring information to the user in a short period of time. Do not have to travel to the place where the information is residing. To explore the Internet or to access the Internet, what we need is a personal computer with Internet capabilities.

The paper discusses the major requirement. This paper has also presented on how the SOW can help the academic staff in UUM to become more systematic. Accordingly, checklist questionnaires were giving to evaluate the developer acceptance towards the prototype.

5.4.1 SOW Structure

This section will be brief because the details have been highlighted in Chapter 4. The discussion will focus more on the structure and process in the Moodle and SOW.

The structure of this system is quite important because for this research, SOW was embedded into UUM E-Learning. SOW from the hardcopy embed into Moodle platform through database.

5.5 Research Constraints

Throughout the research, constraints are discovered:

1. This system need to be purge by the user after every second the admin key- in the data.

2. Security issue is not supported. The research did not cover the security issues. It is assumed that Windows 2000 Advanced Server and the SQL Server have good security control.

5.6 Further Recommended Research

The research has not yet explored the full potential of the SOW application as solid tools for the Moodle. Below are the suggested researches for future researchers:

1. Moodle Security approach.
2. Bank data to discover all of any activities that the academic staff will cover for along the semester.

5.7 Conclusion

In conclusion, regarding to the first experiment, the new method of SOW was acceptable by the lecturers in UUM. It could be an interesting system if this system implemented in UUM and in all around University around Malaysia because this system could help the lecturers to save their time and energy to key-in their SOW every semester in every week.

By using this system, the lecturers could decrease their redundancy of data. Means, the adaptation of this application will change the process of teaching and learning where it can create an authentic learning environment suitable to various learning style.

From the findings that were tested by usability, functionality, reliability, adaptability, maintainability, and efficiency testing, we can conclude that all of these testing were gave the positive result. These testing were used scale from 0 until 1 to estimate the probability of used of this structure.

From usability testing, we can see that this structure is easy to understand. So that, lecturer can uses this structure easily. Functionality testing proved that this structure has its own functionality because this structure is precise in executing in its result.

Reliability testing also shows the positive result. From here, we can see that this structure was reliable to use because the structure informs the respondents concerning invalid data entry. This structure also is easy to maintain because it is easy to modify and adapt, there is great risk when changes are made and the changes are easy to test. Besides, the structure shows that it is easy to adapt in other environment because majority of the respondents agreed that it is adaptable in various environments and platform like Moodle latest or for the oldest version. Lecturer also will have the quality time to handle their SOW because this structure has a good response and execution time. That means, the lecturers will not have to wait for a long time to upload their TP into Moodle platform.

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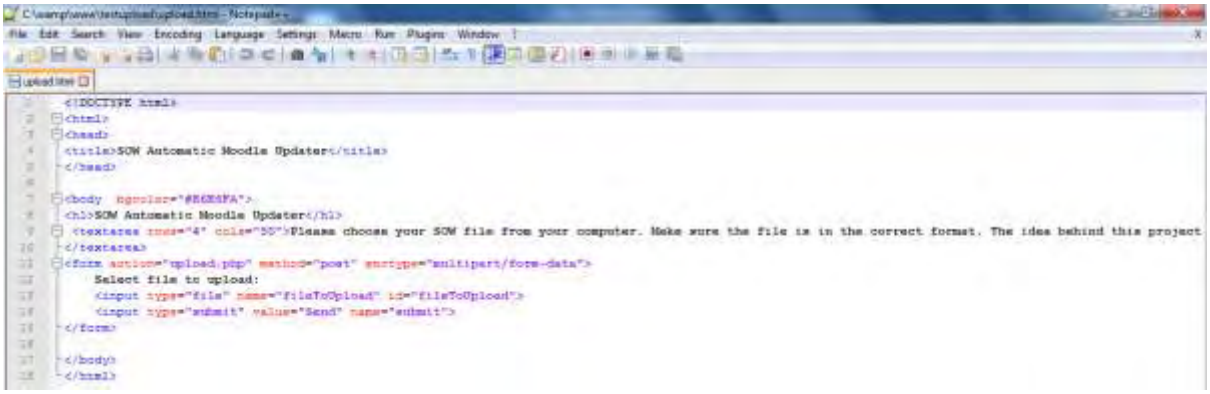
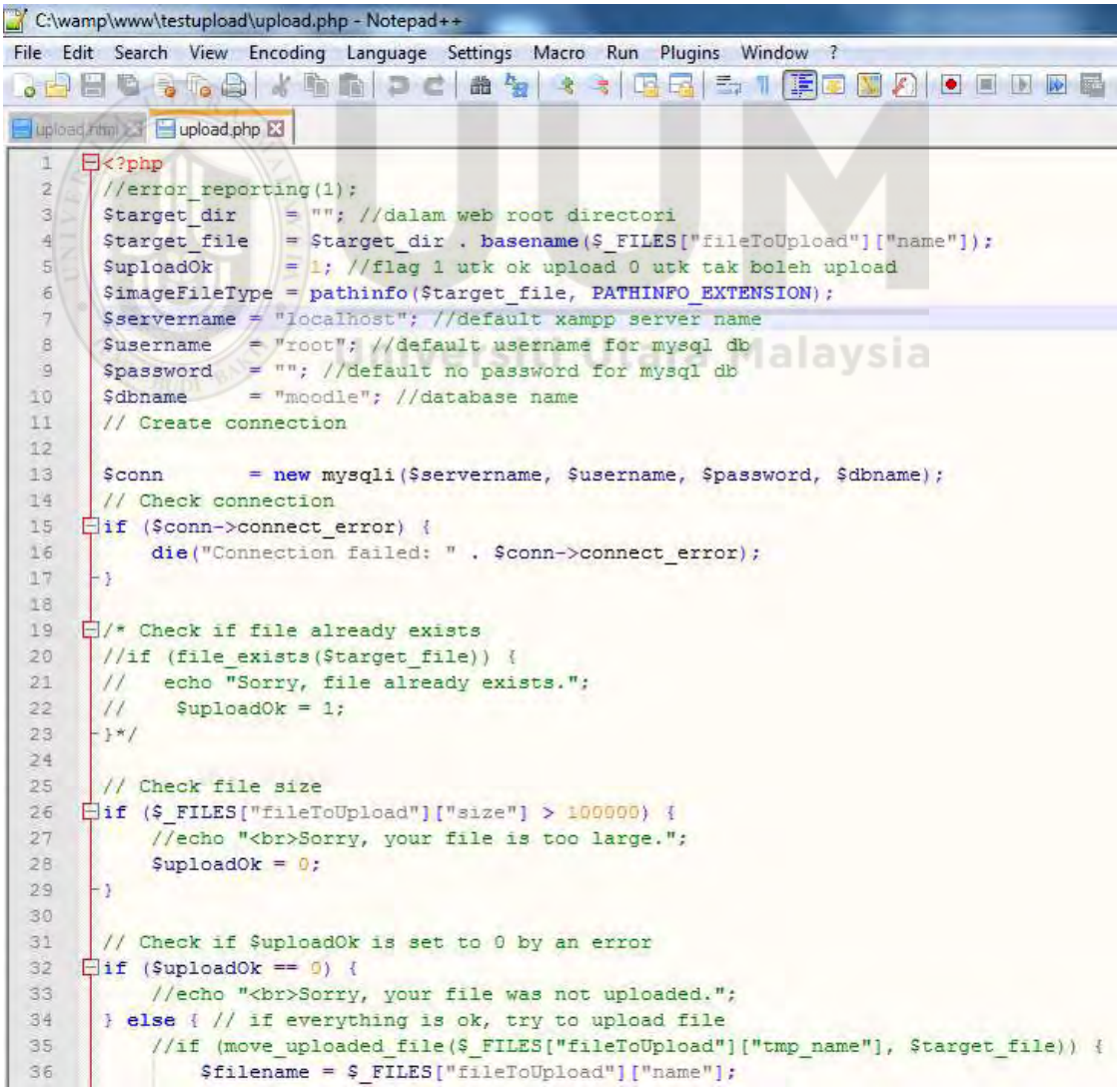
APPENDICES

APPENDIX A



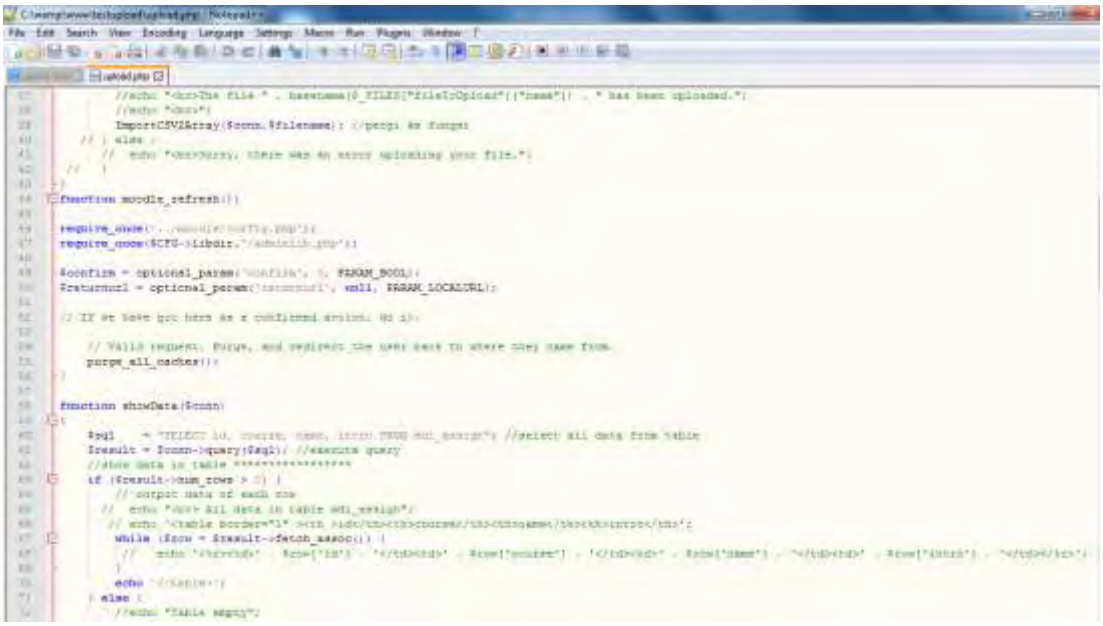
```
<!DOCTYPE html>
<html>
<head>
<title>SOW Automatic Moodle Updater</title>
</head>

<body  bgcolor="#E6E6FA">
<h1>SOW Automatic Moodle Updater</h1>
 <textarea rows="4" cols="50">Please choose your SOW file from your computer. Make sure the file is in the correct format. The idea behind this project
</textarea>
<form action="upload.php" method="post" enctype="multipart/form-data">
    Select file to upload:
    <input type="file" name="fileToUpload" id="fileToUpload">
    <input type="submit" value="Send" name="submit">
</form>

</body>
</html>
```

Upload.html

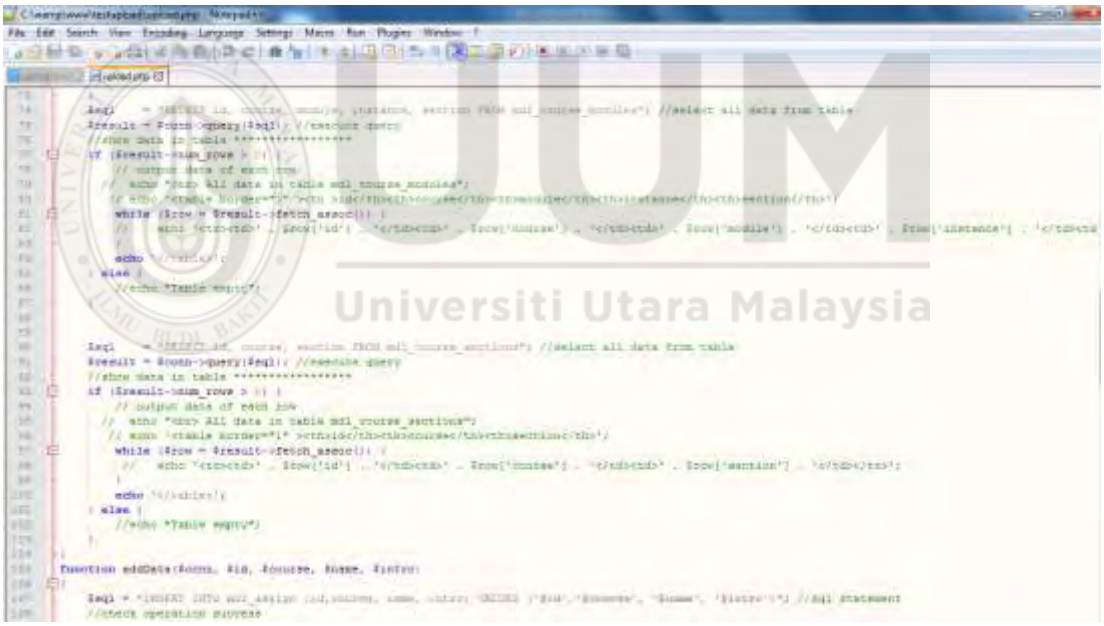


```
C:\wamp\www\testupload\upload.php - Notepad++
File  Edit  Search  View  Encoding  Language  Settings  Macro  Run  Plugins  Window  ?
upload.html  upload.php
<?php
//error_reporting(1);
$target_dir    = ""; //dalam web root directori
$target_file   = $target_dir . basename($_FILES["fileToUpload"]["name"]);
$uploadOk      = 1; //flag 1 utk ok upload 0 utk tak boleh upload
$imageFileType = pathinfo($target_file, PATHINFO_EXTENSION);
$servername = "localhost"; //default xampp server name
$username   = "root"; //default username for mysql db
$password   = ""; //default no password for mysql db
$dbname     = "moodle"; //database name
// Create connection

$conn       = new mysqli($servername, $username, $password, $dbname);
// Check connection
if ($conn->connect_error) {
    die("Connection failed: " . $conn->connect_error);
}

/* Check if file already exists
//if (file_exists($target_file)) {
//   echo "Sorry, file already exists.";
//    $uploadOk = 1;
}*/

// Check file size
if ($_FILES["fileToUpload"]["size"] > 100000) {
    //echo "<br>Sorry, your file is too large.";
    $uploadOk = 0;
}

// Check if $uploadOk is set to 0 by an error
if ($uploadOk == 0) {
    //echo "<br>Sorry, your file was not uploaded.";
} else { // if everything is ok, try to upload file
    //if (move_uploaded_file($_FILES["fileToUpload"]["tmp_name"], $target_file)) {
        $filename = $_FILES["fileToUpload"]["name"];
```

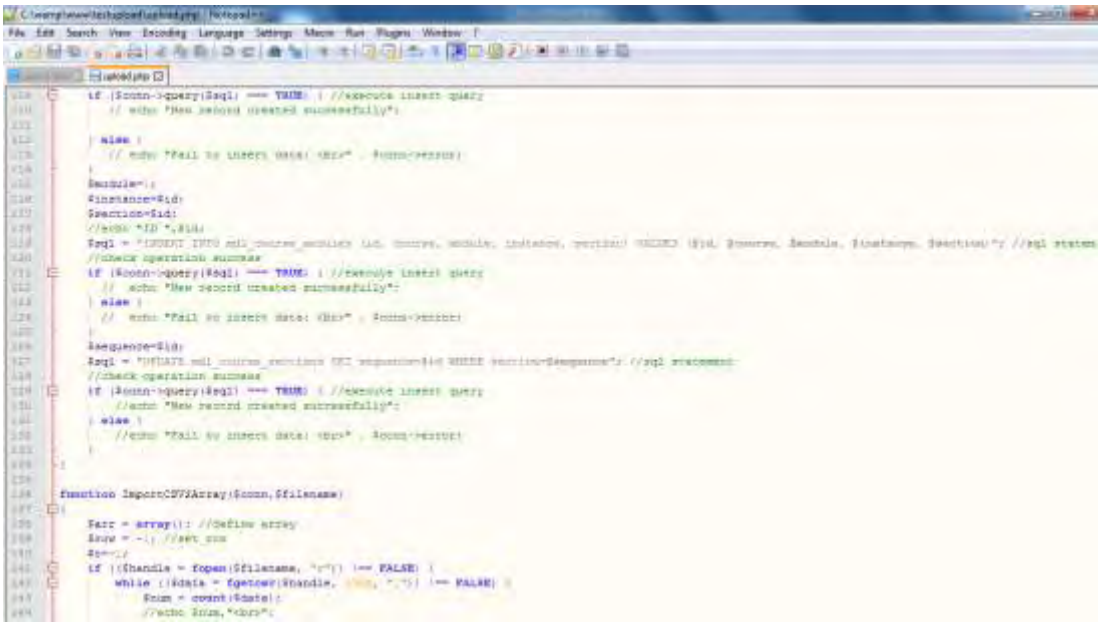
Upload.php



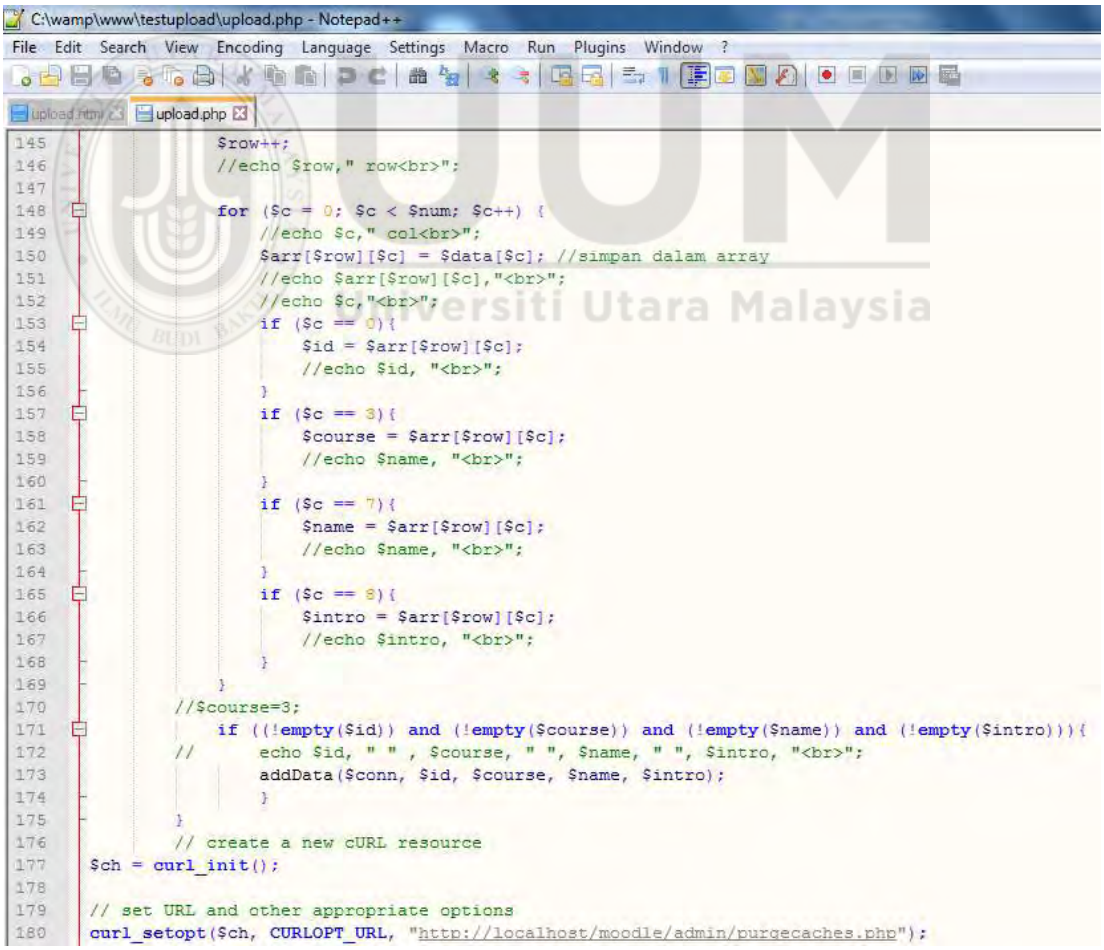
Upload.php



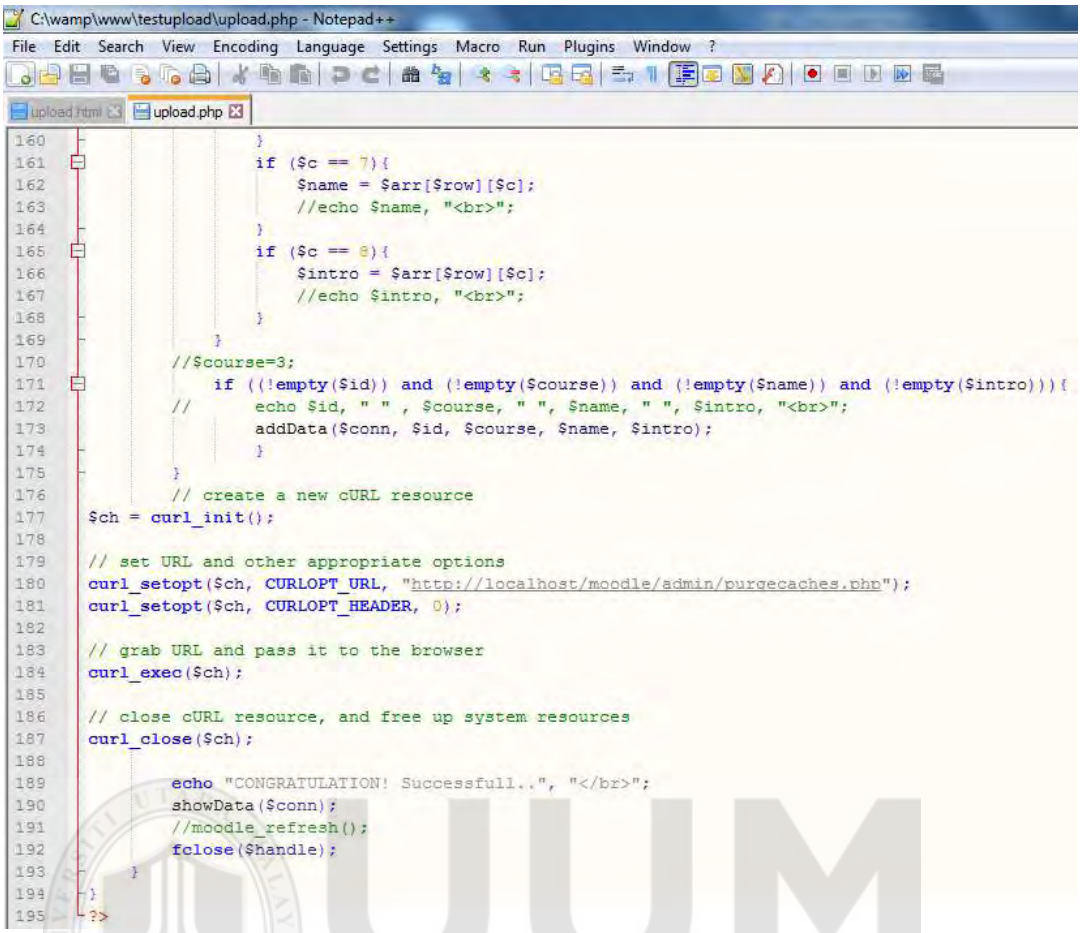
Upload.php



Upload.php



Upload.php

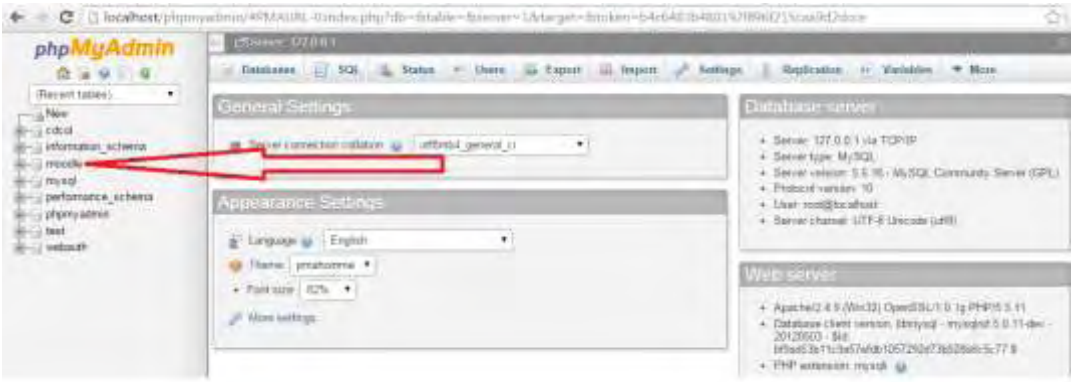


Upload.php

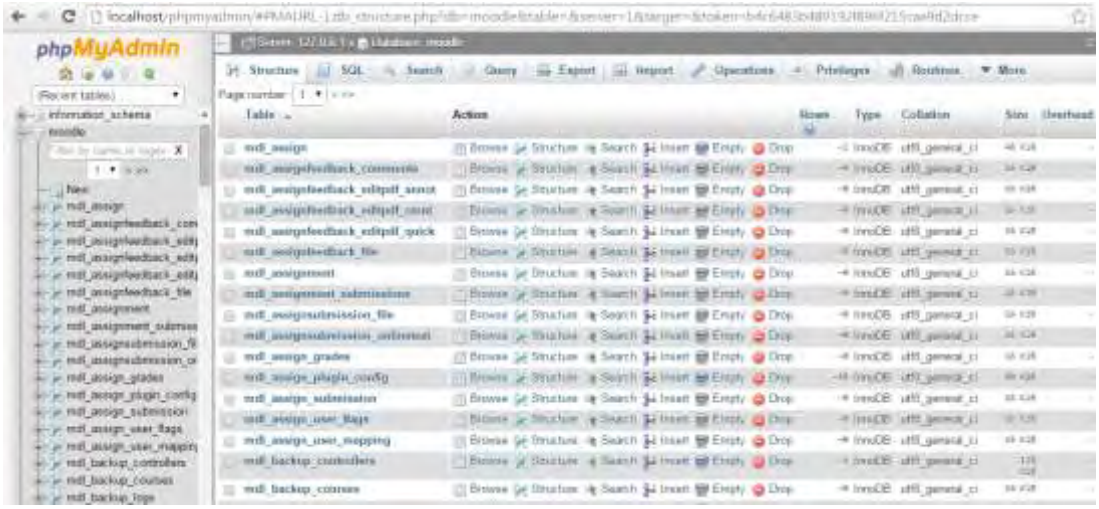
APPENDIX B

Select “phpmyadmin”

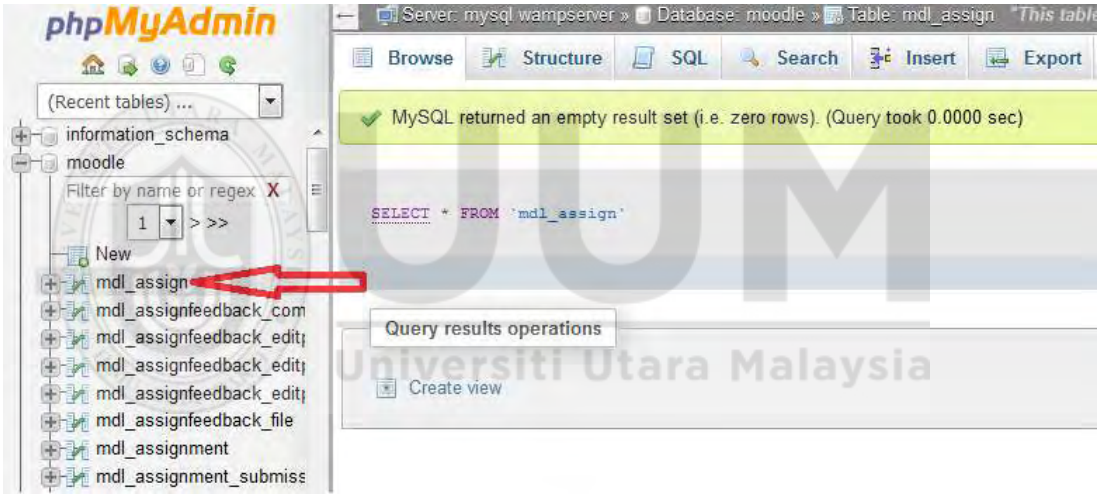
General setting for Wampp



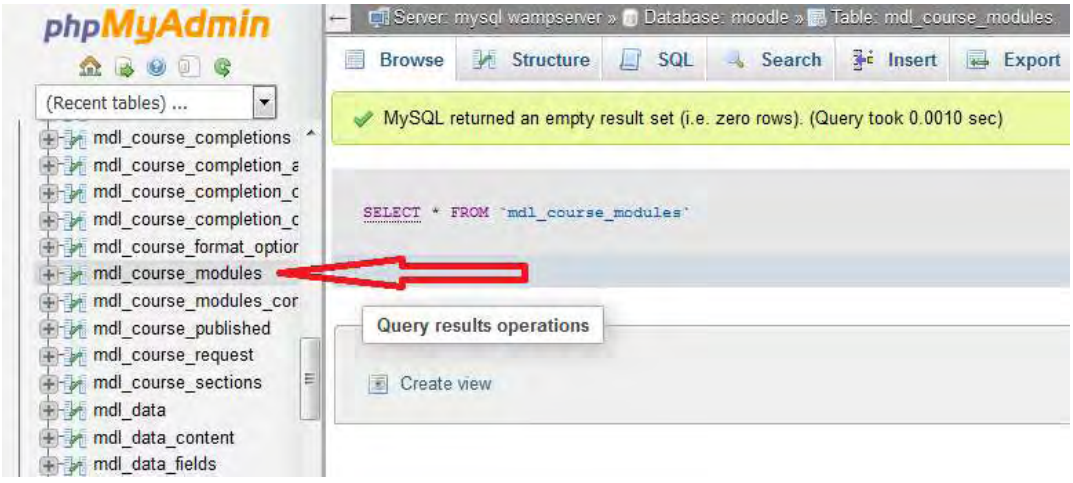
Select Moodle (database)



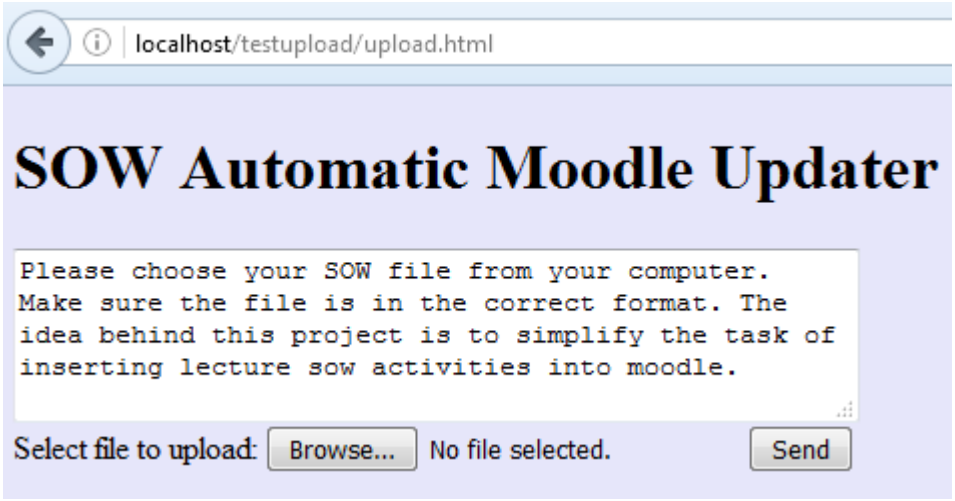
Localhost



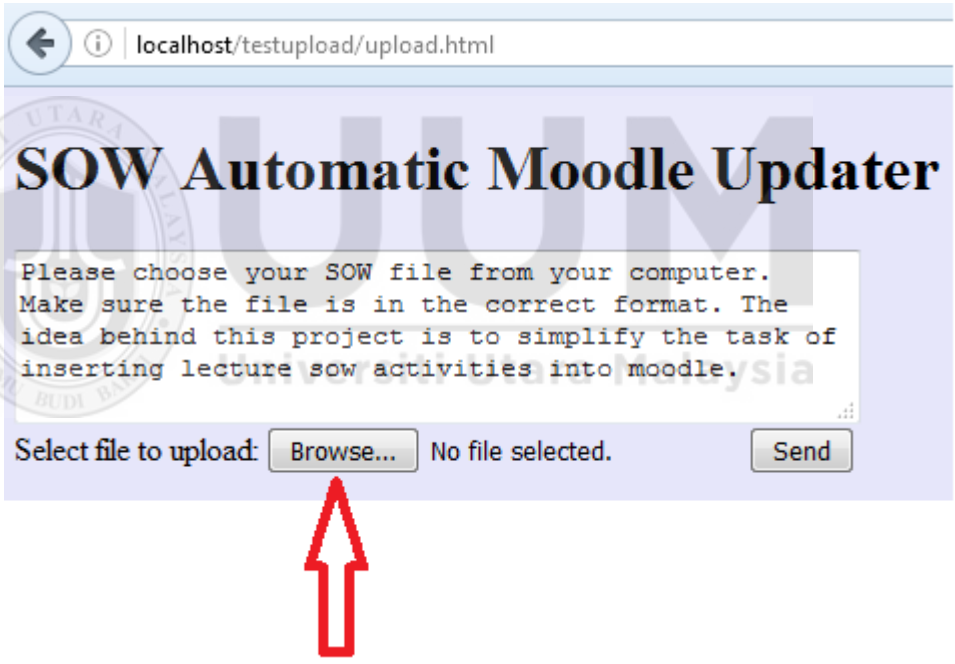
Select “mdl_assign”



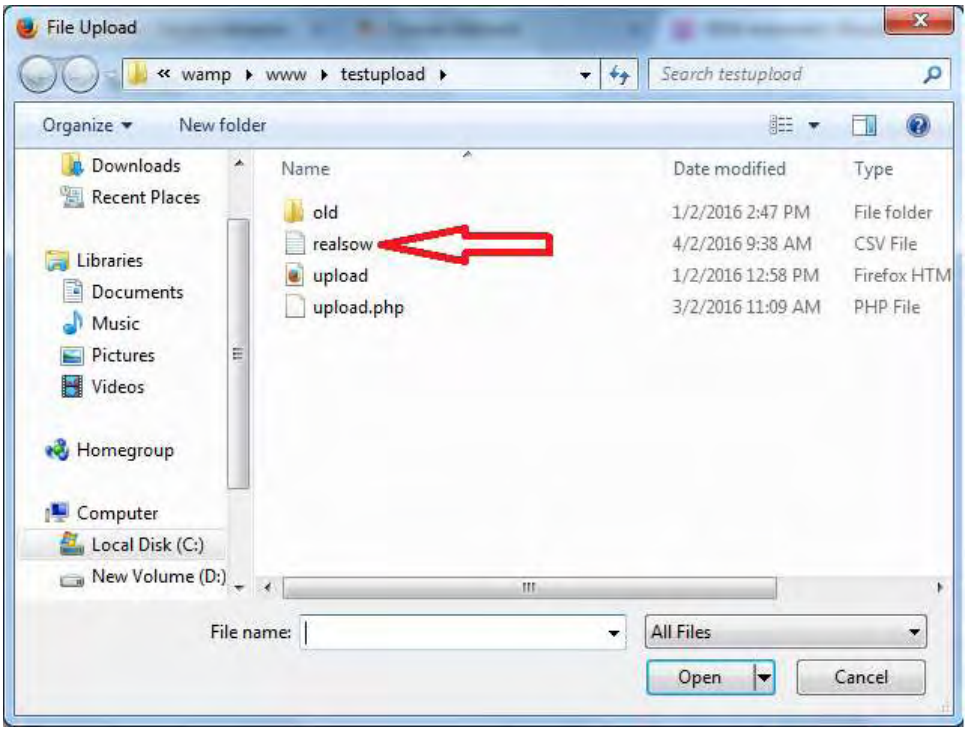
Select mdl_course_modules



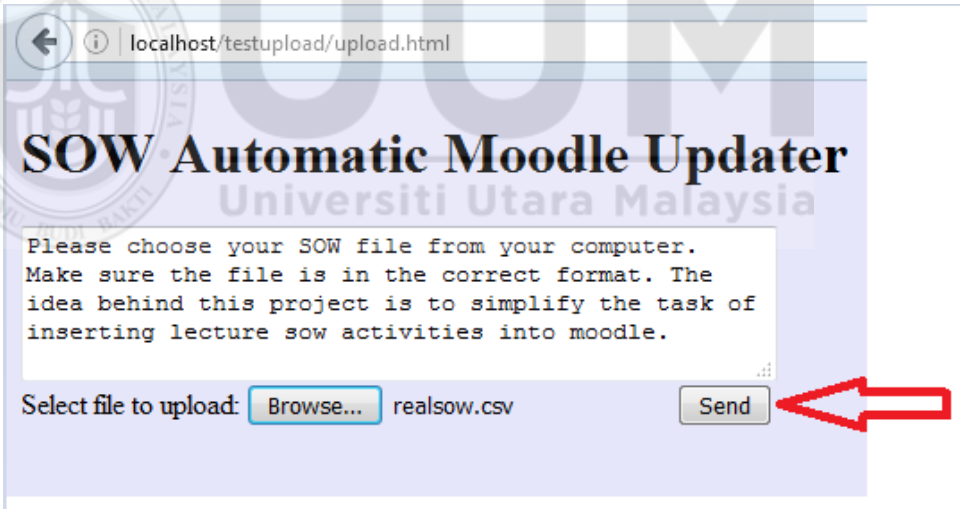
Go to "localhost/testupload/upload.html"



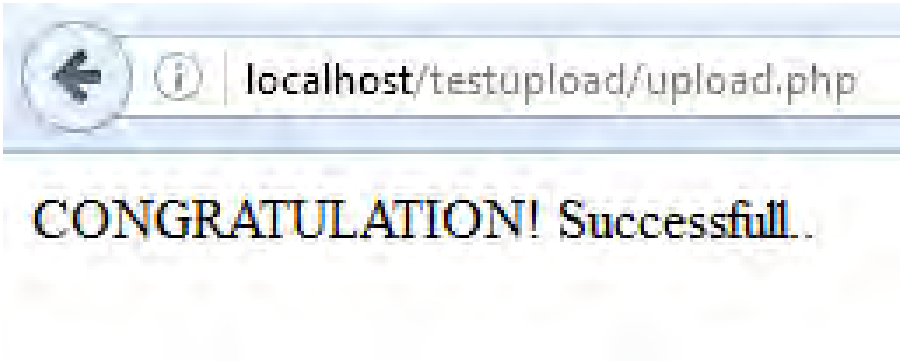
Browse File



Select which file want to upload

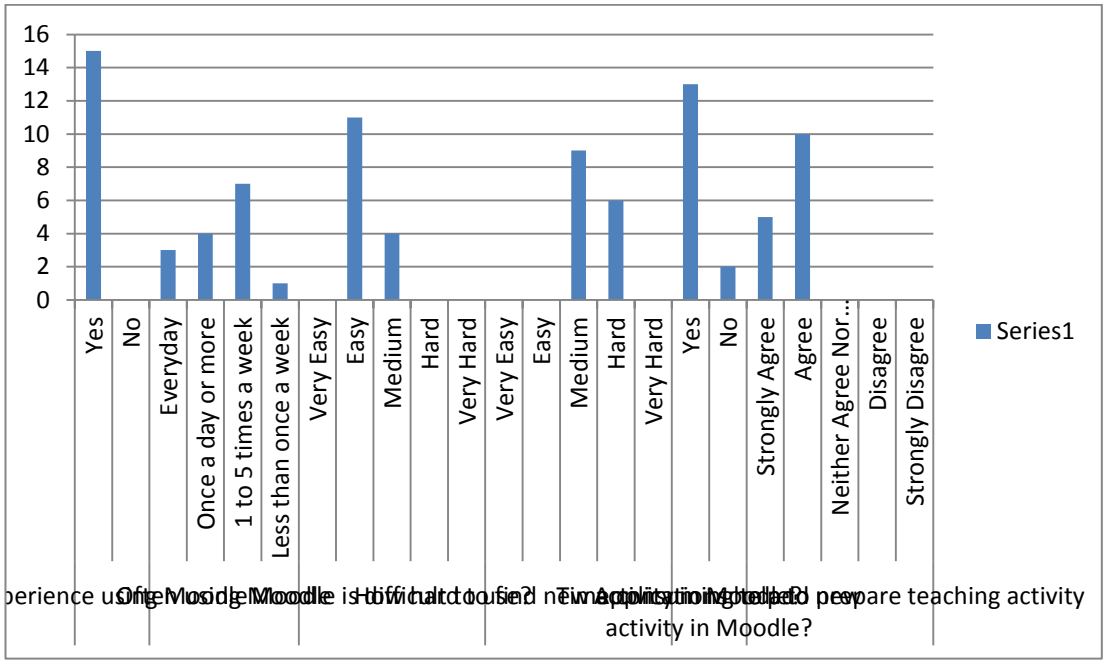


Click Send Button



Message appear

APPENDIX C



Bar Chart