The Development of an Online Learning Management System

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Abstract: During the pandemic, schools were shut down, but education was converted online. With this, students and teachers both felt more burden and stress out with more workload. An Online Learning Management System was developed for La Salle Secondary School to help ease the workload for teachers while helping students have easier access to their learning material. The main objective is to develop and test a web-based system for the teachers and students in La Salle Secondary School, Kota Kinabalu to easily share materials while keeping track of their studies. The development of the system is done by using prototype methodology. This system provides seven functional modules such as login, student, teacher, administrator, to-do list, report, subject and class. Hypertext Preprocessor (PHP) is used as the main programming language while Structured Query Language (MySQL) is used to manage the database systems. This system would greatly benefit the students and teachers as it makes distributing notes easier and faster.

Keywords: learning management system, online learning, web-based system

1. Introduction

Online learning is slowly becoming a normal factor for both students and teachers throughout the phases of the pandemic [8]. Even though the world has stop for a few months, schools and universities continue to operate as normal through online means for the students to receive their education. With this, their time is not wasted due to staying at home and doing nothing but could still learn for the confine of their own home. A management system on the other hand is a system in which information distribution is controlled and is easily shared with selected users in which is initially intended. [1] describes that a learning management system can do more than store contents and student information, it can be used to develop and grow new and exciting e-learning technologies as more features being added would increase the functionality and technicality of the system.

SM La Salle is a secondary school which is in Kota Kinabalu, Sabah. Before using online mediums, the school uses traditional process such as teachers give students homework, and it will be sent in the following week. At present day, the school does not have aa online system in which to standardize the

information shared between the students and teachers. However, the school would turn to establish social media such as telegram, whatsapp, and google classroom to share information, notes, and schoolwork. Below shows the as-is model in which the students and teachers would need to go through every week

Through this process, a series of problems arise when using the current method such as students tend to forget password or ignore the messages sent by the teachers. There are some cases where teachers need to share the notes on multiple platforms in which would increase the duties perform by the teachers. Another problem is that students would be unaware of the work given to them by their teacher.

As a result, this project aims to design and develop a solution in which would solve this issue by creating an Online Learning Management System for SM La Salle that would help both students and teachers manage their workload efficiently and practically. This is due to learning management system plays a vital role on the development of both the students and teachers and its effect can be greatly reduce if it is not done appropriately due to the loss of engagement between the students and teachers [2]. This management system come would include some general features such as being able to show the notes given by the teachers, reminders on deadline for students, the ability to download or upload notes etc.

The report consists of five sections. Section 1 describes the case study, problems, objectives, scope, expected result and significance. Section 2 will go into detail about literature review and related works. Section 3 explains the methodology used in the development process. Section 4 is a summary of the project.

2.   Related Work

2.1   Learning Management System

Learning Management System (LMS) is a software application or web-based technology used to plan, implement, and assess a specific learning process [3]. This is not something new for university students as they have been using them daily to receive material used for classes and as a medium to upload their assignments. For secondary schools and below, this is a new medium for them. When the pandemic started, schools quickly took to online methods to share materials using established LMS such as Google Classroom and Edmodo. Some teachers tend to use social messaging applications such as Whatsapp and Telegram with moderate success.

2.2   Web-based Application

The World Wide Web is a constantly evolving network that has already travelled far beyond its conception in the early 1990s, when it was created to solve a specific problem [4]. Web-based refers to techniques that will be used in the process of communication between different devices through the internet. Using client-server model, the user can access the website by inserting a domain name. These web-based applications will have a server which can be online or local to store information such as databases, files etc. Each web-based application has their down architecture that interacts with all the features present in the system. This would ensure that multiple applications work simultaneously. It can also be described as the layout that logically defines the connections between the server and client-side for a better web experience [5].

2.3   Comparison among existing systems

There are three systems that will be compared to with our proposed system which is Online Learning Management System for SM La Salle. The three systems are Google Classroom, Edmodo, and our own Author system. Google Classroom is an Online Learning Management System (OLMS) created by google for teachers and students to use and it was popularized during the rise of the pandemic

among primary and secondary schools. Edmodo on the other hand was created by Jeff O'hara, Nic Borg and Crystal Hutter. It was created as a method to help students and teachers engage with each other and lessen the amount of paper used by the teacher as they can teacher using Edmodo. It is used to share content, distribute quizzes, assignments and communicate with users. This system is mainly used by primary, secondary, and college students. Final system is Tun Hussein Onn University's Author system. This is used by the lecturer and students to distribute content, quizzes and assignments. This is only used by UTHM community which are lecturer and students. Outside people are not able to access this system as they are not able to register into the system unless enrolling into the University.

Table 1 summarizes the comparison of 3 existing system with proposed system. Three existing systems have been examined to obtain more useful information for the proposed system development. The comparisons are between modules and features of the proposed system.

Table 1: Comparison of 3 Existing System with Proposed System

Features/System	Author	Edmodo	Google Classroom	Proposed System
Login	Available	Available	Available	Available
Classroom	Available	Available	Available	Available
Distribute Material	Available	Available	Available	Available
Assignment	Available	Available	Available	Available
To-do list	Not Available	Not Available	Available	Available
Mark	Available	Not Available	Not Available	Available
Report	Available	Not Available	Not Available	Available

After looking through the comparisons in the table above, the fundamentals feature to have on a learning management system would be login system, classroom, dashboard, distribute materials and assigning assignments. These features are all present in all the compared systems. However, the features tend vary to each system and would probably be added into the proposed system. The features such as to do list, marks and assessments are good examples of features that would be added into the proposed system as it is useful for users while features like calendar, discover and bag are not added as they do not have a useful purpose that corresponds with the goal of the proposed system.

3. Methodology/Framework

This chapter explain the use of prototype model in this project and the activities that had been carried out. The development of Online Learning Management System for SM La Salle is using prototype model which consist of four phases which are planning, development, implementation, and maintenance. Each phase has their own deliverables. Table 2 shows the activity and deliverables for each phase.

Table 2: Software development activities and deliverables

Phase	Activities	Deliverables
Planning	• Proposed the project • Identify problems, scopes, and objectives • Task scheduling	• Project proposal • Develop Gantt chart • Functional and non-functional requirements • UML Diagram • Requirement Traceability Matrix (RTM) • To – Be Model
Development	• Design system database • Design user interface	• Class Diagram • System architecture • Database • User interface design • System prototype
Implementation	• Publish system on hosting server to be tested. • Receive feedback and potential improvements • Fix bugs and inconsistencies	• Implemented system • Improvements and feedback
Maintenance	• Fix problems and bugs	• Test plan • Test case

3.1   System Requirement Analysis

Requirement analysis is the process of determine requirements that developed system needs to fulfil, or user expectation outcome from the proposed system. System requirements include functional and non-functional requirements, user requirements and system requirements. Table 3 summarizes the functional modules of the proposed system

Table 3: System functional module

No.	Module	Function		User
1.	Login module	-	To manage registered user login into the system.	Administrator, student, teacher
2.	Student module	-	To view and download learning material	Student
		-	To upload assignment answers	
		-	To view grade	
3.	Teacher module	-	To view and create learning material	Teacher
		-	To create and view assignment	
		-	To download student's answers	
		-	To insert student grade	
4.	Administrator module	-	To register new users	Administrator
		-	To manage users	
		-	To assign users to class and subjects	
5.	To – do list module	-	To list down unfinish assignments with deadline	Student
6.	Report module	-	To generate statistical report on student's grade	Administrator
7.	Subject and class module	-	To create and manage subjects	Administrator
		-	To create and manage classes	

3.2   Functional and Non-Functional Requirement

Functional requirements are functions of the developed system, while function is described as a specific behaviour that convert input to output. Table 4 shows the functional requirements of the proposed system

Table 4: Functional requirements

No.	Module	Description	
1.	Login module	-	The system should give error message for wrong information.
		-	The system should allow user to login into their respective account
		-	The system should alert the user for invalid input
		-	The system should redirect user to homepage

Table 4: (cont)

No.	Module	Description
2.	Student module	- The system should allow user to view learning materials and download - The system should allow user to upload answer in assignments tab - The system should allow user to view grade - The system should allow user to select subject
3.	Teacher module	- The system should allow user to create and view learning material - The system should allow user to create and view assignment - The system should allow user to insert marks of students in the marks tab - The system should allow user to select class
4.	Administrator module	- The system should allow user to register new administrator - The system should allow user to register new student - The system should allow user to register new teacher - The system should allow user to manage other users
5.	To – do list module	- The system should display unfinish assignments to students - The system should display deadline of assignments
6.	Report module	- The system should be able to generate statistical report on student grade.
7.	Subject and class module	- The system should allow user to create or assign classes and subjects to other users - The system should allow user to create new classes and subjects

A non-functional requirement defines the quality attribute of a software system. They represent a set of standards used to judge the specific operation of a system [6]. Table 5 shows the non-functional requirements of the developed system

Table 5: Non-functional requirements

No.	Requirements	Description
1.	Performance	The system should be always usable
2.	Operational	The loading time for a website is no more than 1 minute
3.	Security	The system should be user friendly

3.3   User Requirement Analysis

User requirements define the expectation of user from the functionality of the system. Table 6 shows the user requirements of the developed system.

Table 6: User requirements

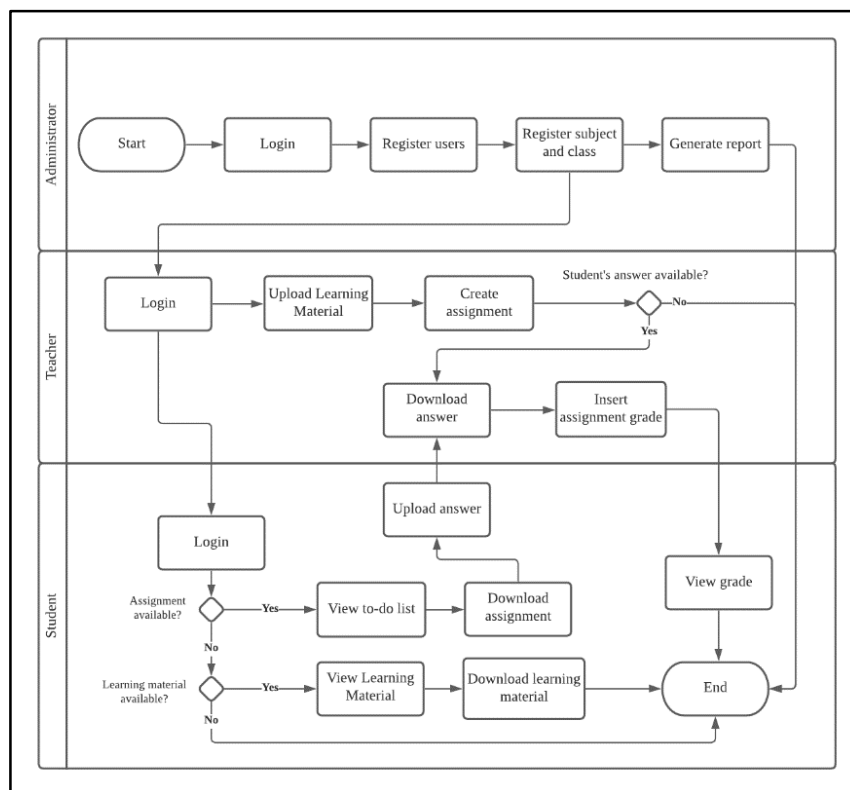| No.	User Requirements
1.	All users must be able to enter valid id and password to enter the system
2.	Teacher should be able to select class
3.	Student should be able to select subject
4.	User should be able to view, create and upload learning materials
5.	User should be able to view, create and upload assignments
6.	Student should be able to upload assignment answers
7.	Student should be able to view to do list
8.	User should be able to insert and view grade
9.	Administrator should be able to register new user, class, and subject
10.	Administrator should be able to enter new, edit or delete information
11.	Administrator should be able to generate report by the system

3.4   Use Case Diagram

Figure 2 shows the use case diagram of the proposed system.

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Figure 1: Use case diagram

3.5   Class Diagram

Class diagram is a static diagram that is used to visualize, describe and documenting different aspect of a system. Figure 3 shows the class diagram of the proposed system.

Figure 2: Class diagram

3.6   To - Be Model

To – be model is describes the future state of the system and how it will impact the organisation by solving the problems faced.

Figure 3: To – be model of proposed system

3.7   Database Design: Schema Data

Schema Data refers to the organization of data as a blueprint of how the database is constructed. It exists as a visual representation and as a set of formula known as integrity constraints that govern a database.

The database scheme is listed as follows:

    i.   User (<u>userID</u>,userName, password, email, phone, activity, role)

    ii.   Material (<u>materialID</u>, title, fileName, file, userID)

    iii.   Assignment (<u>assignmentID</u>, title, fileName, file, upload, duedate, grade)

    iv.   Class (<u>classID</u>, className)

    v.   Subject (<u>subjectID</u>, subjectName)

3.8   User Interface Design

User interface design is the process of building interfaces in software or computerized devices with looks and style being the main aspect of it [7]. The figures below are some sketches of user interface for the proposed system.
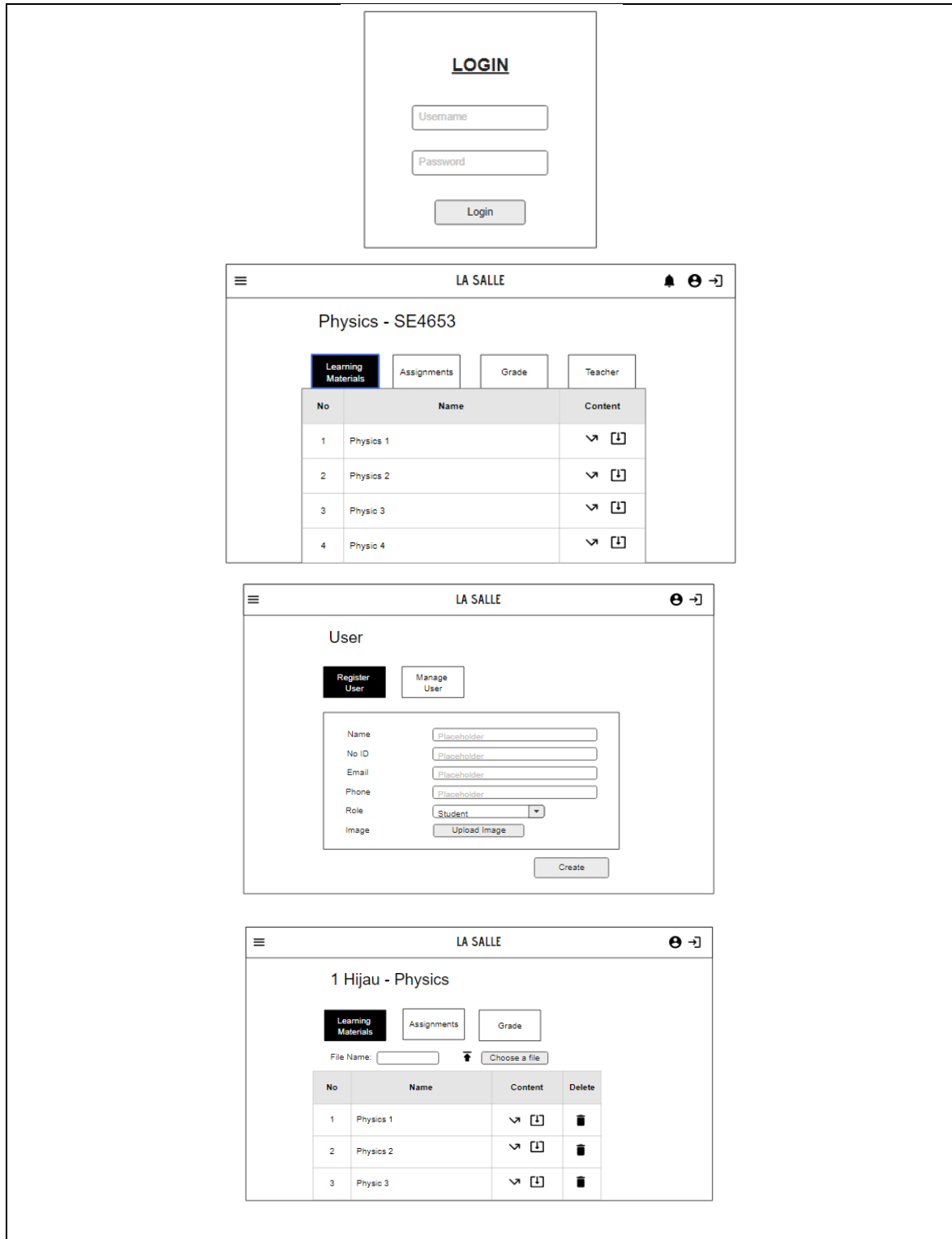
Figure 4: Interface Design

4.   Result and Discussion

This section will discuss on the implementation and testing that was done using PHP and HTML frameworks such as Laravel and Bootstraps. Figure 5 shows some of the final user interface of the system.
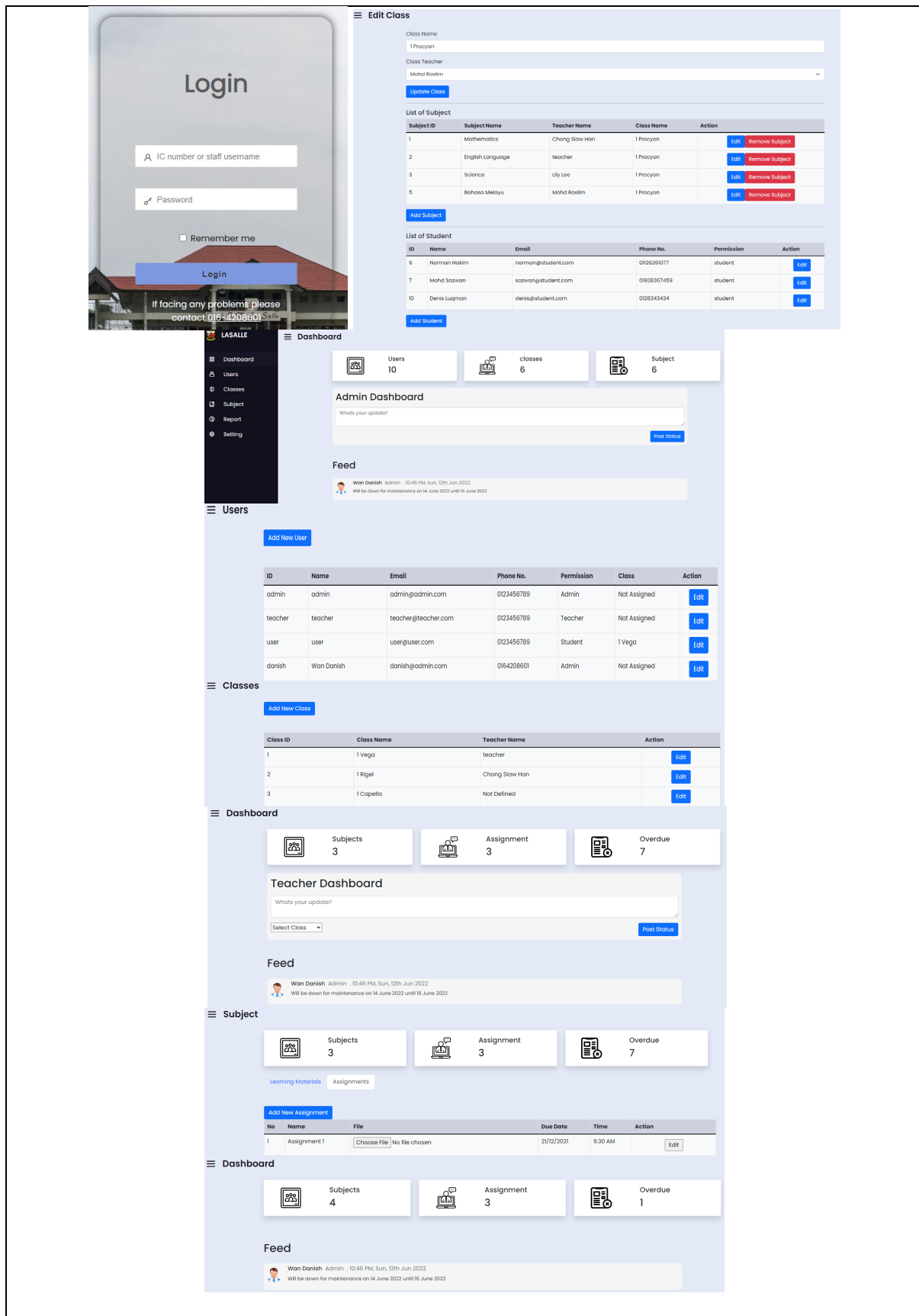
Figure 5: Interface of the System

4.1   System Testing

Testing phase is important in the development of the system as it is going to determine if the developed system fulfils the objectives and user requirements. The strength and weaknesses of the system is also discovered during the testing phase and will be recommended as improvement for the future. Testing is done thoroughly for Online Learning Management System for SM La Salle.

Table 7: Test Cases of System Modules and Results

Module	Test Case	Output
Login	User able to login to the system using username and password	Pass
Admin	Able to register new users, subjects and classes.	Pass
Student	Able to view and download learning materials.	Pass
	Able to download assignments and upload answers.	Pass
	Able to view grade assigned by respective teacher	Pass
Teacher	Able to create and upload learning materials.	Pass
	Able to create and upload assignments.	Pass
	Able to download student's answer	Pass
	Able to grade student's assignment	Pass
Report	Able to generate statistical report on students' grade	Pass
To Do List	Able to show students' assignments	Pass
	Able to show deadline of each assignment	Pass
Subject and Class	Able to assign subject and class to respective users	Pass

User acceptance testing was done through via google Form and was used to assess the attractiveness of the interface of the system. Figure 6 shows the evaluation of the interface results received from the forms. A total of 15 people has fill in the form.
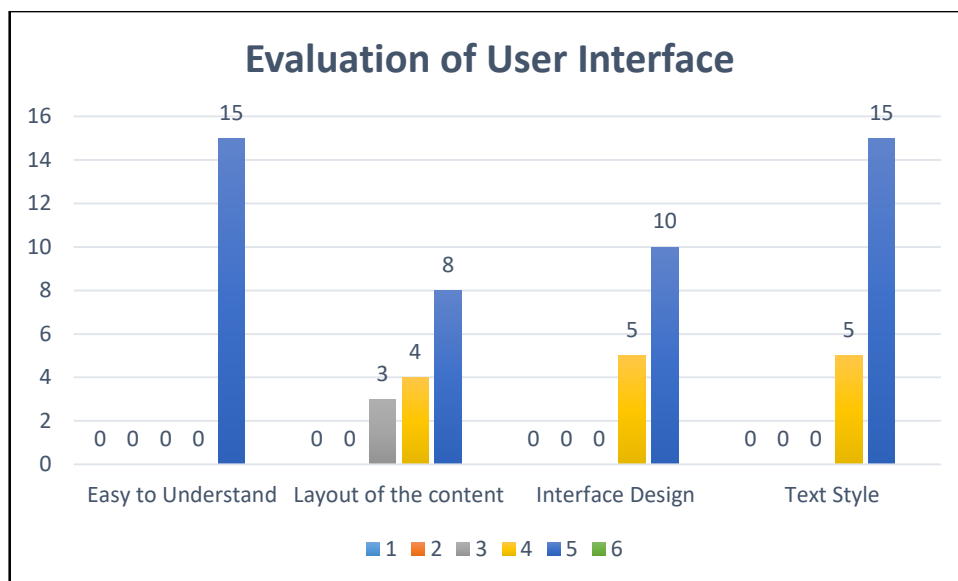
Figure 6: Evaluation of Interface

5. Conclusion

The absence of a dedicated platform to manage and obtain information has forced students and teachers to rely on social media and instant messaging application such as WhatsApp and Facebook. The result of a series of interview with Ms Chong who is the Senior Assistant for Affair found that this method has negative implications for students. Therefore, an Online Learning Management System was developed to overcome these problems. This system would make it easier for teachers to manage and provide materials and assignments to their students. In addition, this system also provides a platform to teacher and students to share and obtain materials.

The advantage of the system is that users can access the system any time because the system is hosted on a server. Another advantage is that teachers are able to grade students directly after they submitted their assignments. Furthermore, the system is able to generate report based on students' performance based on their assignment to be used for their class evaluation.

A few suggestions to improve the system in future works are adding more useful features to the system as the system now feels more barebones and only accomplishes the objectives. For administrators, filtering feature should be added to the user listing for easier organisations and finally, improving the user interface to be more dynamic for users as they are minor user interface problems.

Acknowledgment

References

[1] Alias, N. A., & Zainuddin, A. M. (2005). Innovation for better teaching and learning: Adopting the learning management system. Malaysian online journal of instructional technology, 2(2), 27-40.

[2] Coates, H., James, R., & Baldwin, G. (2005). A critical examination of the effects of learning management systems on university teaching and learning. Tertiary education and management, 11, 19-36.

[3]   Bradley, V., Learning Management System (LMS) Use with Online Instruction. *International Journal of Technology in Education*, 4(1), p.68. 2020

[4]   S. Aghaei, "Evolution of the world wide web : From web 1.0 to web 4.0," *International journal of Web & Semantic Technology*, vol. 3, no. 1, pp. 1–10, 2012.

[5]   Dhaduk, H. An Ultimate Guide of Web Application Architecture. Insights on Latest Technologies - Simform Blog. Retrieved November 10, 2021, from https://www.simform.com/blog/web-application-architecture/#section1, October 22, 2020.

[6]   Zhou, J. Y. *Functional requirements and non-functional requirements: A survey*. National Library of Canada = Bibliothèque nationale du Canada, 2004

[7]   Gautreau, C. (2011). Motivational factors affecting the integration of a learning management system by faculty. *Journal of Educators Online*, *8*(1), n1.

[8]   Shin, W. S., & Kang, M. (2015). The use of a mobile learning management system at an online university and its effect on learning satisfaction and achievement. *International Review of Research in Open and Distributed Learning*, *16*(3), 110-130.

[9]   Wang, Q., Woo, H. L., Quek, C. L., Yang, Y., & Liu, M. (2012). Using the Facebook group as a learning management system: An exploratory study. *British journal of educational technology*, *43*(3), 428-438.

[10] Wang, F. H. (2017). An exploration of online behaviour engagement and achievement in flipped classroom supported by learning management system. *Computers & Education*, *114*, 79-91.

[11] Stone, D., Jarrett, C., Woodroffe, M., & Minocha, S. *User interface design and evaluation*. Elsevier, 2005.

[12] A. Elengoe, "Covid-19 outbreak in Malaysia," *Osong Public Health and Research Perspectives*, vol. 11, no. 3, pp. 93–100, 2020.

[13] L. Bass, P. Clements, and R. Kazman, Software Architecture in Practice, 2nd ed. Reading, MA: Addison Wesley, 2003. [E-book] Available: Safari e-book.