Faculty of Computer Science and Information Technology

E-Learning Solar System for Primary School Year 3 Students

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Bachelor of Computer Science with Honours (Software Engineering)

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E-LEARNING SOLAR SYSTEM FOR PRIMARY SCHOOL YEAR 3 STUDENTS

NURUL ALIA BINTI AIZAD

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ABSTRAK

E-Learning Solar System for Primary School Year 3 Students is designed for students in the third year of primary school, who are considered novices in learning about the solar system. This web learning is developed to attract students' interest in the solar system and make it easier for students to access online learning. Besides, it is important to develop a web learning based on the syllabus provided by Ministry of Education Malaysia to ensure that the level of learning is appropriate for the age of the students. Accordingly, this project is implemented based on syllabus of Sciences Primary School Year 3 (Kurikulum Standard Sekolah Rendah) using Malay language. ADDIE model which is an acronym for five stages of a development process stand for Analysis, Design, Development, Implementation and Evaluation, is adopted as methodology in developing this electronic learning (e-learning) system. This e-learning can help students recognise the members of the solar system, know the position of the planets from the sun and their temperature, and the time of the planets' rotation. Other than that, the students can also strengthen their knowledge and increase their understanding of the solar system by performing quizzes with learning elements and games to improve their mental skills. The design of this system uses various multimedia elements that can provide an enjoyable learning process.

ABSTRAK

Sistem Suria E-Pembelajaran untuk Murid Tahun 3 Sekolah Rendah direka untuk murid tahun 3 sekolah rendah, yang dianggap sebagai orang baru dalam mempelajari tentang sistem suria. Pembelajaran web ini dibangunkan untuk menarik minat pelajar terhadap sistem suria dan memudahkan pelajar mengakses pembelajaran secara atas talian. Selain itu, adalah penting untuk membangunkan pembelajaran web berdasarkan sukatan pelajaran yang disediakan oleh Kementerian Pendidikan Malaysia bagi memastikan tahap pembelajaran bersesuaian dengan peringkat umur pelajar. Sehubungan itu, projek ini dilaksanakan berdasarkan sukatan pelajaran Sains Sekolah Rendah Tahun 3 (Kurikulum Standard Sekolah Rendah) menggunakan bahasa Melayu. Model ADDIE yang merupakan akronim untuk lima peringkat proses pembangunan untuk Analisis, Reka Bentuk, Pembangunan, Pelaksanaan dan Penilaian, digunakan sebagai metodologi dalam membangunkan sistem pendidikan ini. E-pembelajaran ini dapat membantu pelajar mengenali ahli sistem suria, mengetahui kedudukan planet daripada matahari dan suhunya, dan masa putaran planet. Selain itu, para pelajar juga boleh mengukuhkan pengetahuan dan meningkatkan pemahaman tentang sistem suria dengan melaksanakan kuiz berunsur pembelajaran dan permainan untuk meningkatkan kemahiran mental mereka. Reka bentuk sistem ini menggunakan pelbagai elemen multimedia yang dapat memberikan proses pembelajaran yang menyeronokkan.

CHAPTER 1: INTRODUCTION

1.1 Introduction

The solar system was first introduced at primary school in Science Year 3 subject in education Malaysia. The topic is very interesting for all of us especially for the students who are new to astronomy education. The first introduction plays a very important role in building a foundation to educate students so that their interest in the astronomy field will be more profound in the future.

Nowadays, the use of digital platforms is becoming more widespread in all fields, including the education field and web learning application is one of the learning methods used in the platform. It allows learners to be flexible and easily access to gain course materials anytime and anywhere, just by using any devices such as mobile phones, laptops or tablets. In addition, learning applications in education also can improve students' academic performance positively (Ababa et al., 2021).

Quizzes or tests is one of the ways or methods that can be used in educational practices. It is an evidence-based instructional strategy that can help learners remember what they learned and build their motivation and critical thinking (Lakhina, 2018). In addition, incorporate games in education is effective in teaching strategy because it can uplift learner motivation in learning process, and quizzes or stack of questions which are considered as gamification (Falciani, 2020). Moreover, compilation of notes in a digital platform helps student access class materials during class or post-class via online, which students can review and study class material efficiently.

Thus, by developing an e-learning solar system for primary school year 3 students with game-based learning elements, students can improve their understanding, knowledge and interest in astronomy syllabus. It is also very important to apply an interactive learning approachwhere students be able to participate in learning through digital technology such as online reading primary student besides making a learning process fun and exciting.

1.2 Problem Statement

Solar System is one of the topics taught in Malaysian primary schools. The first introduction about solar system will positively impact and attract student interest if they get a suitable platform such interactive learning through the use of technology to explore

more. This can be an excellent way for students to express their creativity and stimulate their minds (Paul, 2022). Nowadays, students' interest in Science stream is a troubling things because the number of students taking Science, Technology, Engineering, Mathematics (STEM) subject is decreasing yearly (Chin, 2019). In Sarawak, there are only 23 percent of upper secondary schools enrol into Science stream on 2020 and it is very important to give early STEM exposure to children so that it can be nurtured from a young age (Abdullah, 2020).

In addition, there is a lot of learning application developed in English medium, while currently, Malaysian primary schools use Malay language in their teaching and learning. Therefore, limited solar system learning (based on Kurikulum Standard Sekolah Rendah (Semakan 2017) syllabus) application might lead to a decline in students interest in this topic and most of the teachers agreed that astronomy teaching aids are limited (Ramarao, K., (n.d)). Next, the lack of interest shown by students of younger ages in the solar system will eventually lead to the demise of the study of astronomy.

Moreover, in the digital era, students easily distract or have difficulty paying attention in classroom lessons (Mak, 2018). Traditional method of teaching need more effort from educators to make sure the learning process in a good way. Otherwise, the lesson may lead to lost interest of students because traditional learning is mostly on theory-based lessons and it will be an effective learning to mix traditional method and online learning together (Graphy, 2022). Thus,e-learning solar system allows them to gain interest in learning about solar system, either during class or outside the school times and be able to solve problems stated.

1.3 Scope

This project is conducted to produce an e-learning solar system for primary students in Year 3. The scopes of this project are:

a. The system will consist of notes about the solar system in Year 3 primary school using Malay language (based on *Kurikulum Standard Sekolah Rendah (Semakan 2017)* syllabus) in an interesting and interactive way.

b. The system will include assessments according to students' education level using game-based learning elements.

1.4 Aim and Objective

The main reason for conducting this project is to develop an online learning system, e-Learning Solar System, to increase students' understanding and interest in learning Solar System. Based on the problem statements and the project aim, the objectives of this project are:

a. To analyse the current existing system of web learning applications about solar system for primary school level education.
b. To design an e-learning solar system with game-based elements for year 3 primary school students.
c. To test the usability and functionality of the e-Learning Solar System.

1.5 Brief Methodology

The methodology that is chosen for this project is ADDIE model.
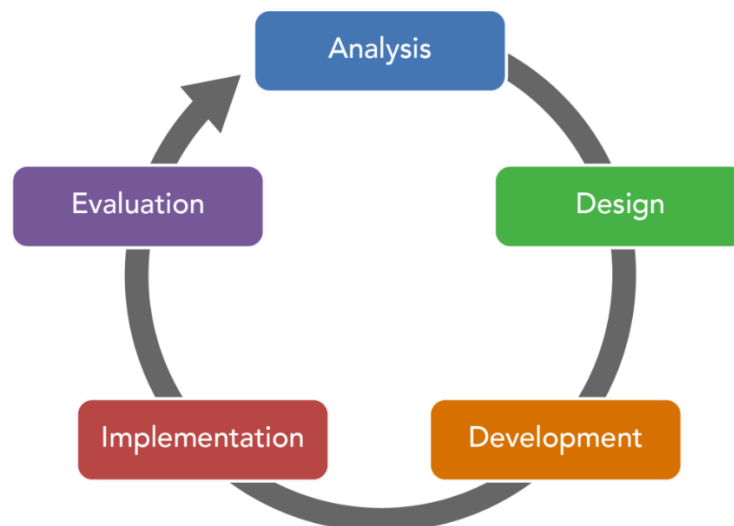
Figure 1. 1 ADDIE Methodology(Lumen Learning, 2022)

The ADDIE model is a process that is used by training developers to come out with educational programs (Debell, A. 2020). There are five main phases that need to be paid attention while using ADDIE methodology, namely analysis, design, development, implementation and evaluation. These steps need to be followed to ensure the effectiveness of the development process. Phases in ADDIE model are:

1.5.1. Analysis

The analysis phase is to identify and analyse learning objectives and goals. The developer needs to know what the user needs to learn, clarify the problem statement and identify learner's existing knowledge. The analysis will be conducted by collecting information through interviews or questionnaire to achieve learning needs.

1.5.2. Design

In this phase, developer requires to give more attention and be specific in each element of design plan such as learning objectives, content, exercises or modules, the knowledge that need to be acquired by users and media selection. Interface designs will be created before proceeding to the next phase to visualise the idea of the learning system.

1.5.3. Development

Development phase is to create and develop the outcome from design phase. The scripting language that will be used in developing the system are HTML, PHP, JavaScript and CSS. In this phase also will conduct testing and review process on the system to detect if there are any errors.

1.5.4. Implementation

During the implementation phase, developer needs to make sure the project obtains positive result. This phase also includes training the educators about the system and organising the environment for learning suitability, so they will understand and aware with of content and materials.

1.5.5. Evaluation

This phase mainly involves final test of the entire project. Important information or feedback will be gathered from users by completing survey after they use the system.

1.6 Significance of Project

The completion of this project can enhance the interest in learning solar system among Year 3 primary students. Students also can increase their knowledge of solar system using digital platforms anytime and anywhere.

1.7 Expected Outcome

The expected outcome of this project is an e-learning solar system for primary school year 3 students. It will increase students interest in solar system subject. Furthermore, it offers

an e-learning system comprised of information and exercises based on the Kurikulum Standard Sekolah Rendah (Semakan 2017) syllabus that incorporates game-based elements related to the solar system.

1.8 Project Report Outline

Throughout this project, there will be six chapters that are going to be completed. The six chapters are explained as below:

1. Chapter 1: Introduction

   This chapter presents a general view of the project to the audience to know the purpose of conducting this project and how important it is to society. It will cover the introduction of the project, problem statement, project scope, aims and objective, brief explanation of the methodology that will be used to conduct the project, significance of project and project expected outcome.

2. Chapter 2: Literature Review

   The Literature Review chapter will involve an overview of the research on existing systems that are very similar to those related to this project. There are three existing systems that will be reviewed in this chapter. A comparison of the three systems will be done to produce a better solution for E-Learning Solar System.

3. Chapter 3: Methodology/Requirement Analysis and Design

   Methodology approach for this project will be described futher in this chapter. Besides, analysis of the questionnaire from the target users among primary school teachers will be used to design the project. The project requirements and system design of the E-Learning Solar System for Primary School Year 3 Students will be shown.

4. Chapter 4: Implementation

   The development configuration will be presented, including how it works in the development of this project. The tools are Notepad++, Scratch 3 and XAMPP Control Panel. This chapter also will present the implementation of interface design where each module of the web application will be described.

5. Chapter 5: Testing

   The testing process of E-Learning Solar System will be discussed in this chapter. The web application will be tested to find any error or bugs and check the functionality of the application that should be improved. The testing chapter will also cover functional and non-functional testing.

6. Chapter 6: Conclusion and Future Work

   The overall progress and work done throughout the project will be reviewed and it will be summarized in this chapter. The conclusion includes the achievement of the project, its limitation and any available opportunity for future work that can be carried out as an extension of this project.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Nowadays, there are few similar Solar System web learning systems that have been released. Each system have its own features, functionality and designs. Literature review on existing systems is important before implementing the e-Learning Solar System for Primary School Year 3 Students to produce a better result. This chapter discussed existing solar system web learning systems,tools and technology which consist of software and hardware. The existing system will be compared in terms of features and also review on the proposed project.

2.2 Overview of Objectives

Analyse the current system of web learning applications about solar system Year 3 Primary School is one of the project's objectives. There are three similar existing systems to be reviewed in this chapter which are Space Place, Enchanted Learning-Our Solar System and Space for Kids. Features in each system are also will be compared to analyse the strengths and the weaknesses.

2.3 Review on Similar Existing Systems

2.3.1 Space Place
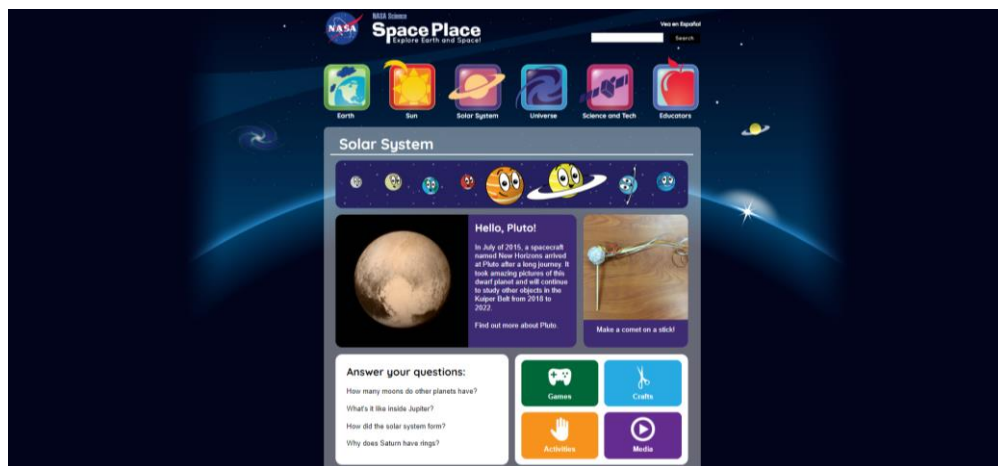
Figure 2. 1 Main page of Space Place Web Learning (NASA, 1998)

Space Place is a solar system web-based learning that created for kids, and it was published by The National Aeronautics and Space Administration (NASA). This website engages upper-elementary-age children (9-12 years old) in astronomy through videos, informative article , interactive games and fun activities. It is

accessible on web application only. Figure 2.1 shows the main page of Space Place which the menu is listed horizontally with pictures attached and it is displayed on each page (not only at the main page). It includes topics related to space such as information about the earth, the sun, the universe, the solar system (planets) and science and technology. Each topic user can choose a subtopic of the solar system such as Earth and Sun. Figure 2.1 also displays the layout page for each topic include informative notes, games, activities, crafts and media. Each features are brief further below.
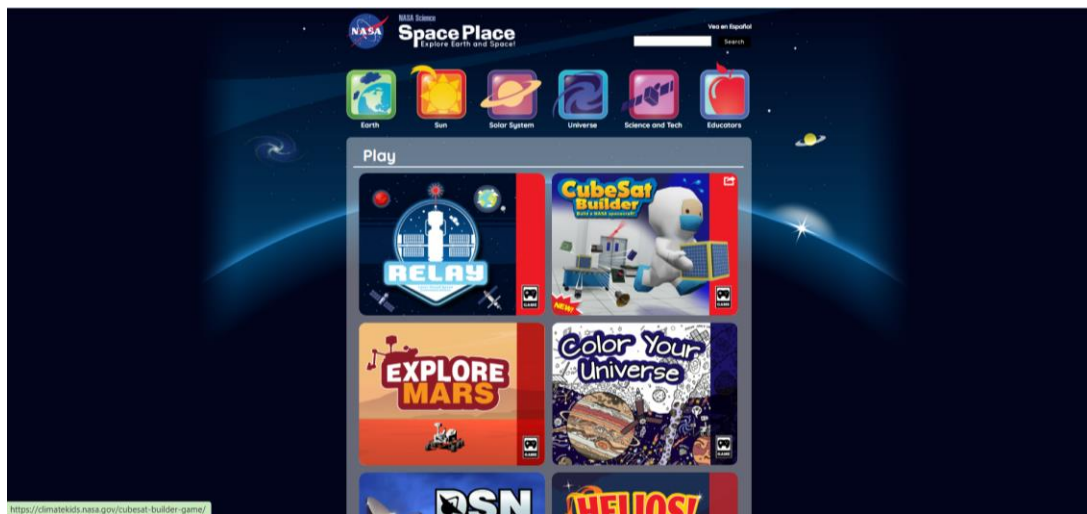
Figure 2. 2 Games in Space Place

Space Place provides interactive games as shown in Figure 2.2. It depicts a few games. Each game was came with game instructions and additional information which related with the game as shown in Figure 2.3 below.
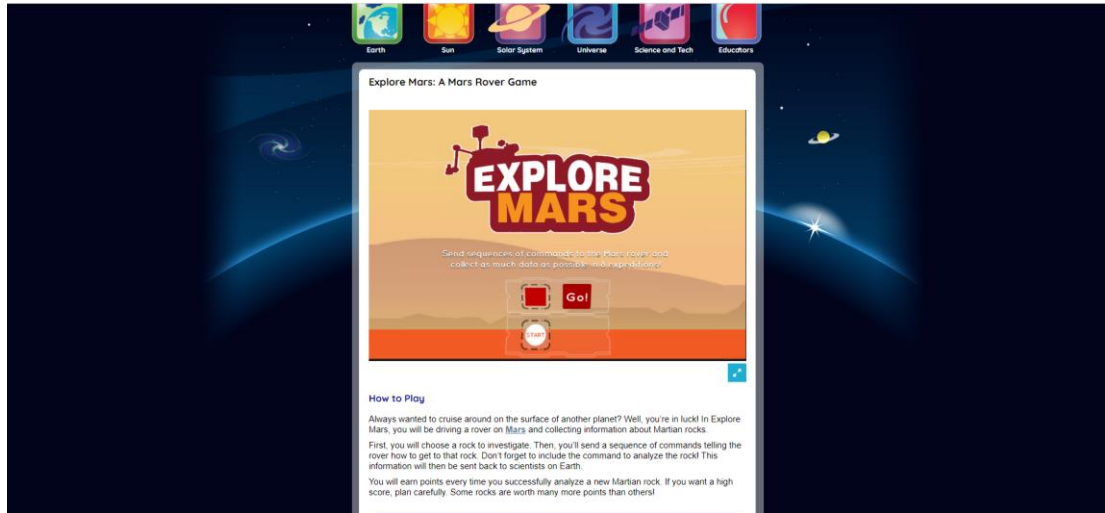
Figure 2. 3 Explore Mars Game

The game instructions can help user to understand how to play the game and the additional information can increase users knowledge indirectly. The game also includes visuals and sound.
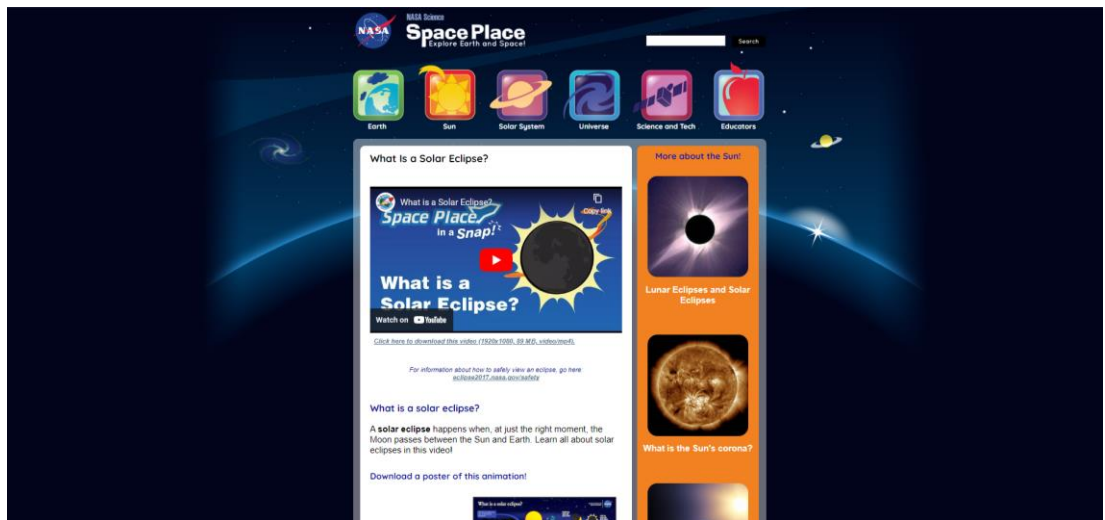
Figure 2. 4 Media Section in Space Place

For media section, its contains short videos and informative posters as shown in Figure 2.4 and user be able to download the informative posters provided. Other than that, the web learning provides crafts and hands-on activities that users can do it physically by following the guidelines given as depicted in Figure 2.5 below,
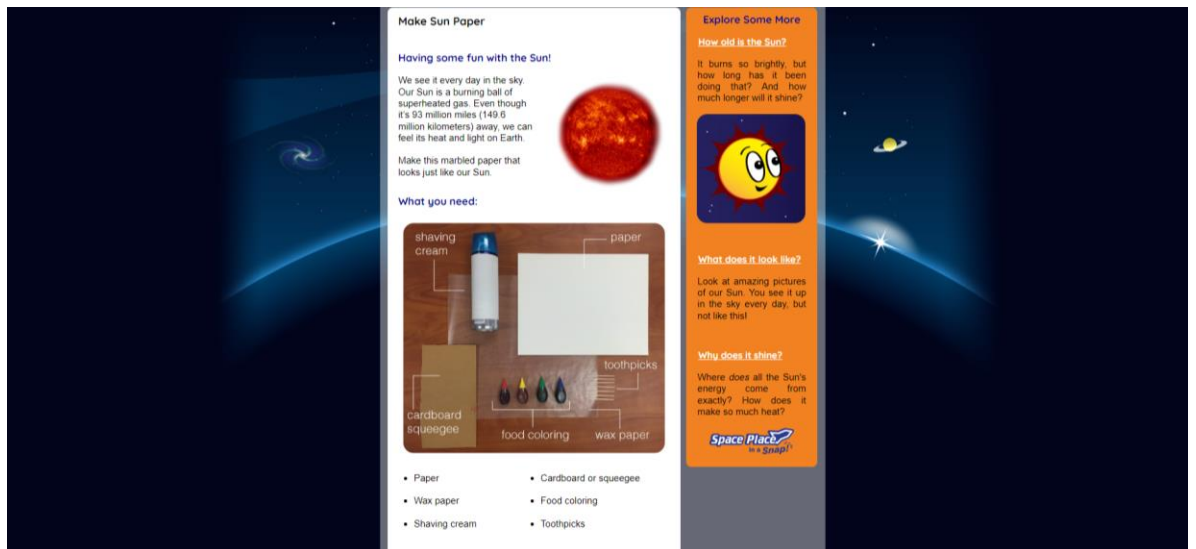
Figure 2. 5 Crafts Section in Space Place

In addition, Space Place include Parents and Educators section and it also provides features same as each topic such games, videos and craft activities for teaching aids as Figure 2.6 below.

Figure 2. 6 Parents and Educators Section in Space Place

This section has a list of NASA resources where parents and educators can directly go to the specific website provided by NASA. Moreover, users can choose language preference, either English or Spanish and a search feature is available too.

2.3.2 Enchanted Learning-Our Solar System

Figure 2. 7 Main Page of Enchanted Learning-Our Solar System(Enchanted Learning, n.d.)

Enchanted Learning-Our Solar System is used to make learning fun and facilitate the users to get resources about solar system for elementary school. Figure 2.6 shows the main page of the system that allows user to choose topics at the upper of the site. Then, there are notes related to the topic that have been selected under the list of the content.

This web learning provides information about astronomy, classroom activities, tutorials, games and crafts. Each elements are brief further below. Topics that have been covered in this website are The Sun, The Moon and The member of Solar System and present it through text, images and animation elements.

Figure 2. 8 Tutorial in Enchanted Learning-Our Solar System

Figure 2.8 shows tutorial section which the user needs to answer questions by choosing the correct answer. Besides, it provides information regarding the question and shows score at the upper of the site.

Figure 2. 9 Puzzle Game in Enchanted Learning-Our Solar System

This web learning also provides game-based element to attract user interest in astronomy, as shown in Figure 2.9 and it apply to all solar system members topic. The user needs to complete the puzzle with answer the questions correctly and a picture will appear. This game indirectly increases user knowledge by playing the game. In addition, it also has search feature to facilitate users to find keywords on the website.
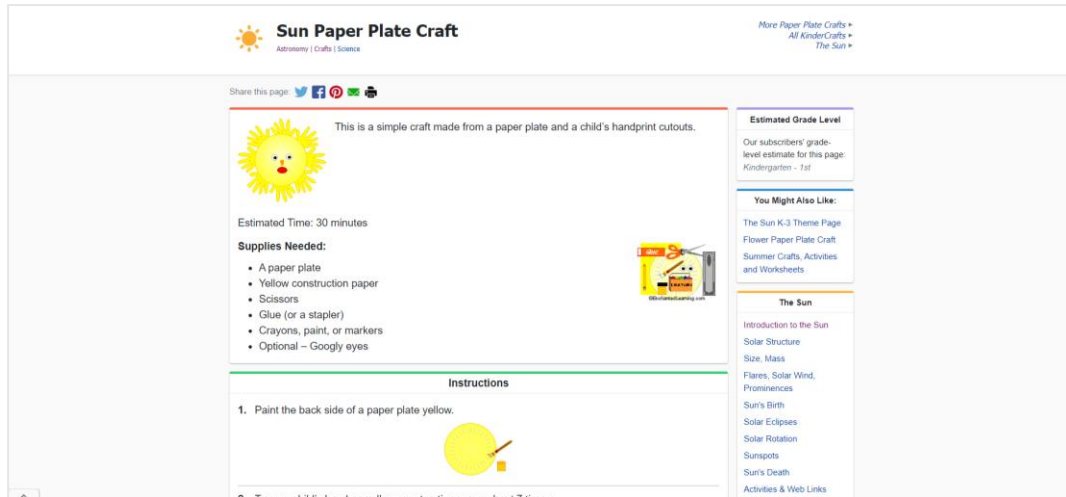
Figure 2. 10 Crafts in Enchanted Learning-Our Solar System

For craft activitiy section, it provides hands-on activities that user can do it physically by following the instruction as represented in Figure 2.10. Each craft activity has an instructions and guidelines, a picture of craft and each step includes pictures.

2.3.3 Space for Kids
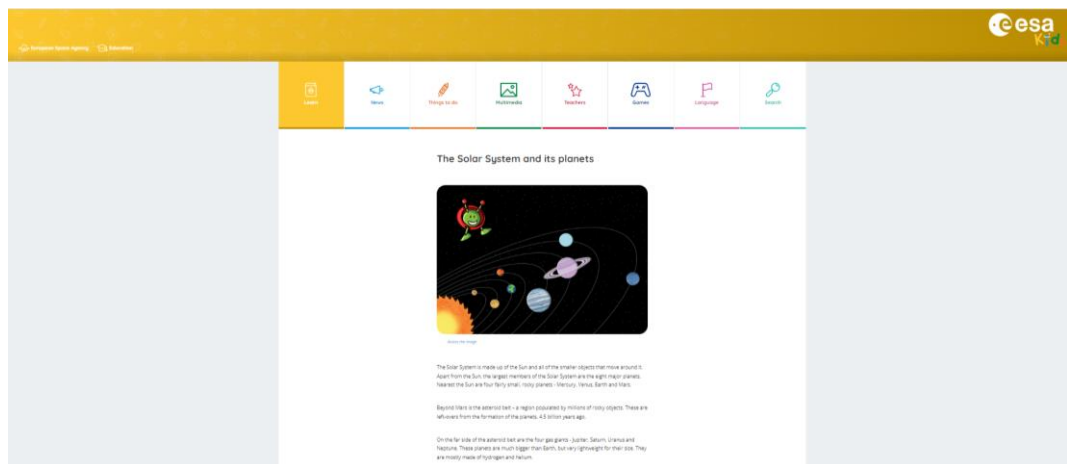
Figure 2. 11 Main page of Space for Kids(ESA, 2020)

Space for Kids is a web-based learning for kids published by The European Space Agency (ESA). This website kids aged between 6 and 12 and provides solar system learning that is suitable for kids, news of solar system, animations, interactive games and a list of contest organised by ESA. It also provides web and mobile

application platform. Multimedia that offered by Space for Kids are text, images, videos and animation.
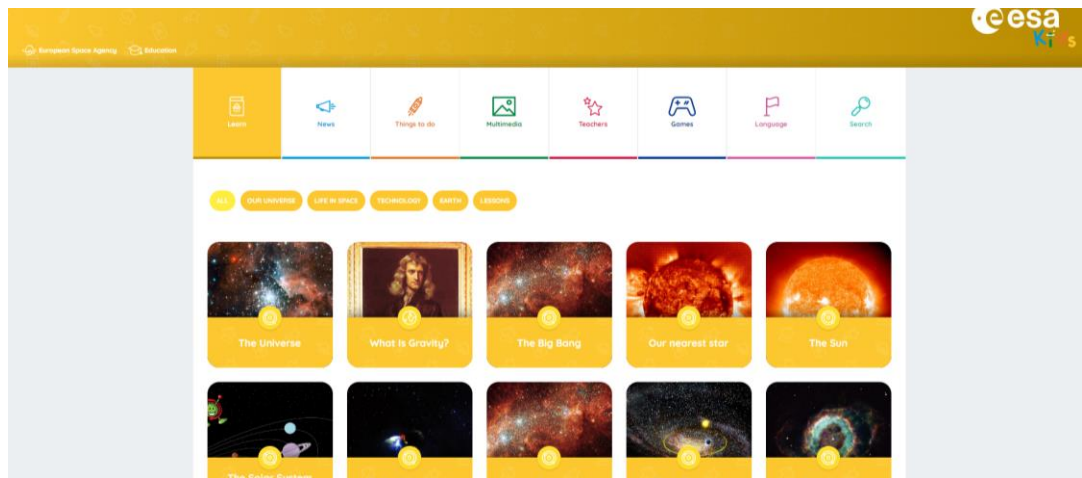
Figure 2. 12 Learn Section in Space for Kids

Figure 2.12 illustrates Learn section that contains topics related to the solar system. Users can filter topics by choosing the listed title division and the system will list topics that had been chosen. Each topic layout has a title, image and content.
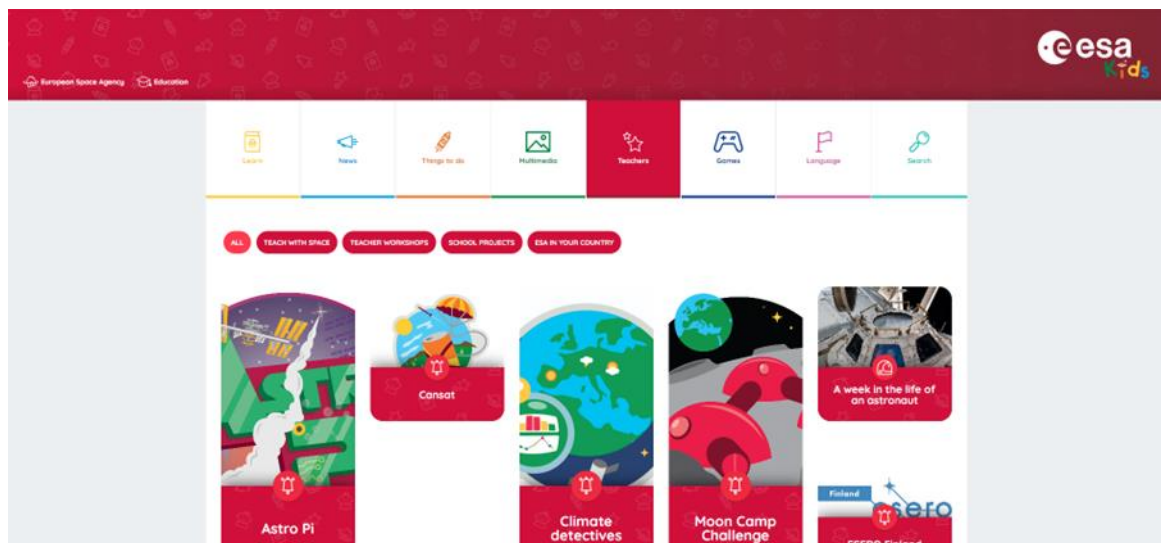
Figure 2. 13 Teachers Section of Space for Kids

Space for Kids also offers learning tools for class activity in Teacher's section as display in Figure 2.13. Each topic under Teacher section will direct the user to ESA official websites and it offers classroom activities, and competition and training ads.
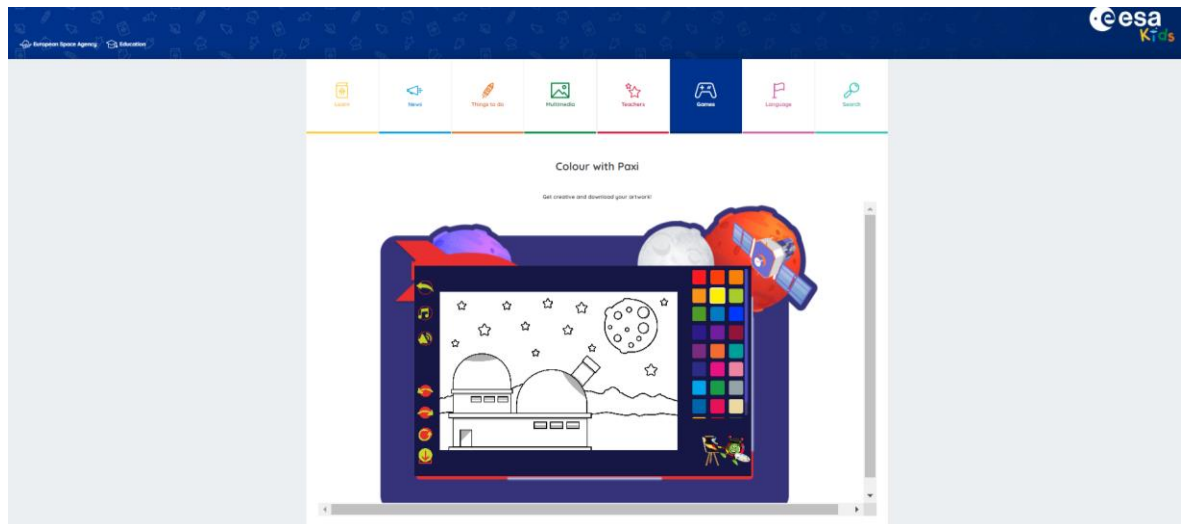
Figure 2. 14 Games in Space for Kids

Moreover, this web learning offers games that can increase user's interest in solar system such matching Milky Way, colouring, Space Memory, Space Cleanup and Catch the Craft. One of the games is Colour with Paxi as shown in Figure 2.14. Users need to colour the sketch by selecting the colour and part of the sketch. Each game also has sound and background musics. In addition, the users can choose language preferences such as German and Spanish and they also able to search keywords.
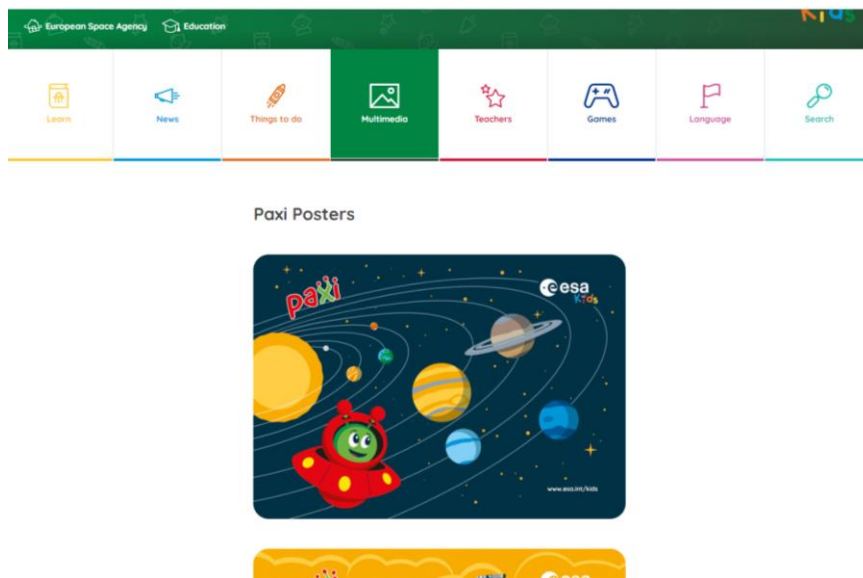
Figure 2. 15 Multimedia in Space for Kids

In Multimedia section, its content media materials such as posters, videos and images. Figure 2.15 shows an example of media in Multimedia section.

2.3.4   Table of Comparison

Table 2. 1 Comparison of the features of the existing system

Application / Features	Space Place	Echanted Learning-Our Solar System	Space for Kids	Proposed System
Notes	/	/	/	/
Picture	/	/	/	/
Video	/		/	/
Game	/	/	/	/
Quiz		/		/
Language	English /Spanish	English	English/Spanish/ German/	Malay
Animation	/	/	/	/
Account Login/ Registration				/
User Profile				/

The comparison table as shown in Table 2.1 invloves 3 existing systems with the proposed system. The existing systems are Space Place, Enchanted Learning-Our Solar System and Space for Kids. The features and multimedia elements that have been compared are notes, image, video, game, quiz, language, animation, account login and registration and user profile.

2.3.5   Review of the Proposed System

Existing systems have been compared to ease the purpose of planning and developing the proposed project, e-Learning Solar System for Primary School Year 3 Students in

Table 2.1. The comparison is made according to the features and multimedia elements available in each of the existing systems. E-Learning Solar System is develop for Primary Year 3 students, who are considered novices in learning about the solar system. Features and multimedia elements of existing systems are helpful in the selection of attributes for the proposed system by analysing the advantages and disadvantages of each system.

Table 2.1 shows that Space Place and Sapce Kids do not have a quiz feature and Enchanted Learning-Our Solar System does not have a video. These systems also do not have Malay language features. Therefore, the proposed system will combine all the features and multimedia elements that are available in the existing systems. In addition, the content of the proposed system will refer to syllabus of Sciences Primary School Year 3 (Kurikulum Standard Sekolah Rendah).

Based on the analysis and research, all features serve a purpose in the e-Learning Solar System. One of the goals of developing this system is to make it easier for students to access online learning, particularly solar system notes. The notes will be implemented by using multimedia elements such as image, video and animation. These multimedia elements are applied to improve the visual aspects of the system for target user. Selection of game and quiz features in the proposed system is to apply an interactive learning approach to the user. Next, the Malay language is implemented because Malaysian education uses the Malay language in Science subjects in primary school including textbooks. Lastly, account login, registration and user profile features are added to the proposed system.

2.4   Summary

In conclusion, this chapter is about literature review based on a comparison of three existing systems. A table is created to compare features among the existing systems. The comparison of existing systems and review on tools and technology are utilised for the proposed project development.

CHAPTER 3: METHODOLOGY

3.1   Introduction

In this chapter, the methodology of the proposed project, which is e-Learning Solar System for Primary School Year 3 Students will be discussed. The analysis and design phases will be explained in detail. This chapter is to produce the user and system requirement in order to design the system.

3.2   Methodology

ADDIE model is used as methodology to develop the propsosed system, e-Learning Solar System for Primary School Year 3 Students. The ADDIE model is a learning development model and an instructional design methodology. It provides a systematic, iterative process for determining training needs, designing instructional programs and materials, and evaluating their effectiveness (Bouchrika, I., 2022). The ADDIE model consists of analysis, design, development, implementation and evaluation phases, as shown in Figure 3.1.
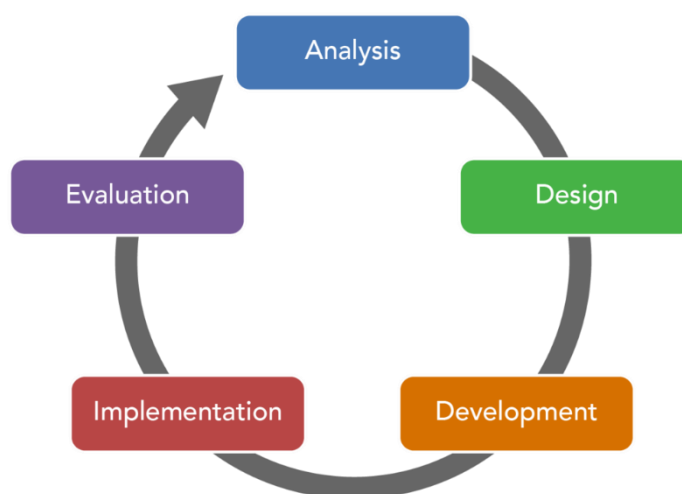
Figure 3. 1 ADDIE model

3.3   Analysis

In order to develop the proposed system, a survey is carried out to collect data and gather information from target respondents.

3.3.1 Questionnaire

The purpose of conducting survey is to clarify the problem statement and identify learner's existing knowledge. Since the scope of this project covers the population of primary school students, survey is distributed to primary school teachers to ensure a good response rate and receive higher engagement. The survey consisted of 8 questions and was distributed through a Google Form.The survey was conducted randomly among individuals who work as primary school teachers from different schools in Malaysia, and among them are teachers at SK Batu Berendam 2, SK Serkam, SK Matang Jelutong, SK Padawan and more. There were 42 respondents to this survey.

Section A

Question 1
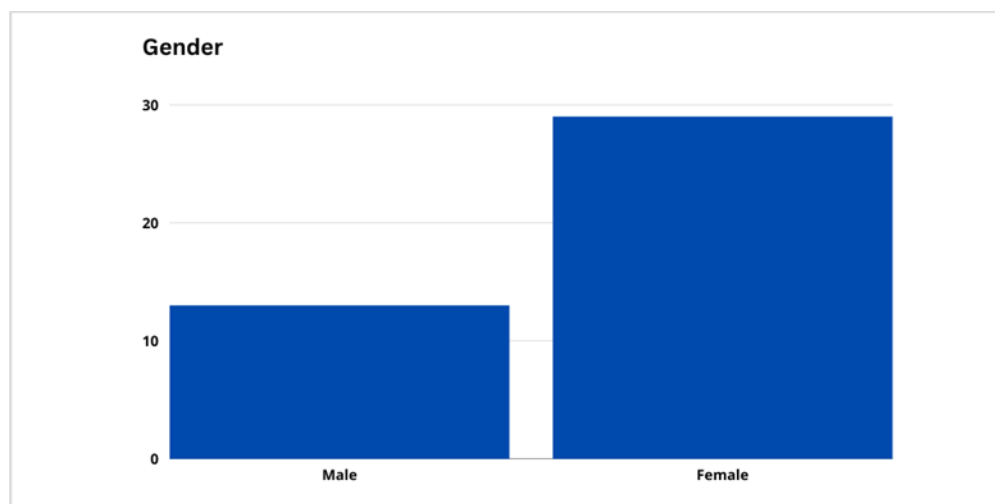
Figure 3. 2 Bar Chart of Respondents' Gender

Figure 3.2 shows number of respondents among female is more than male, which there are 29 female and 13 male.

Question 2
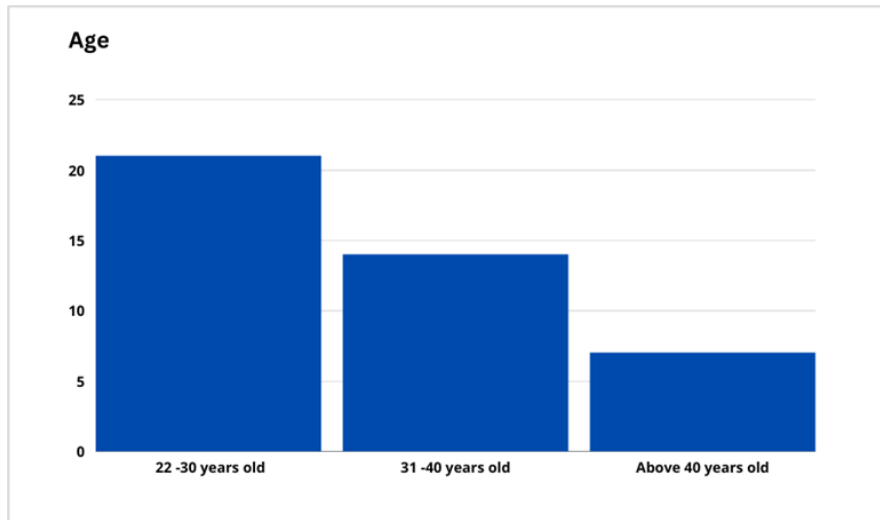
Figure 3. 3 Bar Chart of Respondents' Age

Figure 3.3 represents number of respondents by age range. The age range of the most respondents is 22-30 years old, which is a total of 21 teachers. Then, followed by 31 until 40 years old with 14 teachers and above 40 years old with 7 teachers.

Question 3
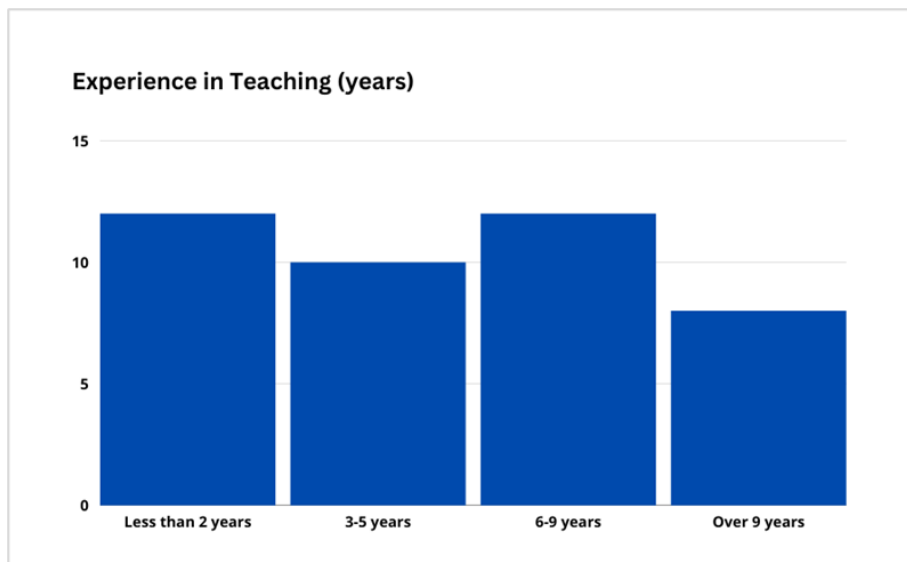
Figure 3. 4 Bar Chart of Respondents' Teaching Experience (years)

Based on Figure 3.4, number of respondents by experience in teaching are balanced. There were 12 respondents experience in teaching above 2 years and 6 until 9 years. Then, followed by 3 until 5 years with 10 respondents and over 9 years with 8 respondents. Different teaching period can get a different point of view on the survey conducted.

Question 4
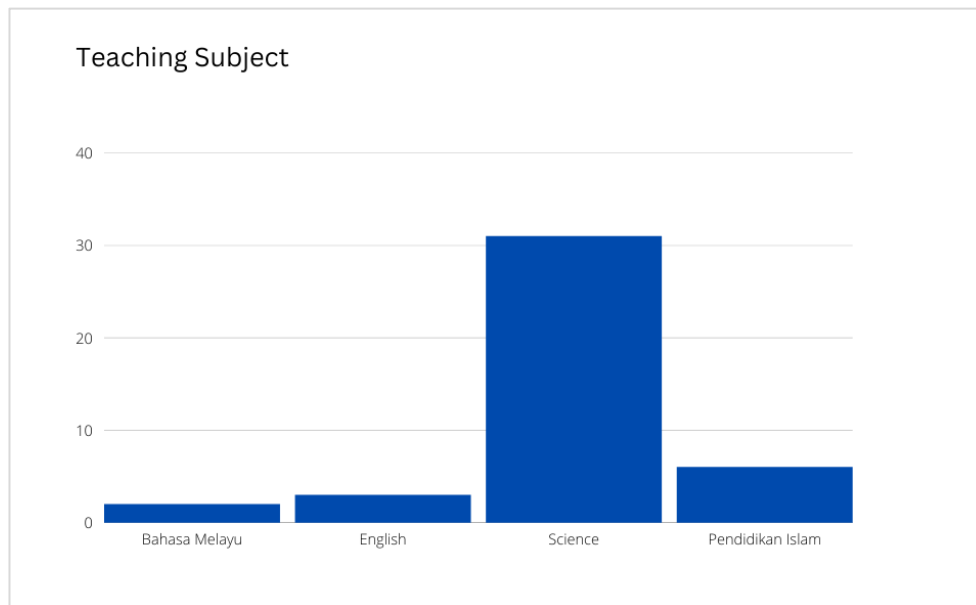
Figure 3. 5 Bar Chart of Teaching Subject

Based on the Figure 3.5, there were 31 respondents teaching Science subjects, 6 Pendidikan Islam teacher respondents, 3 English teacher respondents and 2 Bahasa Melayu teacher respondents. Approximately 74% of the respondents have specialised knowledge of the solar system in the primary school syllabus, which can increase the reliability of data collected for the questions in Section C.

Section B

Question 1
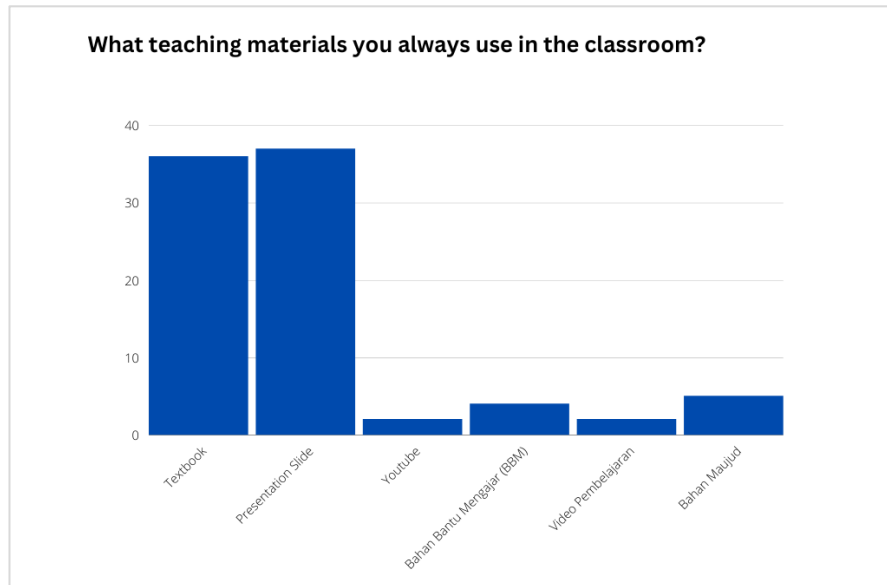
Figure 3. 6 Bar Chart of Teaching Materials Used

Figure 3.6 depicts that most respondents use presentation slides and textbooks as teaching materials, followed by Teaching Aids (Bahan Bantu Mengajar), Bahan Maujud and Learning Videos.

Question 2
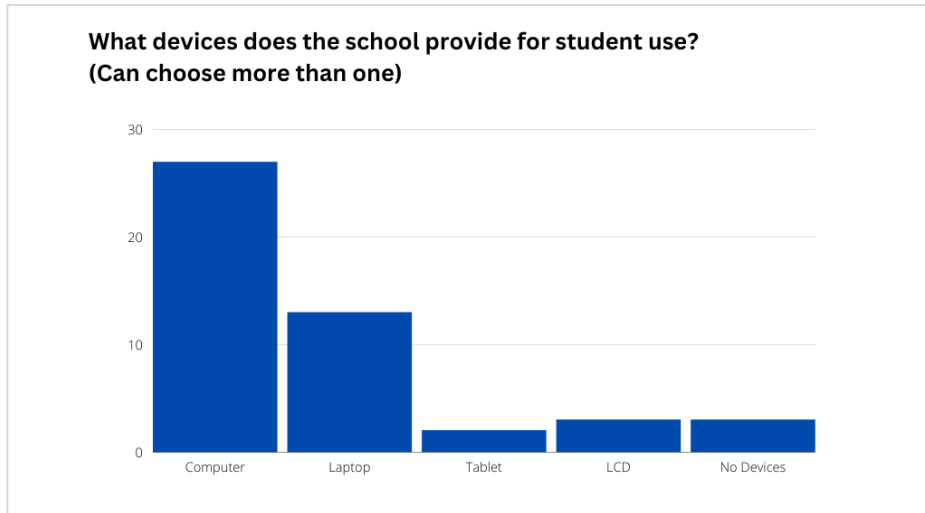
Figure 3. 7 Bar Chart of Deviced Provided by School for Students Use

Based on Figure 3.7, the higher number of devices provided by the school for students is a computer, with 21 respondents and laptops with 11 respondents. This shows that a web application system is suitable to develop instead of mobile-based. In addition, primary school in Malaysia does not allowed students to bring mobile phone to the school. It will make it difficult for students to use this application during the learning process at school.

Question 3
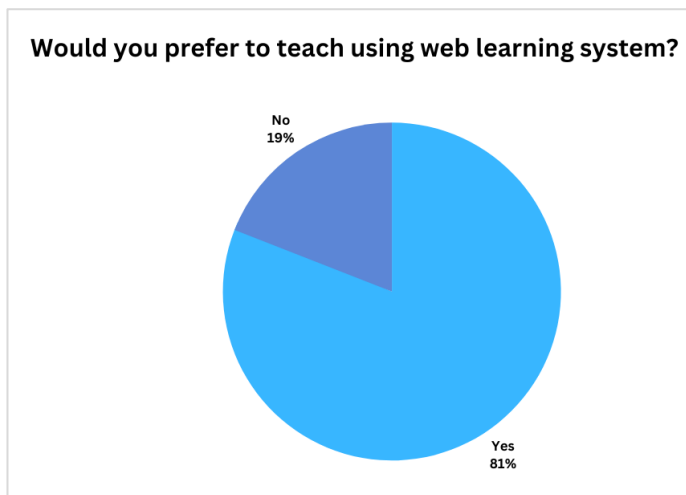
Figure 3. 8 Pie Chart of Preferrence Teach using Web Learning System

Based on Figure 3.8, 34 primary school teachers prefer using web learning systems in their teaching method.

Section C

Question 1
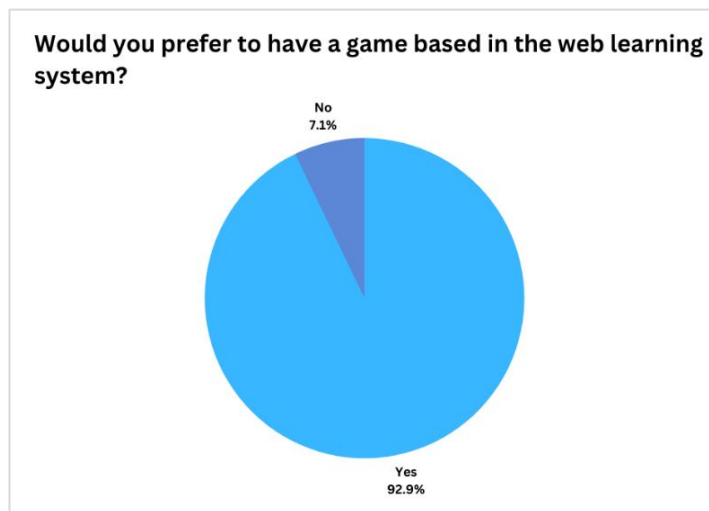
Figure 3. 9 Pie Chart of Preferrence Game Based element in Web Learning System

Based on Figure 3.9, 39 respondents preferred to have a game-based elements in the web learning system and only 3 did not prefer to. Game-based learning platforms will boost students' engagement, motivation and productivity, besides establishing learning activities that gradually teach subjects and lead users to achieve goals (Abd Rahman et al., 2022).

Question 2
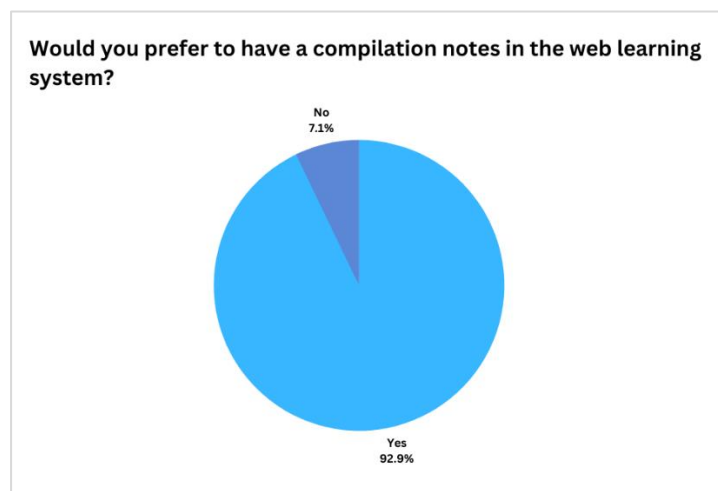
Figure 3. 10 Pie Chart of Preferrence Compilation Notes in Web Learning System

Based on Figure 3.10, 39 respondents preferred to have a compilation note in the web learning system and only 3 respondents did not prefer to it. Compilation notes make it easier for students to access notes via the online platform.

Question 3
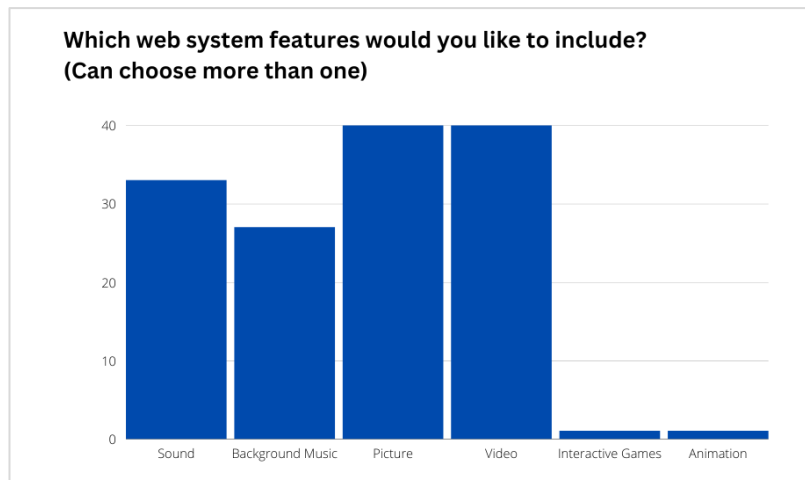
Figure 3. 11 Bar Chart for Question 7

Based on Figure 3.11, there are a few features that respondents would like to include in the web learning system. The three highest features that were chosen are picture and video (40 respondents), sound (33 respondents) and background music (27 respondents). This can help the developer to set features for the system that are suitable for primary school students.

Question 4
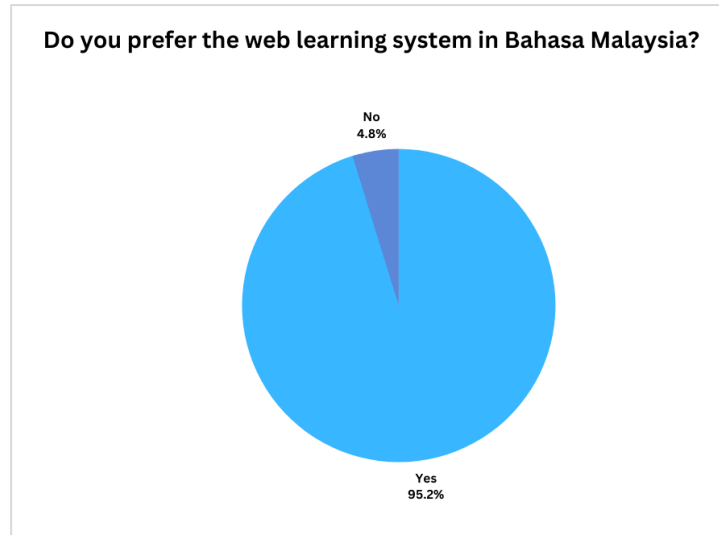
Figure 3. 12 Pie Chart of Preferrence Web Learning System in Malay

Based on Figure 3.12, 40 respondents preferred the web learning system developed in Malay language and only 2 respondents did not prefer it. Malay is the best language to be used in the system since the solar system topic in Science subject for primary school syllabus is in Malay. Malay language has been used in Malaysia education through the implementation of Kurikulum Baru Sekolah Rendah (KBSR) to enliven the Malay language as an intermediary for the communication of knowledge, science, culture and unity (Halim, 2020). Hence, it is important to used Malay language in the system to ensure that it is inline with the use of language in education.

Question 5
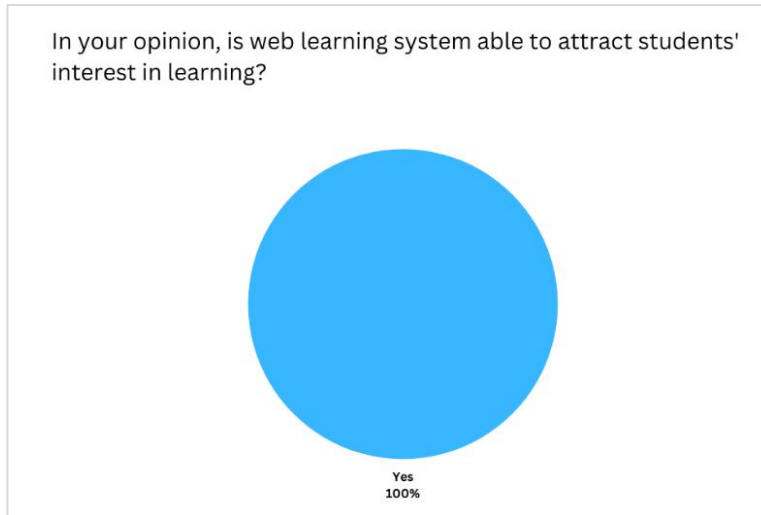
Figure 3. 13 Pie Chart for Question 9

Based on Figure 3.13, all respondents agreed that a web learning system could attract students' interest in learning compatible with digital era nowadays.

3.3.2 Characteristic of Learner

Characteristics of learners described what user requirements and learner's level to use this e-learning solar system for the best experienced. The followings are the user characteristic and the minimum requirements needed.

Table 3. 1 Characteristic of Learner

Characteristic	Requirement
Age	10 years old and above
Subject	Science
Education Stage	Primary School Year 3 and above

3.3.3 Functional Requirement

Functional requirements are system features that must be implemented to enable users to do the tasks:

•   Login account: The user can login to the web application by entering their email and password.

•   Account register: The unregistered user can register the account by fill in the credential information in order to login to the web application.

•   Edit user profile: The user can update their profile information by editing the credential information exclude email.

•   Download Document/Image: User can download learning material provided such any documents or images like posters.

•   Answer dan submit the Quiz answer: The user can answer and submit the answer after completing the quiz and the score will appear correctly.

•   View notes: The user will be able to see all of the resources that they wish to learn about.

3.3.4 Non-Functional Requirement

Non-functional requirement specifies the quality attribute of a software system and evaluates the system based on responsiveness, usability and other non-functional standards that are critical to the success of the software system (Matthew, 2023). The list below shows the non-functional requirements for e-Learning Solar System.

•   Reliability: The system must execute without error in less than 10 seconds for each page, include login and registration features, and display multimedia through an internet connection.

•   Availability: The system can be accessed throughout the week at any time during the day.

•   Usability: The user should be able to easily navigate the user interface and identify system features such as buttons.

3.3.4.1   Review on Tool and Technology

Software Requirement

Table 3. 2 Software Requirement for e-Learning Solar System

Software	Description
Xampp	Xampp is an open-source cross-platform web server solution stack package which provide the Apache web server. It allows user to develop, test, and build websites on local server. Xampp also a platform to test and verify the working of projects before released it using hosting.
PhpMyAdmin	PhpMyAdmin is database management tool written in PHP language to handle the administration of MYSQL over the web. PHP can interact with databases which can create, read, update and delete.
Notepad++	Notepad++ is a text and source code editor for use with Microsoft Windows. It supports tabbed editing, which allows working with multiple open files in a single window
Scratch Programming	Scratch is high-level block-based visual programming language. It used to create digital stories, games, and animations. Projects can be exported to HTML5, Android apps, Bundle (macOS) and EXE files using external tools.

Hardware Requirement

Hardware requirement is minimum criteria of hardware needed to develop e-Learning Solar System.

Table 3. 3 Hardware Requirement for e-Learning Solar System

Hardware	Requirement	Description
Processor	Intel i3 and above	For a better effectiveness, processor higher than Intel Core i3 is needed.

Random Access Memory	4 GB and above	The laptop must have at least 4 GB RAM to ensure the performance of system running smoothly.
Graphic Processing Unit	1 GB and above	To ensure the result output to be generated in a short time, minimum 1 GB is needed.

3.4   Design

The proposed project is specifically designed for the user in primary school Year 3 students. Thus, the design phase will include lesson planning, content, flowchart, use case diagram, activity diagram and interface design.

3.4.1   Lesson Planning

Lesson Planning or Rancangan Pengajian Harian(RPH), term used by Ministry of Education Malaysia, is important things in this project to make sure the project achieves the learning goals. It follows the guidelines provided by the Ministry of Education Malaysia (Office of the Director General of Education Malaysia, 1999). The lesson planning involves theme, standard content, target learner, learning objective and success criteria as listed in Table 3.4 below:

Table 3. 4 Lesson Planning

Theme	Earth and Space
Standard Content	Solar System

Target Learner	Primary School Year 3 Students
Learning Objective	Students be able to: 1. List the seven members of the Solar System. 2. Stating the position of the planet from the Sun affects the temperature difference. 3. State that the planets move around the Sun according to orbit. 4. Conclude the relationship between the planets from the sun and the time the planets revolve around the sun.
Success Criteria	Students can: 1. State the centre of the Solar System and name the seven members of the Solar System. 2. Order the planets in the solar system and state that the planets revolve around the Sun according to their respective orbits 3. Conclude that planets that are close to the Sun are hotter than planets that are far from the Sun. 4. Building Solar System Models creatively and innovatively.

3.4.2   Content of Lesson

Table 3.5 shows the list of subtopics and learning styles used in the system.

Table 3. 5 List of Subtopic and Learning Style

Unit/Subtopic	Learning Style		
	Visual	**Auditory**	**Kinesthetic**
Solar System: • Members of the Solar System • Planet Temperature • Orbit of Planet • Time of Planetary Circulation	• Picture • Video • Note	• Sound • Music	• Quiz • Game

3.4.3 Activity Diagram

Activity diagram is an important diagram in modelling a system. It can depict activities (sequential and concurrent), the data objects consumed or produced by them, and the execution order of different actions(Ahmad et al, 2019).
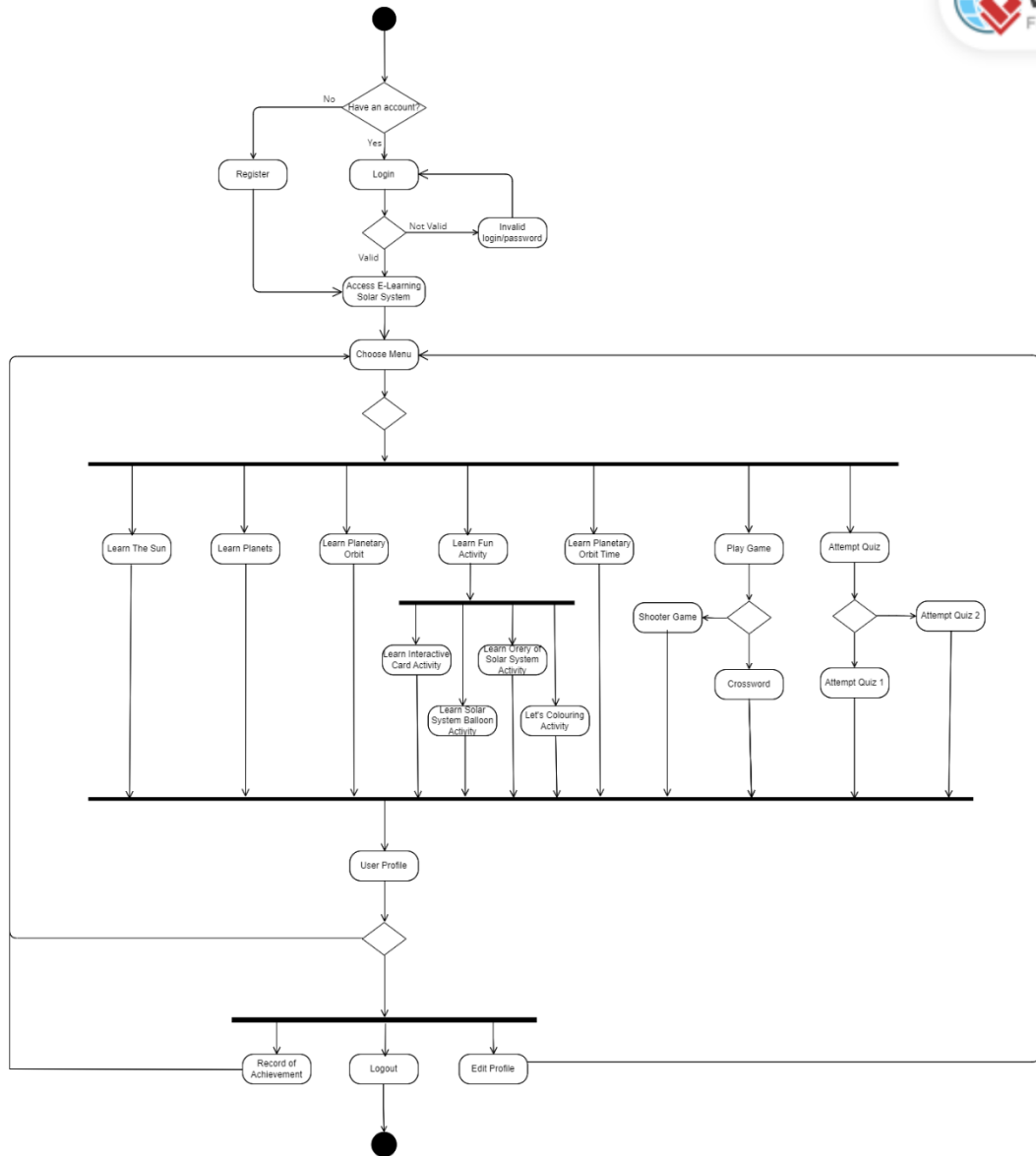
Figure 3. 14 Activity Diagram

The execution of the activity diagram begins with start node, which directs to the decision node shape like diamond login page with two outgoing edges which is login or register account. For login node, if the input invalid, it will execute to invalid email or password node. But, if the input is valid, it will directs to access e-Learning Solar System node. For register node, the user will directs to the system once complete the registration process. Next, the node will continue to choose

menu where it will execute to the decision node which user need to choose nodes listed. The nodes are Learn The Sun, Learn Planets, Learn Planetary Orbit, Learn Planetary Orbit Time, Learn Fun Activity, Play Game and Attempt Quiz. Then, the Learn Fun Activity node will execute to Learn Interactive Card Activity node, Learn Solar System Balloon Activity, Learn Orery of Solar System Activity and Let's Colouring Activity. For Play Game node, it will excute to the decision node with two outgoing edges, which are Shooter Game and Crossword Game. Moreover, attempt Quiz also will execute to the decision node with two outgoing edges, which are Quiz 1 and Quiz 2. Next, through all the menus, the user can direct to user profile node. The node will continue to the decision node which user need to choose nodes either execute to record of achievement, edit profile, choose menu or log out nodes. The edit profile and record of achievement nodes can directs to choose menu node. Lastly, the log out node complete the activity diagram by reaching the end node.

3.4.4　Use Case Diagram
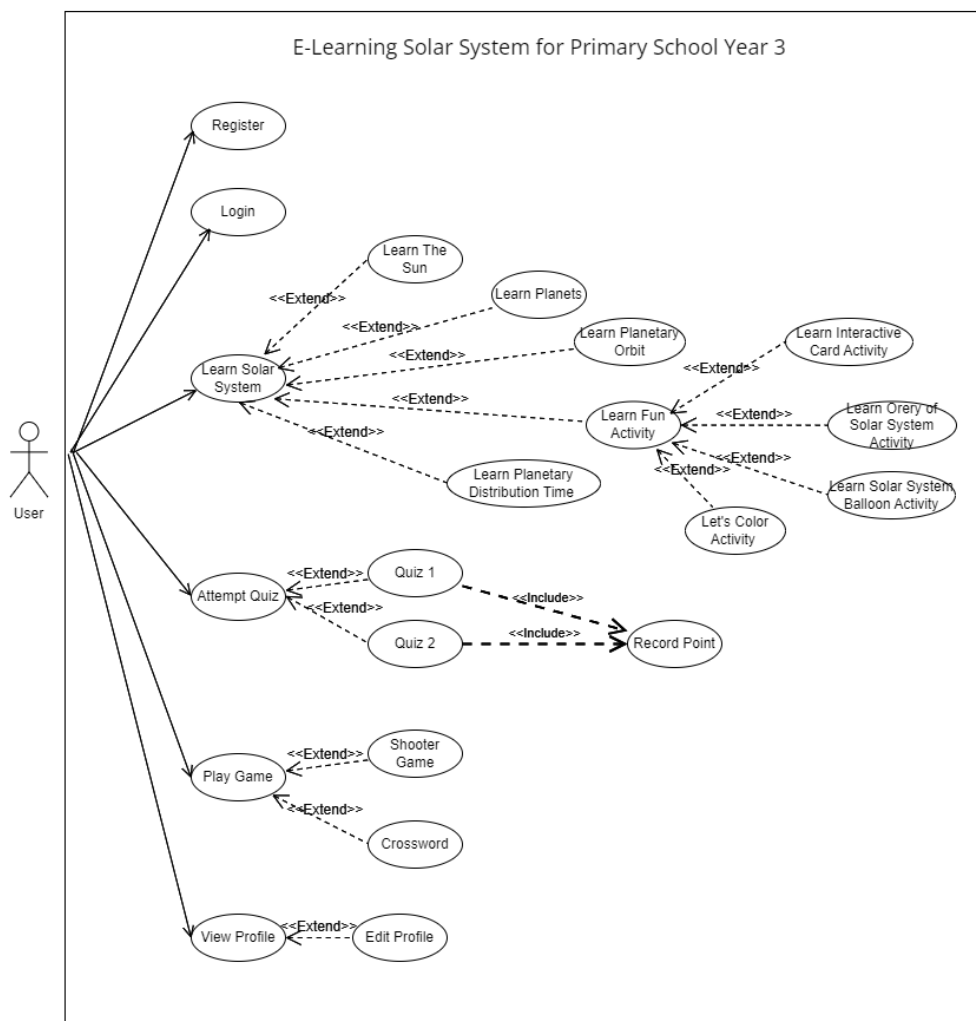
Figure 3. 15 Use Case diagram of e-Learning Solar System

Figure 3.15 shows the use case diagram for the proposed project. The use case diagram shows the interaction between the user and the system. The details of each use case will explain below.

Use Case 1

Table 3. 6 Use Case Login

Use Case Name	Login
Summary	User be able to login to access the system by entering email and password.
Persona	User
Pre-Condition	User entering email and password.
Description of Main Sequence	i. User enters email and password in fields provided. i. User clicks the login button.
Description of Alternative Sequence	If the user not registered yet, the user can click the registration hyperlink to register account.
Post Condition	The user directed to main page of the system.

Use Case 2

Table 3. 7 Use Case Register

Use Case Name	Register
Summary	Unregistered user be able to register in order to login the system by filling the credential information.
Persona	User
Pre-Condition	User filling credential information
Description of Main Sequence	i. User filling credential information in fields provided. ii. User clicks the register button.

Description of Alternative Sequence	The user be able to reset the fields provided.
Post Condition	The user directed to main page of the system.

Use Case 3

Table 3. 8 Use Case Learn Solar System

Use Case Name	Learn Solar System
Summary	When the user enters the system, the screen will display all the menu or choices in learning solar system. They can choose one of the learning activities to proceed with the learning process.
Persona	User
Pre-Condition	User selects one of the learning subtopics or activities to start the learning process.
Description of Main Sequence	i. User opens the e-Learning Solar System website. ii. User chooses one of the listed menu. iii. User can go to user profile page by clicking the user profile icon.
Description of Alternative Sequence	If the user does not prefer to proceed with other lesson, user can stay at the main page by viewing the overview of the solar system.
Post Condition	The selected learning subtopic will be displayed on the screen.

Use Case 4

Table 3. 9 Use Case Learn The Sun

Use Case Name	Learn The Sun
Summary	After the user click "The Sun" button, the screen will display learning about the Sun.
Persona	User
Pre Condition	User click "The Sun" menu button.
Description of Main Sequence	i. User will directed to The Sun lesson after clicking The Sun menu button ii. The system will show the Sun notes which include text and graphics. iii. The user need to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to The Sun page successfully.

Use Case 5

Table 3. 10 Use Case Learn Planets

Use Case Name	Learn Planets
Summary	After the user click "Planets" menu button, the screen will display learning about Planets.
Pre Condition	User click "Planets" menu button
Persona	User

Description of Main Sequence	i. User will directed to Planets lesson after clicking Planets menu button
	ii. The system will show Planets notes which include text and graphics.
	iii. The user need to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon.
	ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to Planets page successfully.

Use Case 6

Table 3. 11 Use Case Learn Planetary Orbit

Use Case Name	Learn Planetary Orbit
Summary	After the user click "Planetary Orbit" menu button, the screen will display learning about Planetary Orbit.
Pre Condition	User click "Planetary Orbit" menu button
Persona	User
Description of Main Sequence	i. User will directed to Planetary Orbit lesson after clicking the menu button
	ii. The system will show Planetary Orbit notes which include text and graphics.

	iii. The user need to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon.
	ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to "Planetary Orbit" page successfully.

Use Case 7

Table 3. 12 Use Case Planetary Distribution Time

Use Case Name	Learn Planetary Distribution Time
Summary	After the user click "Planetary Distribution Time" menu button, the screen will display learning about Planetary Distribution Time.
Pre Condition	User click "Planetary Distribution Time" menu button
Persona	User
Description of Main Sequence	i. User will directed to Planetary Distribution Time lesson after clicking the menu button
	ii. The system will show Planetary Distribution Time notes which include text and graphics.
	iii. The user need to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon.
	ii. User can go to user profile page

	by clicking the user profile icon.
Post Condition	The user directed to "Planetary Distribution Time" page successfully.

Use Case 8

Table 3. 13 Use Case Fun Activity

Use Case Name	Learn Fun Activity
Summary	After the user click "Fun Activity" menu button, the system will display Fun Activity options. User can choose one of the Fun Activity to navigate to the specific activity.
Persona	User
Pre Condition	User click "Fun Activity" menu button
Description of Main Sequence	i. User will be directed to Fun Activity options after clicking the menu button ii. The system will show listed Fun Activity which include text and graphics. iii. The user need to click one of the option to go to the specific page.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. User can go to user profile page by clicking the user profile icon.
Post Condition	Listed Fun Activities will be shown with text and picture.

Use Case 9

Table 3. 14 Use Case Interactive Card Activity

Use Case Name	Learn Interactive Card Activity
Summary	After the user click "Interactive Card Activity" option in "Fun Activity" page, the screen will display learning about Interactive Card Activity.
Persona	User
Pre Condition	User click "Interactive Card Activity" option button
Description of Main Sequence	i. User will directed Interactive Card Activity lesson after clicking the option button ii. The system will show guidance of Interactive Card Activity which include text and graphics. iii. The user need to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to "Interactive Card Activity" page successfully.

Use Case 10

Table 3. 15 Use Case Learn Solar System Balloon Activity

Use Case Name	Learn Solar System Balloon Activity
Summary	After the user click "Solar System Balloon Activity" option in "Fun Activity" page, the screen will display learning about Solar System Balloon Activity.
Persona	User
Pre Condition	User click "Solar System Balloon Activity" option button
Description of Main Sequence	i. User will directed to Solar System Balloon Activity lesson after clicking the option button ii. The system will show guidance of Solar System Balloon Activity which include text and graphics. The user need to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to "Solar System Balloon Activity" page successfully.

Use Case 11

Table 3. 16 Use Case Orery of Solar System Activity

Use Case Name	Learn Orery of Solar System Activity
Summary	After the user click "Orery of Solar System Activity" option in "Fun Activity" page, the screen will display learning about Orery of Solar System Activity.
Persona	User
Pre Condition	User click "Orery of Solar System Activity" option button
Description of Main Sequence	i. User will directed to Orery of Solar System Activity lesson after clicking the option button ii. The system will show guidance of Orery of Solar System Activity which include text and graphics. iii. The user need to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to "Orery of Solar System Activity" page successfully.

Use Case 12

Table 3. 17 Use Case Let's Colour Activity

Use Case Name	Lets' Colour Activity
Summary	After the user click "Let's Colour Activity" option in "Fun Activity" page, the screen will display posters for colouring.
Persona	User
Pre Condition	User click "Let's Colour Activity" option button.
Description of Main Sequence	i. User will direct to Let's Colour Activity after clicking the option button. ii. The system will display colouring posters and the user be able to download the posters. iii. The user needs to click other menu button to go to the specific other lessons.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to "Let's Colour" page successfully.

Use Case 13

Table 3. 18 Use Case Attempt Quiz

Use Case Name	Attempt Quiz
Summary	After the user click "Quiz" menu button, the system will display Quiz options. User can choose one of the Quiz to navigate to attempt the quiz.
Persona	User
Pre Condition	User click "Quiz" menu button
Description of Main Sequence	i. User will be directed to Quiz options after clicking the menu button ii. The system will show listed Quizzes which include text and graphics. iii. The user need to click one of the option to go to the specific page.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. User can go to user profile page by clicking the user profile icon.
Post Condition	Listed Quizzes will be shown with text and picture.

Use Case 14

Table 3. 19 Use Case Attempt Quiz 1

Use Case Name	Attempt Quiz 1
Summary	After the user click "Quiz 1" option in "Quiz" page, the screen will display Questions for Quiz 1.
Persona	User
Pre Condition	User attempt Quiz 1
Description of Main Sequence	i. User will directed to Quiz 1 after clicking the option button. ii. The system will show questions for Quiz 1. iii. The user need to answer the questions by clicking the radio buttons. iv. The user need to click complete button after completing the quiz.
Description of Alternative Sequence	i. User can repeat the quiz by clicking try again button. ii. User can go to main page by clicking home icon. iii. User can go to user profile page by clicking the user profile icon.
Post Condition	The score will be displayed.

Use Case 15

Table 3. 20 Use Case Attempt Quiz 2

Use Case Name	Attempt Quiz 2
Summary	After the user click "Quiz 2" option in "Quiz" page, the screen will display questions for Quiz 2.
Persona	User
Pre-Condition	User attempt Quiz 2
Description of Main Sequence	i. User will directed to Quiz 2 after clicking the option button. ii. The system will show questions for Quiz 2. iii. The user need to answer the questions by dragging the answer and drop it to the space provided. iv. The user need to click complete button after completing the quiz.
Description of Alternative Sequence	i. User can repeat the quiz by clicking the try again button. ii. User can go to main page by clicking home icon. iii. User can go to user profile page by clicking the user profile icon.
Post Condition	The score will be displayed.

Use Case 16

Table 3. 21 Use Case Play Game

Use Case Name	Play Game
Summary	After the user click "Game" menu button, the system will display Game

	options. User can choose one of the Game to navigate to play the game.
Persona	User
Per-Condition	User click "Play" menu button.
Description of Main Sequence	i. User will be directed to Play options after clicking the menu button. ii. The system will show listed Games which include text and graphics. i. The user needs to click one of the options to go to the specific page.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. i. User can go to user profile page by clicking the user profile icon.
Post Condition	Listed Games will be shown with text and picture.

Use Case 17

Table 3. 22 Use Case Shooter Game

Use Case Name	Shooter Game
Summary	After the user click "Shooter Game" menu button, the screen will display the game.
Pre Condition	User clicks "Shooter Game" menu button.
Persona	User
Description of Main Sequence	i. User will direct to the Shooter Game page after clicking the Shooter Game option.

	ii. The system will show the game and user will play the game.
	iii. User collecting points in the game.
	iii. The user exits the game.
Description of Alternative Sequence	i. User can repeat to play the gameif game over.
	ii. User can go to main page by clicking home icon.
	iii. The user needs to click other menu button to go to the specific other lessons.
	ii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to the Shooter Game page successfully.

Use Case 18

Table 3. 23 Use Case Crossword Game

Use Case Name	Crossword Game
Summary	After the user click "Crossword Game" menu button, the screen will display the game.
Pre Condition	User clicks "Crossword Game" menu button.
Persona	User
Description of Main Sequence	i. User will direct to Game page after clicking the Crossword Game option.
	ii. The system will show the

	game and user will play the game by inserting letter in each box.
Description of Alternative Sequence	i. User can go to main page by clicking home icon. ii. The user needs to click other menu button to go to the specific other lessons. iii. User can go to user profile page by clicking the user profile icon.
Post Condition	The user directed to Crossword game page successfully.

Use Case 19

Table 3. 24 Use Case Record Point

| Use Case Name	Record Point
Summary	Point will be recorded as the user submit the quiz answers.
Pre Condition	User answers the quiz.
Persona	User
Description of Main Sequence	i. User answers the quiz. i. User clicks submit button after completing the quiz.
Description of Alternative Sequence	i. User can repeat to answer the quiz. ii. User can go to main page by clicking home icon. i. User can go to user profile page by clicking the user profile icon.
Post Condition	The score of the quiz will be displayed.

3.4.5   Sequence Diagram
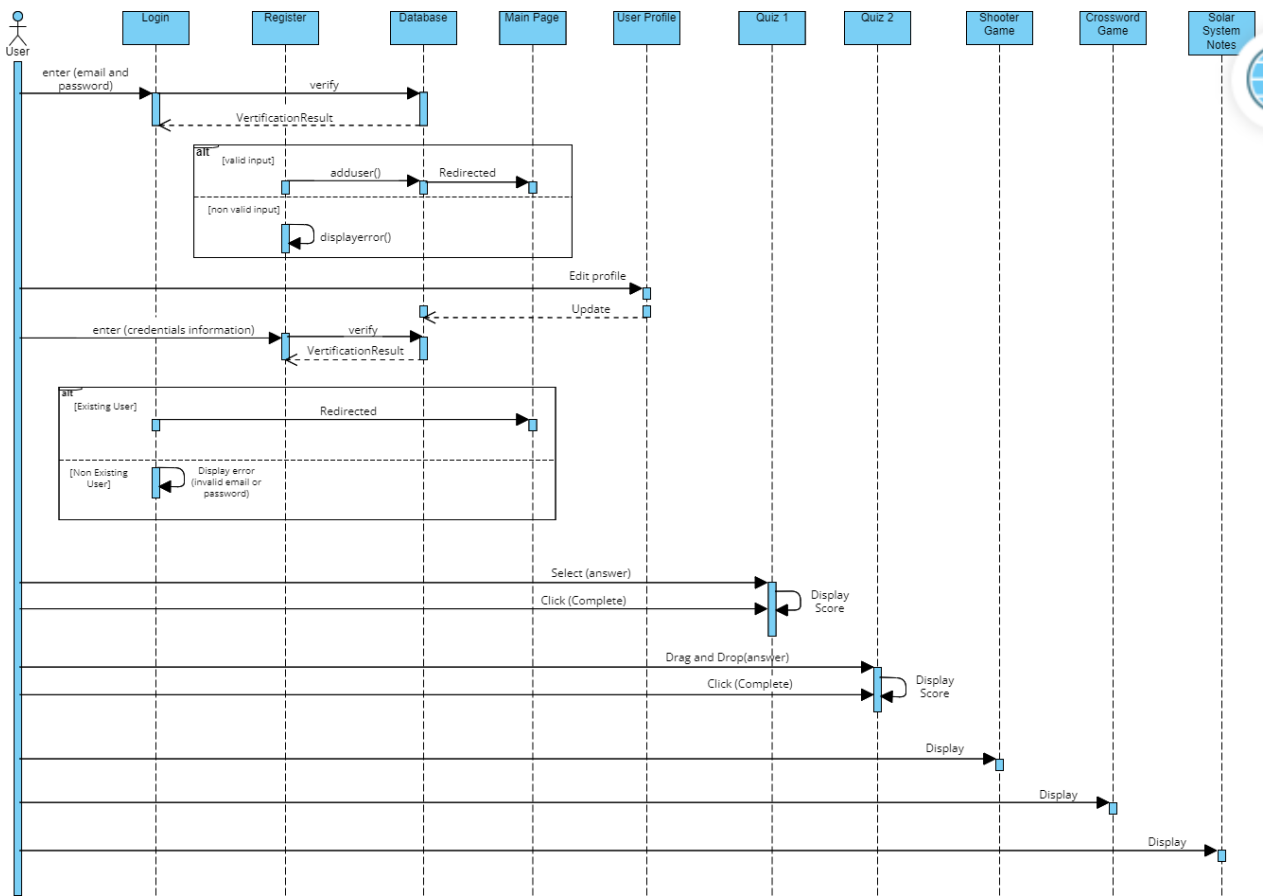
Figure 3. 16 Sequence Diagram

Figure 3.16 depicts a sequence diagram of the e-Learning Solar System for Primary School Year 3. There are 11 lifeline notations consist of an actor element symbol that represents the user of the system and 10 objects, which are the login, register, main page, user profile, quiz 1, quiz 2, shooter game, crossword game and solar system notes.

For the login, quiz 1 and quiz 2 have a reflexive message arrow where each object will send a message to itself. There is also a 2 large rectangles with 'alt' label inside the box representing an alternative combination fragment. It is applied to login and register to show an alternative for other situations. For register alternative rectangle, if the user insert valid input, the upper portion of the box will be executed. Otherwise, it will execute the lower part of the box. Same goes to login alternative rectangle, if the existing user login to the system, the upper portion of the box will be executed. Otherwise, it will execute the lower part of the box. For Shooter Game lifeline, the user will play the game that will be developed using scratch programming and it will be embedded in the system.

3.4.6 Class Diagram
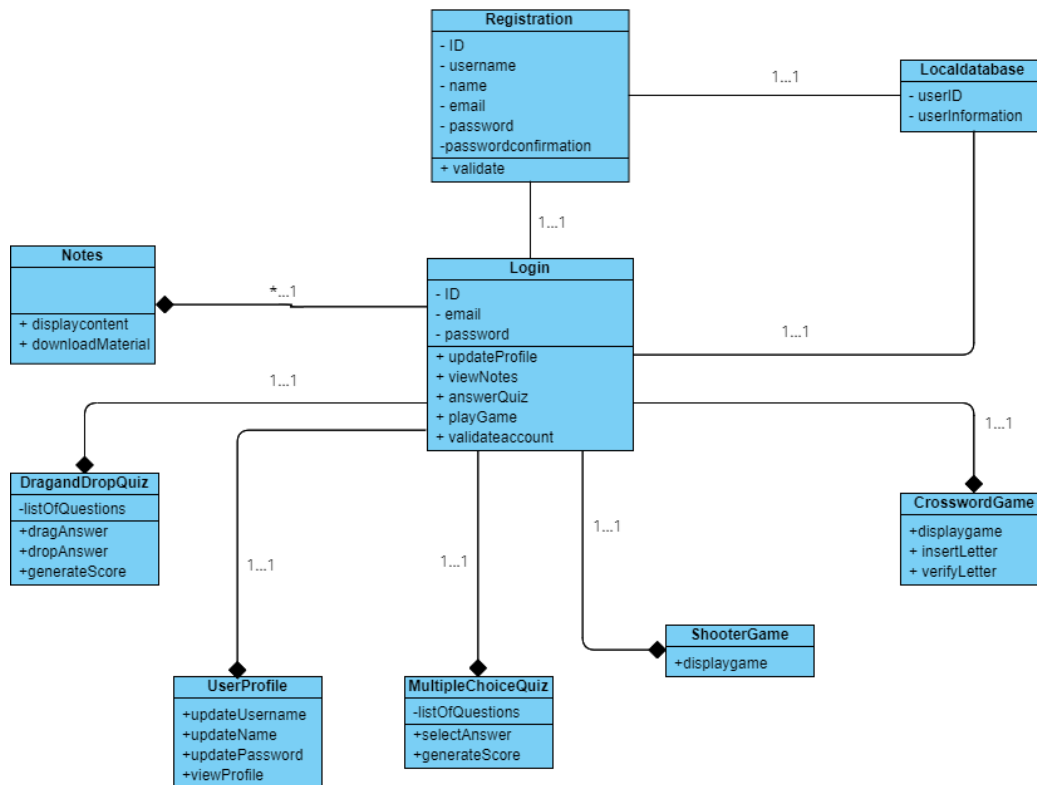
Figure 3. 17 Class Diagram

Figure 3.17 illustrates a class diagram of the e-Learning Solar System for Primary School Year 3. There are 9 classes and it contain attributes and operations. The Login class has 3 attributes which consist of ID, email and password. The class connecting with other classes has a composition relationship exclude Localdatabase and Registration classes. Localdatabase, Registration and Login has simple association relationship on each other. Next, Notes class has 2 operations include downloadMaterial and displaycontent. There are two classes for game which are Shooter Game Crossword Game. For quiz in the system, there are 2 class which are DraggingQuiz and MultipleChoiceQuiz. DraggingQuiz class has 1 attribute and 3 operations, and MultipleChoiceQuiz has 1 attribute and 2 operations. Lastly, User Profile class has 4 operations.

3.4.7   Interface Design

Interface design shows how the system will interact with the user. The user interface will become unsuccessful correlations, even if the learning content was selected well and the user is willing to learn (Azadehfar, M.R., 2014). It is important to have well interface design for e-Learning.

a) Login Page

Figure 3. 18 Login Page of the Proposed Project

Description:

- This page will appear first when its launch.
- User needs to insert email and password and click login button to access the system.

b) Register Page

E-Pembelajaran Sistem Suria

Daftar Masuk

Nama Pengguna

Nama Penuh

Email

Kata Laluan

Pengesahan
Kata Laluan

Daftar   Set Semula

Figure 3. 19 Registration Page of the Proposal Project

Description:

- For unregistered user, they need to register in this page.
- User needs to insert credential information and click register button to create new account.
- There is reset button to clear the form.

c) Homepage

Sistem Suria

Matahari | Planet | Orbit Planet | Masa Pengerdaran Planet | Quiz | Permainan | Aktiviti Ria

Lorem ipsum dolor sit amet, sapien etiam, nunc amet dolor ac odio mauris justo. Luctus arcu, urna praesent at id quisque ac. Arcu es massa vestibulum malesuada, integer vivamus elit eu mauris eus, cum eros quis aliquam wisi. Nulla wisi laoreet suspendisse integer vivamus elit eu mauris hendrerit facilisi, mi mattis pariatur aliquam pharetra eget.

Figure 3. 20 Homepage of the Proposed Project

Description:

- Users can click the home button at the upper left of the page and it is available at all pages to ease the user go to homepage.
- There is menu arranged horizontally at the upper of the page which are *Matahari, Planet, Orbit Planet, Masa Pengedaran Planet, Quiz, Permain* and *Aktivti Ria* and these buttons will navigate the user to a specific page according to the button's name.
- Profile button at the upper right will navigate the user to user profile page.

d) **Sun, Planet, Planetary Orbit, Planetary Distribution Time,**

 and Fun Activity Pages
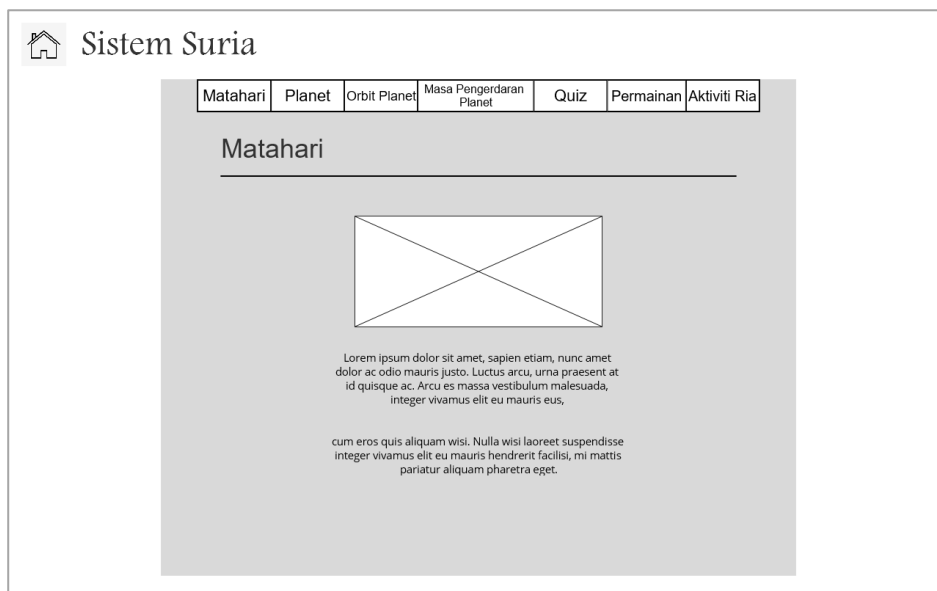
Figure 3. 21 e-Learning Solar System pages

Description:

- Users can choose the menu they want to navigate and it available on each page.
- Each page includes animation, graphics and texts.
- Learning material such as mind map will be provided and user can download it.

e) Quiz and Fun Activity Menu
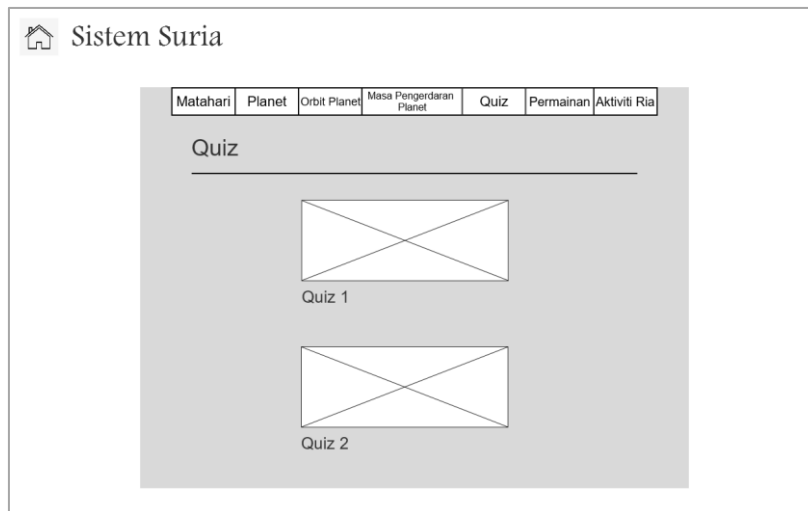
Figure 3. 22 Quiz Page
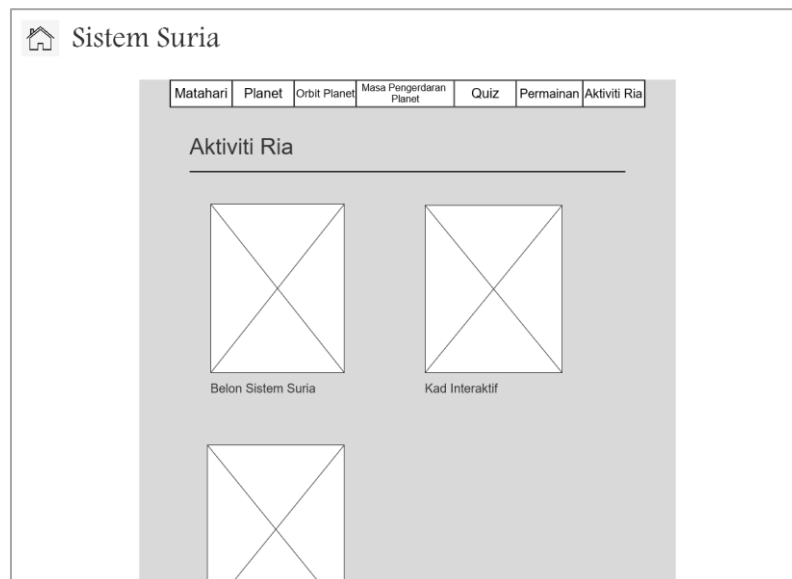
Figure 3. 23 Fun Activity Page

Description:

- Quiz and Fun Activity pages provide options to the user, as shown in Figure 3.22 and Figure 3.23.
- Quiz Page provides two types of quizzes and Fun Activity provides a few activity options.
- Each option have graphics and text, and user can choose the option by clicking the picture or text.

f) Quiz 1 Page
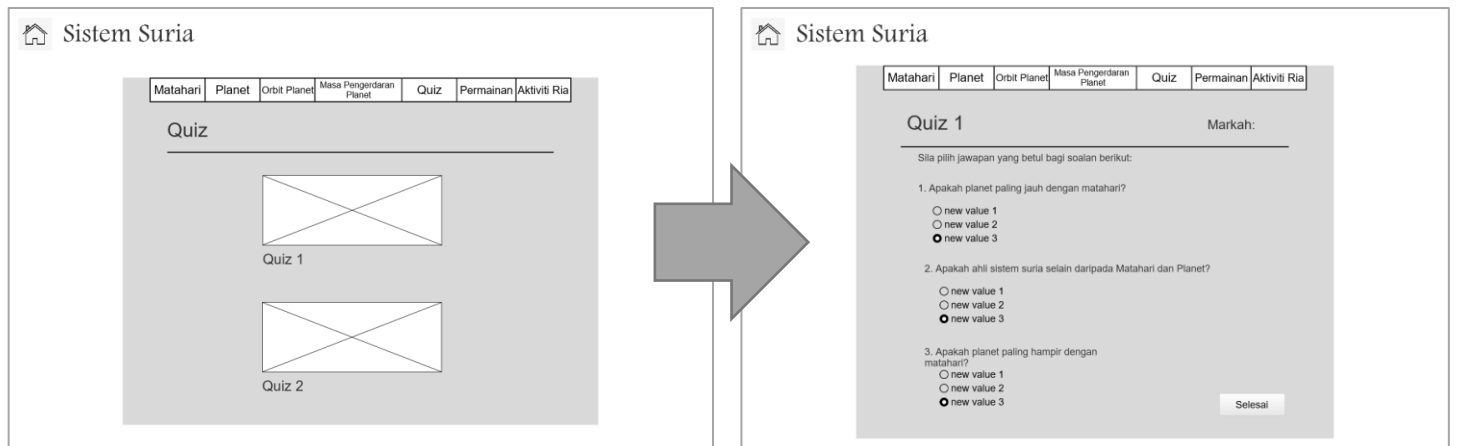
Figure 3. 24 Quiz 1 Page

Description:

- User be able to answer questions by clicking the radio button and user be able to choose only one answer.
- User be able to click finish button at the bottom right of the page to view the score.
- User can see their score at the top of the screen after clicking the finish button.

g) Quiz 2 page
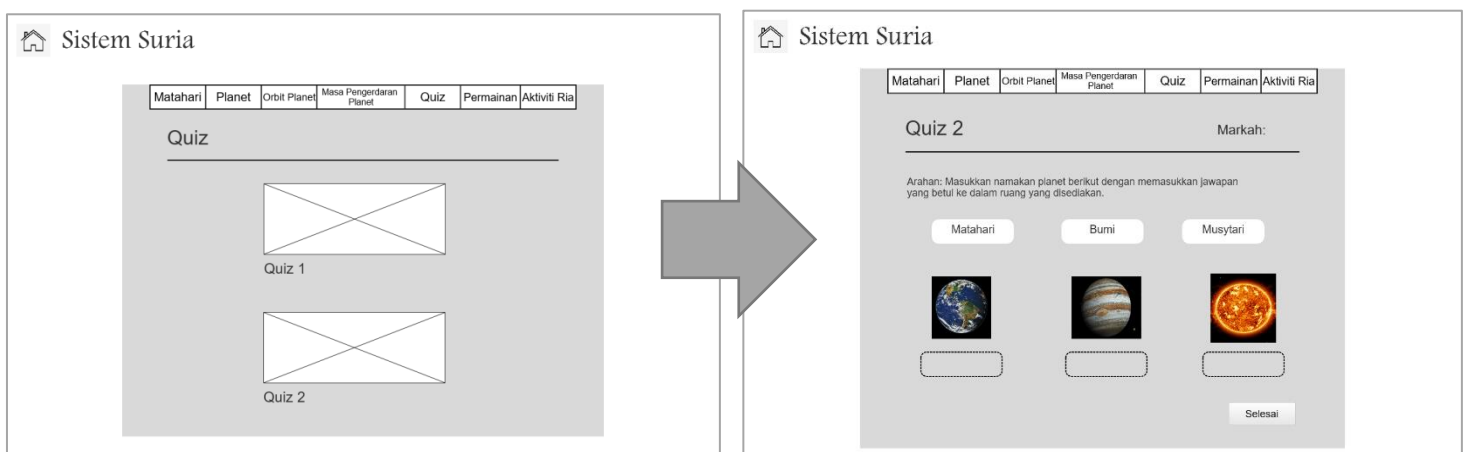
Figure 3. 25 Quiz 2 Page

Description:

- User be able to answer the questions by drag and drop the answer in the space provided.
- Users can click the finish button at the bottom right of the page to view the score.
- User can see their score at the top of the screen after clicking the finish button.

h) Fun Activity Page
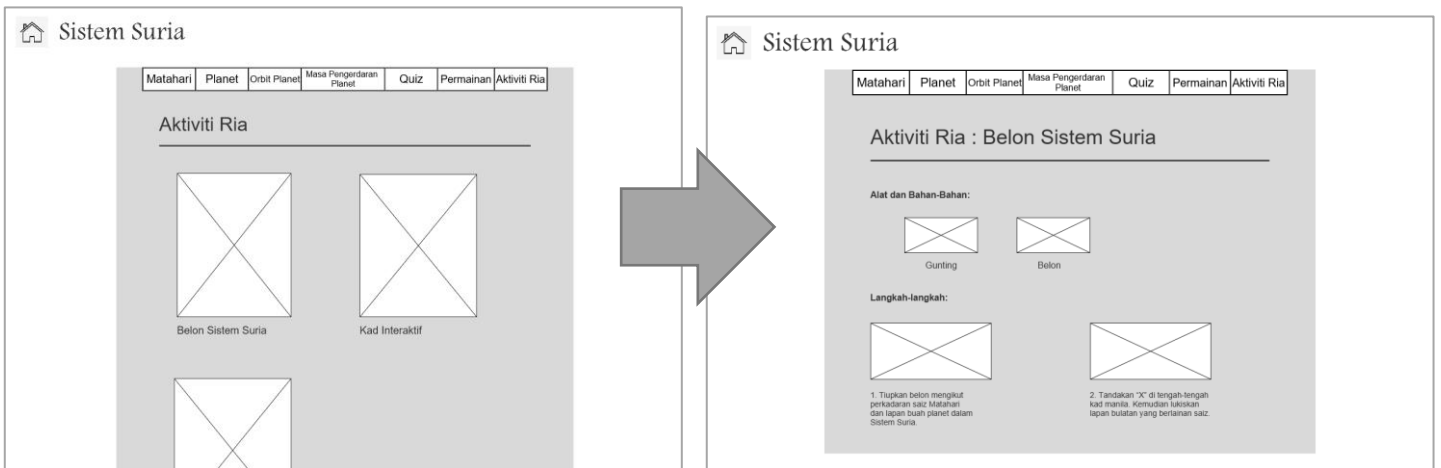
Figure 3. 26 Fun Activity Page

Description:

- User be able to learn how to create crafts related to Solar System.
- The crafts pages include tools needed, instruction and pictures.

i) Game Page
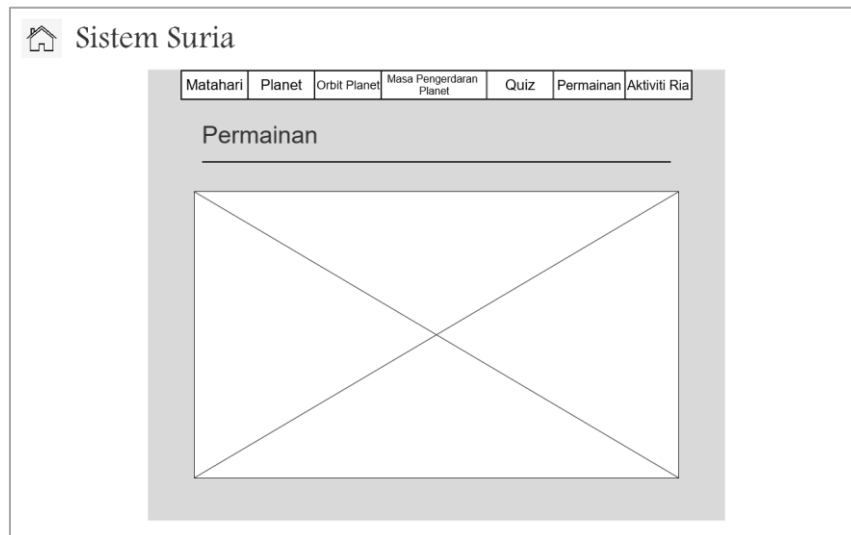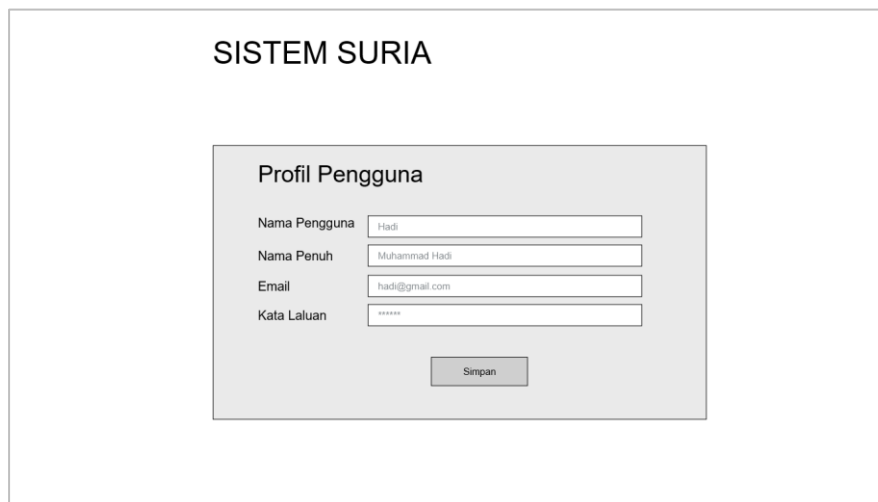
Figure 3. 27 Game Page

Description:

- User be able to play Shooter Game through Scratch which is embedded in this page and Crossword Game with background music.

j) User Profile

Figure 3. 28 User Profile Page

Description:

- User be able to view and update their profile by editing the information in the field directly and click save button to save the updated information.

3.5 Development

The development phase is to create and develop the outcome from the design phase. The software that will be used in developing the proposed project are Xampp, PhpMyAdmin, Notepad++ and Scracth Programming,while minimum hardware will be used are Intel i3, RAM 4 GB and GPU 1GB. The developer also will used scripting language such HTML, CSS, PHP and Java Script. In this phase also will conduct testing and review process on the system to detect if there are any error.

3.6 Implementation

During the implementation phase, developer needs to make sure the project obtains positive results. Developer will make sure all the requirements and objectives of the learning achieved and the system run successfully. In addition, the system will presented to supervisor and educator to get feedback if there is any improvement needed.

3.7 Evaluation

This phase mainly involves final test of the entire project. Important information or feedback will be gathered from users by completing evaluation form. The evaluation will be conducted at selected school among primary school year 3 students after they experience using the system.

3.8   Summary

As a conclusion, this chapter explained in detail the requirement of analysis and design for e-Learning Solar System for Primary School Year 3 Student by using ADDIE model. The analysis phase was made with survey results and references from Science textbook and activity book for Primary School Year 3 students. In addition, design phase includes lesson planning, content, flowchart, use case diagram, activity diagram and interface design. Other than that, the review of tools and technology that will be used in the development also been stated. The features and the system design will be developed and implemented and will be discussed in the next chapter.

CHAPTER 4: IMPLEMENTATION
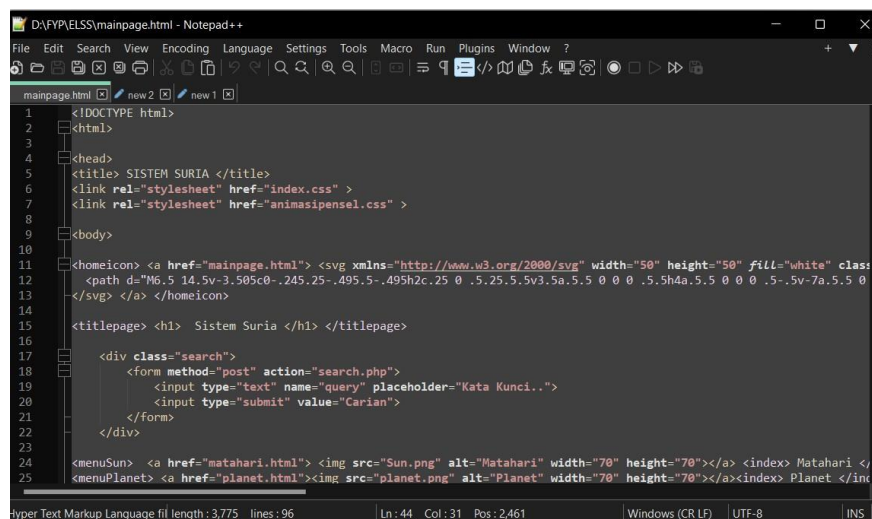
4.1   Introduction

In this chapter, the implementation of the e-Learning Solar System for Primary School Year 3 students will be discussed. First, the development configuration will be presented, including how it works in the development of this project. Next, the discussion of the implementation of the system interface of the e-Learning Solar System will be explained further.

4.2   Installation and Configuration of System's Components

4.2.1   Notepad++

Notepad++ is the most important tool used in this project development. After downloading Notepad++, installation is required to develop the project. Then, it will launch automatically after the user agrees to the licence agreement. Notepad++ can support approximately 80 languages. To run e-Learning Solar System project, the user needs to open the project using a web browser after saving the file according to the type of file, such as a Hyper Text Markup Language file. Figure 4.1 shows an example of usage of using Notepad++.

Figure 4. 1Usage of using Notepad++

4.2.2   Scratch 3

Scratch 3 is a platform to develop a game for this project. Game development can be implemented online or offline. The user needs to download and install Scratch 3 before using it for offline use. Scratch 3 comes with a block-based on visual programming language. The user needs to drag the block of codes to develop a game.
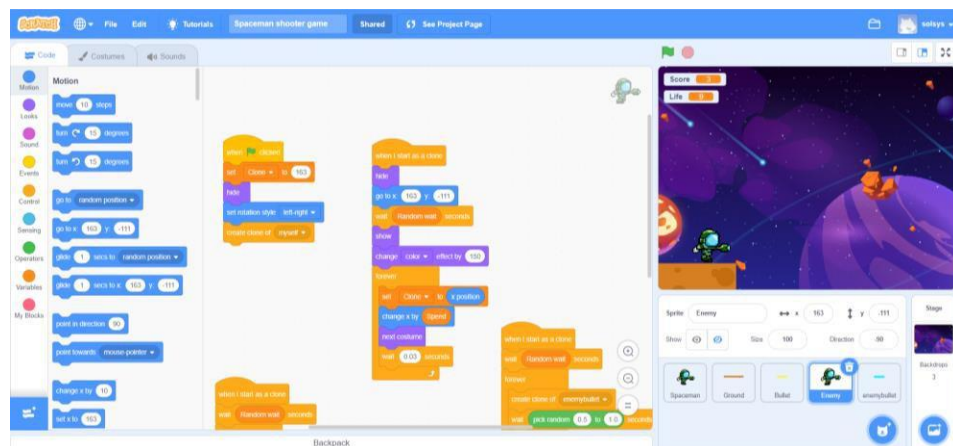
Figure 4. 2 Block Codes in Scratch Application

Based on Figure 4.2 above, shows one of the sets of block codes in the application. The user can also create costumes to apply to the project. A few features can be used, such as brushes, adding text, and creating shapes. Figure 4.3 illustrates the layout of the application for creating costumes.
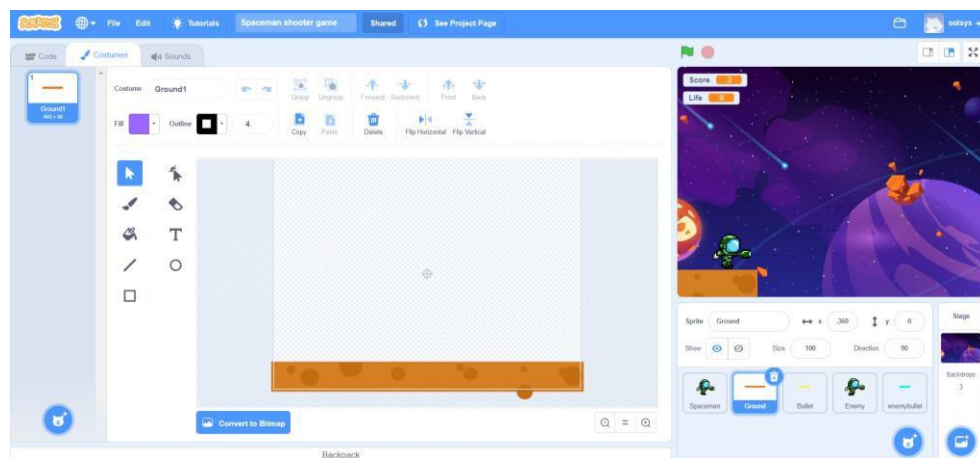
Figure 4. 3 Creating costume in Scratch application

4.3 Configuring Database Connection

Xampp is a platform for web application testing on a local host web server. The open source application can be downloaded at https://www.apachefriends.org/. The database for the e-Learning Solar System has been created using Xampp. Specifically, the MySQL database is used to store any type of data inside the web application, such as documents and user data.
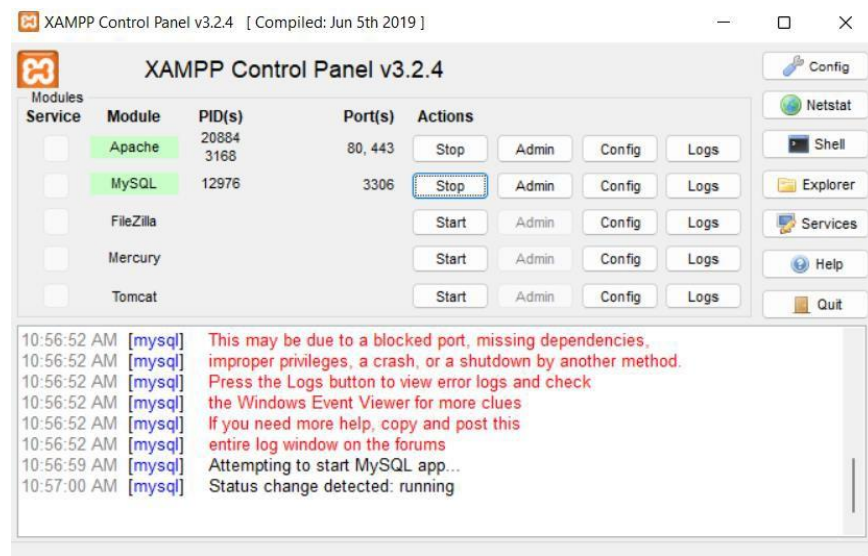
Figure 4. 4 XAMPP Control Panel

To configure the MySQL database connection for e-Learning Solar System, the Apache and MySQL modules must start in the XAMPP control panel. Then, the PHP file created for the database connection can be executed and run.

4.4 Modules for e-Learning Solar System

This part will discuss the system interface of the application. The implementation of interface design in Chapter 3 will be discussed in detail.

4.4.1 Register Module

Register page is the page where new users can register their account in order to access the web application. To make the registration, the user need to fill in the required fields such as username, full name, email, password and password confirmation. Once the user fill in all the fields and click the register button, all the details will be saved in MySQL database.

Figure 4. 5 Registration Page of e-Learning Solar System

4.4.2 Login Module

The login page is the page where the existing user can access the web application by entering their credentials such as email and password. The email address has been set to unique data where one user can only have one account. The login page of the E-Learning Solar System are displayed as Figure 4.6.
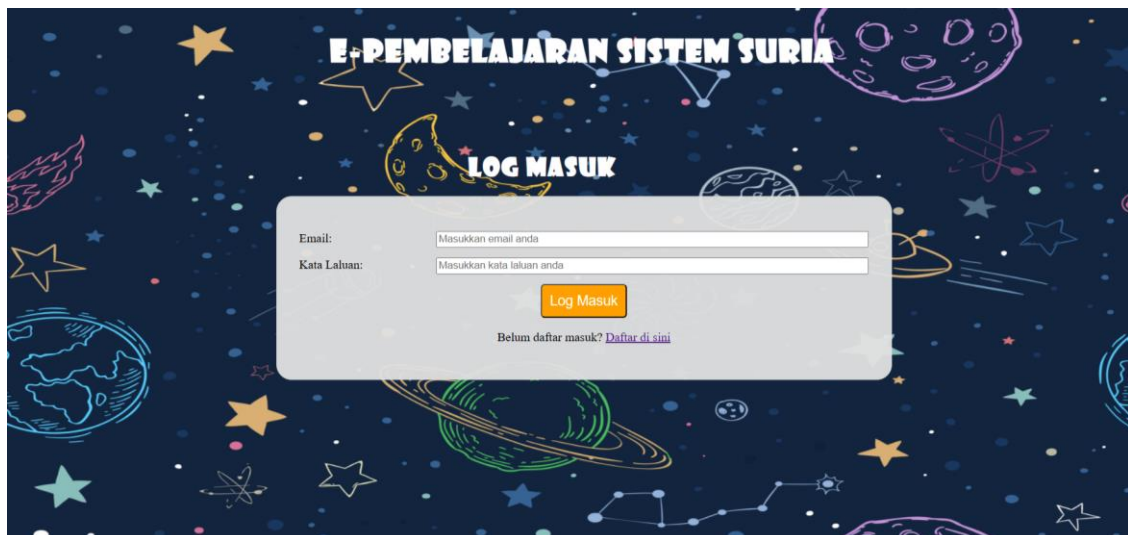
Figure 4. 6 Log In Page of e-Learning Solar System

4.4.3 Main Page Module

The main page of this e-Learning Solar System presents the introduction of a solar system for the primary school year 3 syllabus based on KSSR. The main page contains a horizontal menu list on the top of the page, like other pages where the user can navigate to other sections. Each menu contains an image and label. Then, on the top left of the page, it has a home icon that can navigate the user to the main page. Next, on the top right of the page, it has a user profile icon that can navigate the user to the user profile page. The main page also contains a description including video and other information, as shown in Figure 4.7.
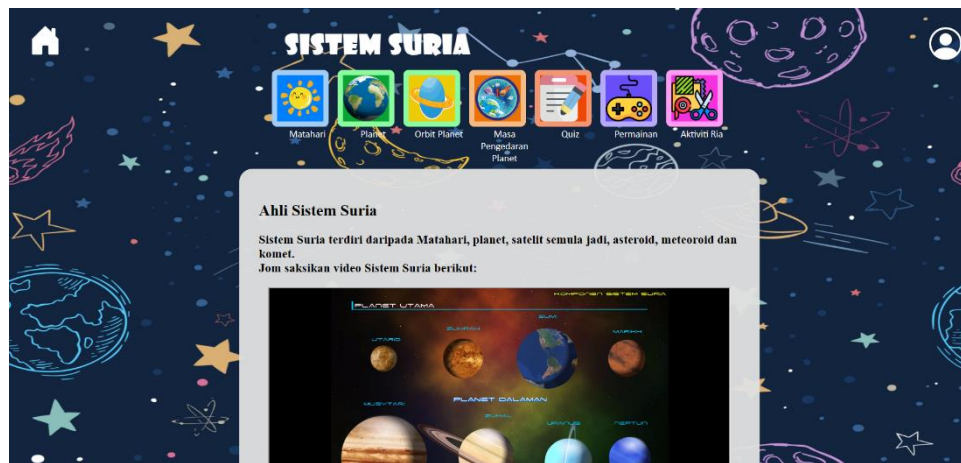
Figure 4. 7Main Page of e-Learning Solar System

4.4.4 User Profile Module

The user profile page displays the information of the existing user. The user also can edit their profile in the field and the data will be updated in the database after clicking the submit button. Figure 4.8 shows the user profile page.

Figure 4. 8 User Profile Page of e-Learning Solar System

4.4.5 Score Summary Module

The score summary page presented the record of quiz score of the user. There are two parts which are Quiz 1 score and Quiz 2 score. It will displays the quiz score with the time of quiz attempt . Figure 4.9 illustrates the score summary page.

Figure 4. 9 Score Summary of e-Learning Solar System

4.4.6 Download module

A few images and documents can be downloaded for activity material. Each materials have a download button that the user can click. Figure 4.10 shows the download button at one of the e-Learning Solar System images.

Figure 4. 10 Download button of Sun poster

4.4.7 Quiz module

4.4.7.1   Multiple Choice Question (MCQ) Quiz

To answer the Multiple Choice Question (MCQ) quiz, the user needs to choose the Quiz 1 option under the Quiz menu. This Quiz 1 page will displays a list of questions with background music and the user can only choose one answer. The questions display are created by referring to *Buku Teks Sains Tahun 3 KSSR* and *Buku Aktiviti Sains Tahun 3 KSSR*. It was developed to evaluate the students understanding about solar system. Figure 4.11 presents the layout of the MCQ Quiz.
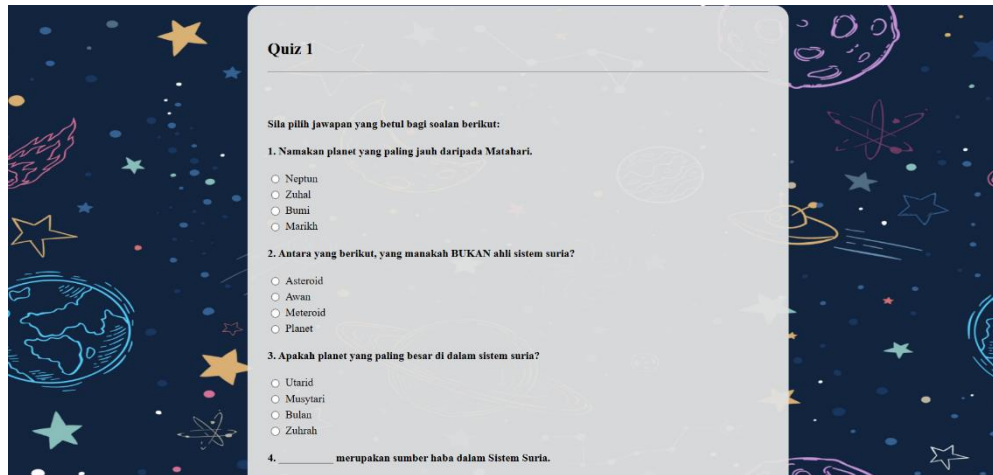
Figure 4. 11 Multiple Choice Question Quiz

After the user completes answering the questions, the user has to click submit button to see the mark, as shown in Figure 4.12. Once the submit button is clicked, the score will appear. The user also can repeat to answer the quiz by clicking the try again button.

Figure 4. 12 Submit and Try Again Buttons of MCQ Quiz

4.4.7.2 Drag and Drop Quiz

Same as the MCQ quiz, the user needs to choose Quiz 2 option under the menu Quiz. Again, there are label of planet names at the upper and planet images with a drop zone at the bottom with background music as illustrated in Figure 4.13.
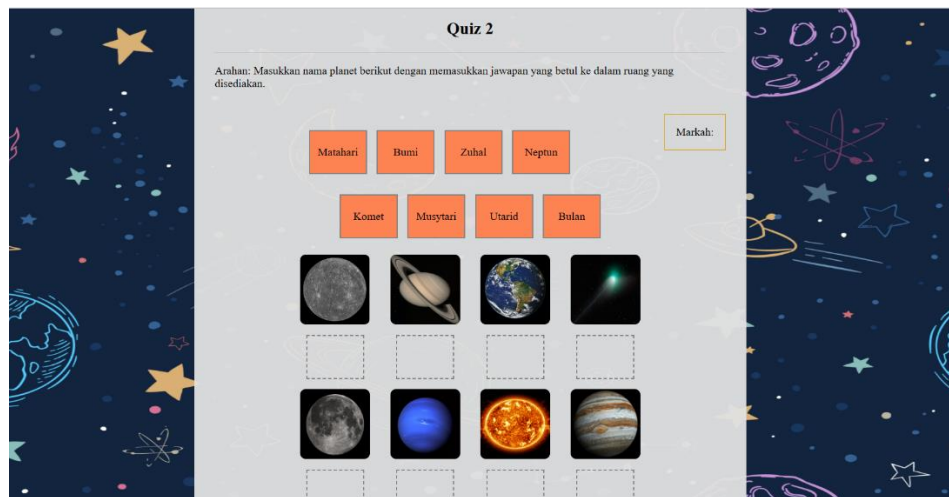
Figure 4. 13 Drag and Drop Quiz

The objective of Quiz 2 is to evaluate the students identification of planet's names. The user must drag the planet name label in the drop zone to match it with the images correctly. The submit button is at the bottom to click after completing the quiz. The score will appear after the user clicks the button. The user also can repeat to answer the quiz by clicking the try again button.

4.4.8 Game Module

4.4.8.1   Shooter Game

The user needs to click on the green flag to start the game. Once the game starts, the spaceman must shoot the upcoming enemy to save his life. To shoot the enemy, the player needs to left-click the mouse and enter space to jump (save from the enemy's bullets). The player only has ten lives to survive the game and needs to collect 20 points to win. Figure 4.14 presents the Shooter Game in the e-Learning Solar System.
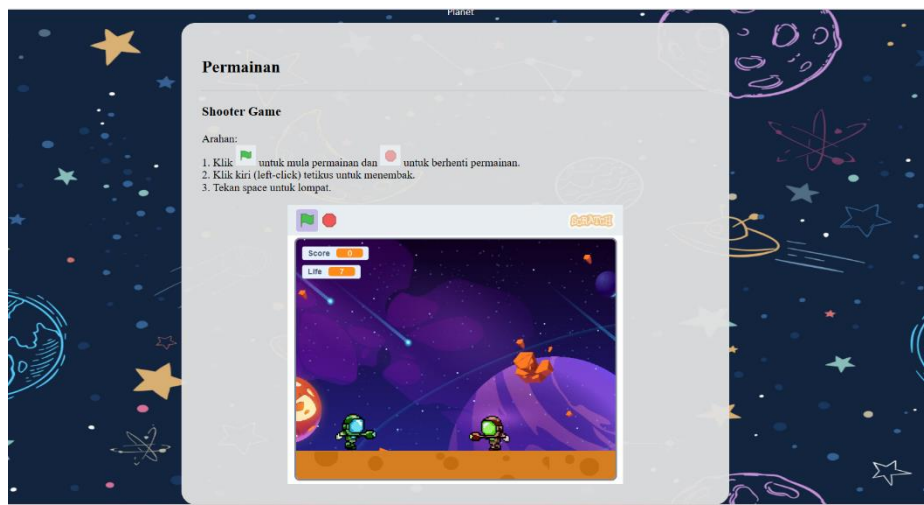
Figure 4. 14 Shooter Game

The Shooter Game was developed using Scratch Programming. The game can also improve ability of decision making and have a positive impact on cognitive skills to the user, where the user needs to make quick action against the enemy to win the game.

4.4.8.2   Crossword Game

The player need to answer the question below the crossword by key in letter in each box. The letter will be in red colour if the answer incorrect or incomplete, and it will turn green if the word correct. There is also background music throughout the game. In addition, this game may improve player's memory and thinking skills with answering the stated questions by forming words in the boxes. Besides, it can test the player's knowledge of the planet's characteristics.
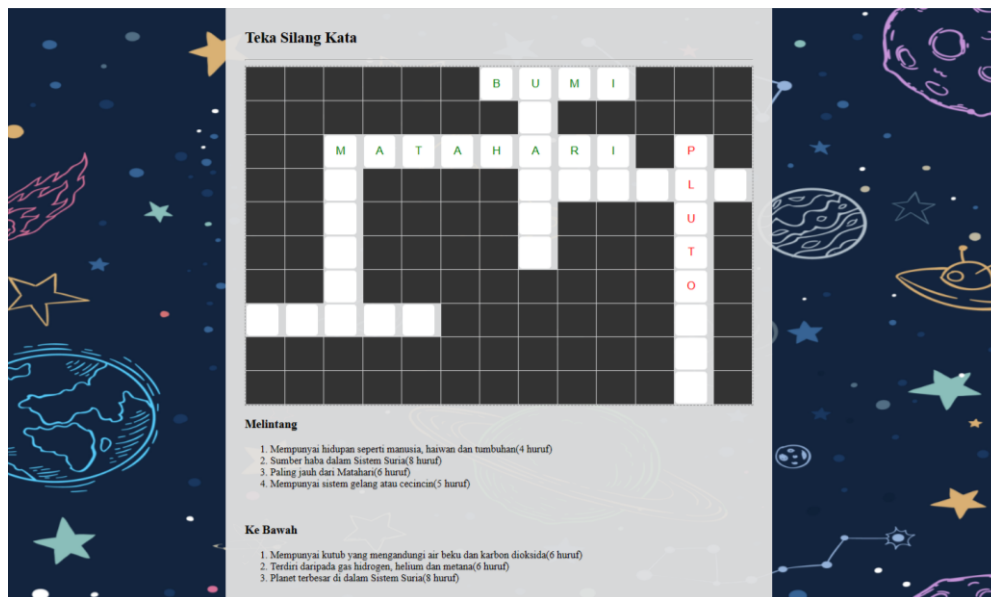
Figure 4. 15Crossword Game

4.4.9 Animation Module

Animation is one of the multimedia elements in e-Learning Solar System. It allows to animate properties in components. The component will be animated once the user navigates to the pages containing animations. For example, Figure 4.16 presents an orbit animation in the application where it animates moving around a circle.
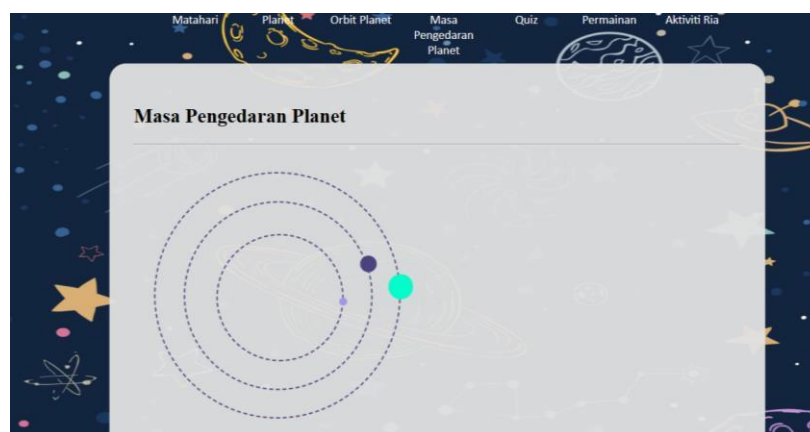
Figure 4. 16 Orbit Animation

4.4.10   Content Module

E-Learning Solar System contains a variety of Solar System contents. The contents are presented with multimedia elements such as images, videos and animation. All content follows the lesson plan as presented in Chapter 3 and some multimedia elements are credited to the *Buku Sains Tahun 3 KSSR*. Figures 4.17, 4.18 and 4.19 show a few pages

of e-Learning Solar System.

Figure 4. 18 Planet Page of e-Learning Solar System
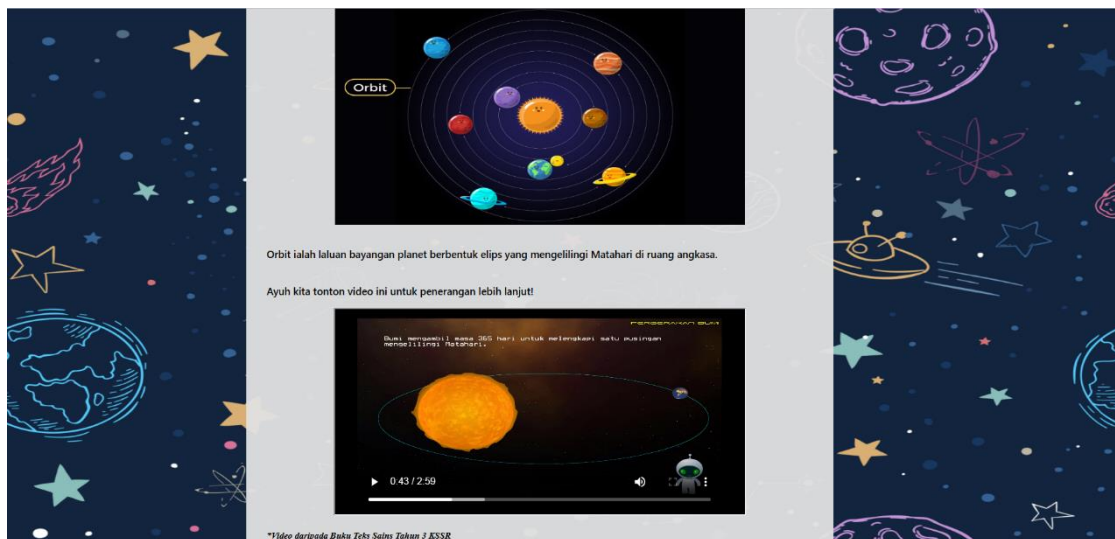
Figure 4. 17 Orbit Planet Page of e-Learning Solar System
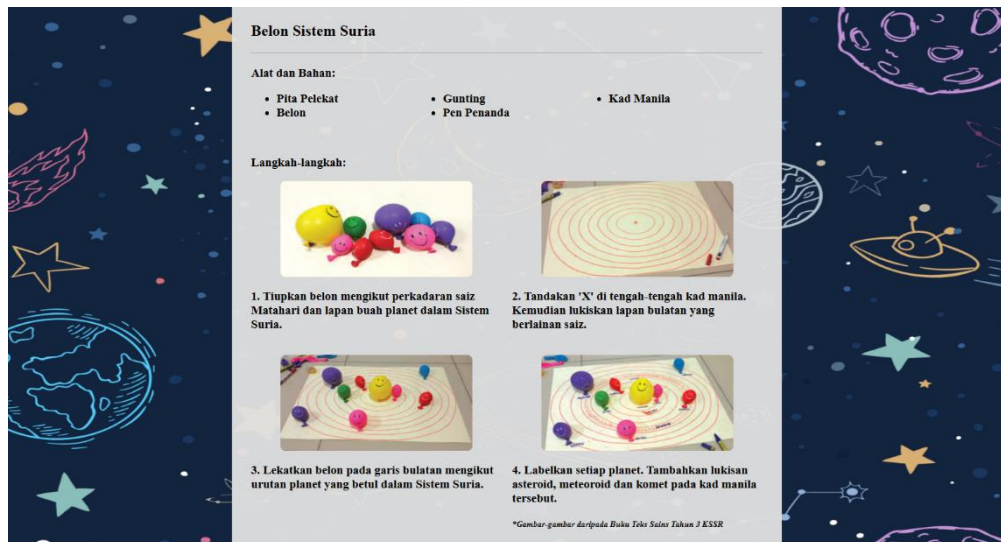
Figure 4. 19 Solar System Balloon Activity Page

4.5   Summary

This chapter has covered the implementation of the web learning application, which is e-Learning Solar System for Primary School Year 3 Students. The system's installation and configuration have been discussed, including a few tools and configuring database connection in this web development. The module of the system, such function and interface of the system, also have been covered in this chapter.

CHAPTER 5: TESTING

5.1 Introduction

This chapter will discuss about testing for E-Learning Solar System for Primary School Year 3 Students. The testing process was conducted to check the functionality of the application and identify errors or bugs that need any changes and modifications. There are two types of testing which are functional testing and non-functional testing.

5.2 Functional Testing

Functional testing is conducted to assess whether the application's features meet the requirements or not. Each requirement of the application will be tested, where the expected result and actual result will be compared in order to determine the result of the test case. This type of testing is conducted by the developer without the need of participation from target users. This section will cover two types of functional testing which are system testing and unit testing.

5.2.1 Unit Testing

Unit testing is a procedure used in software development where the smallest testable components of a programme are examined. The purpose of this test is to ensure that each module of the web application is working as expected. Each modules is tested according to the test plan listed.

System Menu

Table 5. 1 Test Case of System Menu

Test Description: Test and verify the system menu is working				
Test Case ID	Test Case	Expected Result	Actual Result	Pass/Fail
SM1	Click on the home icon	The application will open and display the main page	The web application open and display the main page	Pass
SM2	Click on the	The application will open and	The application open and display	Pass

	Sun menu	display the Sun page	the Sun page	
SM3	Click on the Planet menu	The application will open and display the Planet page	The application open and display the Planet page	Pass
SM4	Click on the Planetary Orbit menu	The application will open and display the Planetary Orbit page	The application open and display the Planetary Orbit page	Pass
SM5	Click on the Planetary Distribution Time menu	The application will open and display the Planetary Distribution Time page	The application open and display the Planetary Distribution Time page	Pass
SM6	Click on the Quiz menu	The application will open and display the Quiz page	The application open and display the Quiz page	Pass
SM7	Click on the Game menu	The application will open and display the Game page	The application open and display the Game page	Pass
SM8	Click on the Aktiviti Ria menu	The application will open and display the Planetary Distribution Time page	The application open and display the Planetary Distribution Time page	Pass

Login Page

Table 5. 2 Test Case of Login Page

Test Description: To ensure the user can logged in into the application				
Test ID	Test Case/Input	Expected Result	Actual Result	Pass/Fail
LF1	User enter correct login credentials as registered and tapping on the Login Button	The user should be directed to home page of the application	The user directed to home page of the application	Pass
LF2	User enter login credentials which are not existed in the database and tapping on the Login button	The application will alert the user with error message	Error message which stating that the email does not exists is displayed	Pass

Register Page

Table 5. 3 Test Case of Register Page

Test Description: To ensure the user can register into the application				
Test ID	Test Case/Input	Expected Result	Actual Result	Pass/Fail
RP1	Enter all required information inside the input field	The user should be able to fill all the required information in	The user be able to fill all the required information in the input field	Pass

		the input field		
RP2	Click on the register button with some fields are empty	The user will be alerted to enter all required information	The user is displayed with toasted text which alert the user to enter all required information	Pass
RP3	Click on the register button with all required information is filled	The register should be a success and all the details should be inserted into the database	The register is successful and all information is saved into database	Pass

Quiz Module

Table 5. 4 Test Case of Quiz

Test Description: Test and verify the Quiz page is working				
Test Case ID	Test Case	Expected Result	Actual Result	Pass/Fail
QP1	Click on the Quiz menu	The application will open and display the list of Quizzes	The application open and display the list of Quizzes	Pass
QP2	Click on the Quiz 1 option	The application will open and display the Multiple Choice Question (MCQ)	The application open and display the Multiple Choice Question (MCQ)	Pass

QP3	Click on the Quiz 2 option	The application will open and display the Drag and Drop quiz	The application open and display the Drag and Drop quiz	Pass
Test Description: Test and verify the Multiple Choice Question (MCQ) quiz is working				
QP4	Click on the radio button to answer the question	Each questions be able to click one radio button only	Each questions can click one radio button only	Pass
QP5	Click on the Finish button of the MCQ quiz to see the score	The score will be displayed based on correct answer and the score should be inserted into database	The score displayed based on correct answer and the score is saved into database	Pass
QP6	Click on the Try Again button to repeat the MCQ quiz	The MCQ will be reset all answered question and score	The MCQ resets all the radio button and score	Pass
Test Description: Test and verify the Drag and Drop quiz is working				
QP7	Drag the name of planets to the drop zone	The user should be drag the label of planet names and drop it in the drop zone	The user can drag the label of planet names and drop it in the drop zone	Pass
QP8	Click on the Finish button of the Drag and	The score will be displayed based on correct	The score displayed based on correct answer	Pass

	Drop quiz to see the score	answer		
QP9	Click on the Try Again button to repeat the Drag and Drop quiz	The Drag and Drop quiz will be reset all drop zone and score	The Drag and Drop quiz resets all the drop zone and score	Pass

Game Module

Table 5. 5 Test Case of Game

Test Description: Test and verify the Game Page is working				
Test Case ID	Test Case	Expected Result	Actual Result	Pass/Fail
GP1	Click on the Game menu	The application will open and display the list of Games	The application open and display the list of Games	Pass
GP2	Click on the Shooter Game option	The application will display the Shooter Game	The application display the Shooter Game	Pass
GP3	Click on the Crossword Game option	The application will display the Crossword Game	The application display the Crossword Game	Pass
Test Description: Test and verify the Shooter Game is working				
GP4	Click on the start button to start the game	The game should be started once the start button clicked.	The game started once the start button clicked	Pass

GP5	Playing the Shooter Game	The user be able to shoot the enemy by clicking the left-click mouse and enter space bar to jump.	The user can shoot the enemy by clicking the left-click mouse and enter space bar to jump.	Pass
GP6	Click on the stop button to stop the game	The game should be stopped once the stop button clicked	The game stopped once the stop button clicked	Pass
Test Description: Test and verify the Crossword Game				
GP7	Insert letters in the crossword box and letter color changes according to the answer	The user should be able to insert one letter only for each box of the crossword. The color of letter will change according to the answer, where the correct word will turn green and the wrong word will turn red.	The user can insert one letter only for each box of the crossword. The color of letter changed according to the answer, where the correct word turned green and the wrong word turned red	Pass

User Profile Module

Table 5. 6 Test Case of User Profile

Test Description: Test User Profile page is working				
Test Case ID	Test Case	Expected Result	Actual Result	Pass/Fail
UP1	Manage user profile	The user should be able to edit their profile	The user able to edit their profile	Pass
GP2	Click on the update button	The user profile that have been edited should be able to update in the database	The user profile that have been edited able to update in the database	Pass

5.2.2 System Testing

System testing is testing conducted on the overall function of the application. The goal of the system testing is to make sure the behaviour of the web application meet the requirement. E-Learning Solar System for Primary School Year 3 Students is tested with several test cases.

Table 5. 7 Test Case of System Testing

Test Description: Test all functions of e-Learning Solar System for Primary School Year 3 Students				
Test Case ID	Test Case	Expected Result	Actual Result	Pass/Fail
ST1	User make registration to use the web application	User should be registered and able to access the application	User is registered and able to access application	Pass

ST2	Registered user log in into the application	Registered user should be able to login and access the application	Registered user able to login and access the application	Pass
ST3	User view score of the quiz at score record page	User should be able to see list of score according to the quiz	User able to see list of score according to the quiz	Pass
ST4	User view contents in each pages in the application	User should be able to see the contents in each pages in the application	User can see the contents in each pages in the application	Pass
ST5	User join quizzes	The quizzes should be displayed and the user be able to answer it	The quizzes is displayed and the user able to answer it	Pass
ST6	User play games	The games be able played by the user	The games be able played by the user	Pass
ST7	User update user details at user profile page	User should be able to update user details at user profile page	User be able to update user details at user profile page	Pass

5.3 Non-Functional Testing

Non-functional testing is a test that conducted on E-Learning Solar System for Primary School Year 3 Students based on non-functional requirements. For this project, there are three non-functional requirements which are reliability, availability and usability.

5.3.1 Reliability Testing

Table 5. 8 Test Case for Reliability Testing

Test Objective: To test the overall reliability of E-Learning Solar System for Primary School Year 3 Students				
Test ID	Test Case	Expected Result	Actual Result	Pass/Fail
RT1	The system must execute without error in less than 10 seconds for each page, include login, register features and display multimedia through an internet connection.	The system should be able execute without error in less than 10 seconds for each page, include login, register features and display multimedia through an internet connection.	The system able to execute without error in less than 10 seconds for each page, include login, register features and display multimedia through an internet connection.	Pass

5.3.2 Availability Testing

Table 5. 9 Test Case of Availability Testing

Test Objective: To test the overall availability of E-Learning Solar System for Primary School Year 3 Students				
Test ID	Test Case	Expected Result	Actual Result	Pass/Fail
AT1	The system can be accessed throughout the week at any time during the day.	The system should be accessed throughout the week at any time during the day.	The system can be accessed throughout the week at any time during the day.	Pass

5.3.3 Usability Testing

Usability testing is conducted to obtain the feedbacks from targeted users in experiencing on a product. The feedback is collected by using questionnare from the representative users. The targeted users will be asked to fill the questionnaire (refer Appendices B and C) after they experienced using the web application. The usability testing is conducted on 32 participants among 28 students and 4 teachers from Sekolah Rendah Integrasi Teras Islam (SRITI) Tahfiz Raudhatul Ilmi, Kota Samarahan (refer Appendices D). Besides, there are two main aspects of usability testing that will be tested which are system functionalities and user interface of E-Learning Solar System for Primary School Year 3 Students.

5.3.1.1   User Interface of E-Learning Solar System

The test elements about the user interface for all users are the same and the results are displayed in Table 5.10.

Table 5. 10 Results of Usability Testing

No	Test Elements	1	2	3	4	5
1	I think that it is easy to understand and use this web learning application.			1	6	25
2	I think that the size of font used for this application is suitable.			6	5	21
3	I found that the solar system notes in the web learning application is interesting and easy to understand.				4	28
4	I think the colour chosen for this application is suitable and attractive.					32

Note. 1 = Strongly disagree, 5 = Strongly agree

Based on the results for user interface usability testing in Table 5.10, 25 out of 32 participants strongly agree that the application is easy to understand and use. This shows that the web learning application is user friendly. Then, 21 participants are strongly agreed that size of font used in the application is suitable and 28 participants strongly agreed that the solar system notes in the web learning application is interesting and easy to understand. Lastly, all of the participants strongly agreed that the colour chosen for this application is suitable and attractive.

5.3.1.2   System Functionality of E-Learning Solar System

The test elements about the system functionalities for different type of users are displayed in Table 5.11 and 5.12. There are 28 students and 4 teachers involved in this survey.

Student

Table 5. 11 Results of usability testing for e-Learning Solar System system functionality (student)

No	Test Elements	1	2	3	4	5
1	I think that it is easy to register and login in this application.			1	1	26
2	I found that this web learning improve my interest in solar system.				1	27
3	I found that the quizzes in the web learning application can evaluate my understanding on solar system.				2	26
4	I found that games in the web learning application is fun and exciting.					28
5	I think I will access the web learning to know about solar system in the future.				6	22

Note. 1 = Strongly disagree, 5 = Strongly agree

Based on the results in Table 5.11, 26 students strongly agree that it is easy to register and login in this application. Besides, 27 out of 28 students are strongly agreed that the web learning improve their interest in solar system and 26 students are strongly agreed that the quizzes in the web learning application can evaluate my understanding on solar system. Moreover, all the students are strongly agreed that games in the web learning application is fun and exciting. Lastly, 22 students are willing to access the web learning to know about solar system in the future.

Teacher

Table 5. 12 Results of usability testing for e-Learning Solar System system functionality (teacher)

No	Test Elements	1	2	3	4	5
1	I think that it is easy to register and login in this web learning application.				2	2
2	I found that it is interesting to use as classroom teaching materials.					4
3	I think that this application can help me to save time in preparing classroom teaching materials.				1	3
4	I believe that the presence of this web learning application can improve student's interest in solar system learning.					4
5	I found that the system features are suitable for primary school students.				1	3
6	I think I will use this web learning application in the future.					4
7	I found that the quizzes can evaluate students' understanding in solar system.					4
8	I found that games in the web learning application suitable for primary school students.					4

Note. 1 = Strongly disagree, 5 = Strongly agree

Based on the results in Table 5.12, 2 out of 4 teachers strongly agreed that the web application is easy to register and login. Then, all of the teachers are strongly agreed that the web application is interesting to use as classroom teaching materials and it can improve student's interest in solar system learning. There are 3 teachers strongly agreed that the application can help them to save time in preparing classroom teaching materials and the system features are suitable for primary school students. Besides, all of the teachers strongly agreed that the quizzes can evaluate students' understanding in solar system and the games in the web

learning application are suitable for primary school students. Lastly, all teachers are strongly agreed that they will use this web learning application in the future.

5.4 Summary

In conclusion, this chapter discuss on testing process of the application. There are two type of test that have been done which are functional testing and non-functional testing. Besides, there are non-functional testing has conducted which are usability, availability and reliability testing.

CHAPTER 6: CONCLUSION AND FUTURE WORK

6.1 Introduction

In this chapter, it will conclude the overall development of e-Learning Solar System for Primary School Year 3 Students. The objective achievements will be discussed whether, the objectives of the project have been achieved or not. Moreover, project limitations and the future work of the project also will be presented.

6.2 Objective Achievements

There are three main objectives for this project. All the objectives have been achieved through the implementation of the project in e-Learning Solar System. Table 6.1 shows the list of objectives and the achievements that have been made.

Table 6. 1 List of Objectives and Achievements

Objectives	Achievements
To analyse the current existing system of web learning applications about the solar system for primary school level education.	The web learning applications about solar system for primary school level education have been analysed and discussed to develop an e-Learning Solar System for Primary School Year 3 Students.
To design an e-learning solar system with game-based elements for year 3 primary school students.	There are web-based application of solar system that have been developed for primary school Year 3 based on KSSR syllabus, and it provide game-based learning such as Multiple Choice Question (MCQ) quiz, Drag and Drop quiz, Shooter Game and Crossword Game.
To test the usability and functionality of the e-Learning Solar System.	The functional and non-functional tests of e-Learning Solar System have been tested and evaluated by primary school students.

6.3 Project Limitations

The limitations of the application had been identified during the development of the project. There limitations are as below:

i. The application does not provide administrator access to edit the contents of solar system.

ii. The e-Learning Solar System is only covered solar system Year 3 primary school syllabus.

iii. There are only two quizzes provided in the web application which are MCQ and Drag and Drop.

6.4 Future Works

There are some works that should be added in the future work to increase its usability and user acceptance. The future works are:

i. Make the web application more interactive and attractive by adding sound effect, completion notification and more, suitable for primary school students.

ii. Add administrator access where admin can update the contents of the application such as notes and quizzes.

iii. Cover all solar system topics taught at the primary school level based on the KSSR syllabus.

iv. Add more and various quizzes to the application to attract user interest.

6.5 Conclusion

As a conclusion, e-Learning Solar System is a web-based application that was developed to gain student interest in learning about solar system in primary school level, especially year 3 students. Besides, this application has achieved all the objectives of the project. The game-based element has also been included in the application. Thus, e-Learning Solar System for Primary School Year 3 Students can be used as a platform for all people that have an interest in solar system.

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Appendices

Appendices A: Questionnare for Collecting Data from Primary School Teacher

QUESTIONNAIRE

Section A

1. Name: _____

2. Gender:

   ☐   Male   ☐ Female

3. Age:

   ☐   22-30 years old   ☐ 30-40 years old ☐ Above 40 years old

4. Experience in Teaching:

   ☐   Less than 2 years   ☐ 3-5   years ☐ 6-9 years ☐ Over 10 years

5. Name of School: _____

6. Teaching Subject: _____

Section B

1. What teaching materials you always use in the classroom?

   ☐   Textbook   ☐ Presentation Slide   Other:_____

2. What devices does the school provide for student use? (You can choose more than one)

   ☐   Computer   ☐ Laptop   Other:_____

3. Would you prefer to teach using web learning system?

   ☐ Yes ☐ No

Section C

1. Would you prefer to have a game based in the web learning system?

   ☐ Yes ☐ No

2. Would you prefer to have a compilation note in the web learning system?

   ☐ Yes ☐ No

3. Which web system features would you like to include? (You can choose more than one)

   ☐ Sound ☐ Background Music

   ☐ Picture ☐ Video Other:_____

4. Do you prefer the web learning system in Bahasa Malaysia?

   ☐ Yes ☐ No

5. In your opinion, is web learning system able to attract students' interest in learning?

   ☐ Yes ☐ No

Thank you for your participating.

Appendices B: Questionnaire for Usability Testing for Student

BORANG MAKLUM BALAS E-PEMBELAJARAN SISTEM SURIA UNTUK PELAJAR SEKOLAH RENDAH

Borang ini digunakan untuk mengumpulkan maklumat berkaitan maklum balas terhadap web aplikasi E-Pembelajaran Sistem Suria.

Arahan: Sila bulatkan keterangan mengikut skala di bawah.

1: SANGAT TIDAK SETUJU   2: TIDAK SETUJU   3: NEUTRAL   4: SETUJU   5: SANGAT SETUJU

Bahagian A: Kebolehgunaan Sistem

Bil.	Keterangan	Skala				
1.	Saya berpendapat bahawa ia adalah mudah untuk memahami dan menggunakan aplikasi pembelajaran web ini.	1	2	3	4	5
2.	Saya berpendapat bahawa saiz tulisan yang digunakan untuk aplikasi ini adalah sesuai.	1	2	3	4	5
3.	Saya dapati nota sistem suria dalam aplikasi pembelajaran web ini menarik dan mudah difahami.	1	2	3	4	5
4.	Saya rasa warna yang dipilih untuk aplikasi ini sesuai dan menarik.	1	2	3	4	5

Bahagian B: Kefungsian Sistem

Bil.	Keterangan	Skala				
1.	Saya fikir ia adalah mudah untuk mendaftar dan log masuk dalam aplikasi ini.	1	2	3	4	5
2.	Saya mendapati bahawa pembelajaran web ini meningkatkan minat saya dalam sistem suria.	1	2	3	4	5
3.	Saya mendapati bahawa kuiz dalam aplikasi pembelajaran web boleh menilai pemahaman saya tentang sistem solar.	1	2	3	4	5
4.	Saya rasa bahawa permainan dalam aplikasi pembelajaran web adalah menyeronokkan dan menarik.	1	2	3	4	5
6.	Saya rasa saya akan mengakses pembelajaran web untuk mengetahui tentang sistem suria pada masa hadapan.	1	2	3	4	5

Bahagian C: Penilaian Keseluruhan

Bil.	Keterangan	Skala				
1.	Sejauh manakah anda berpuas hati dengan pengalaman menggunakan aplikasi ini?	1	2	3	4	5

Appendices C: Questionnaire for Usability Testing for Teacher

BORANG MAKLUM BALAS E-PEMBELAJARAN SISTEM SURIA UNTUK PELAJAR SEKOLAH RENDAH

Borang ini digunakan untuk mengumpulkan maklumat berkaitan maklum balas terhadap web aplikasi E-Pembelajaran Sistem Suria.

Arahan: Sila bulatkan keterangan mengikut skala di bawah.

1: SANGAT TIDAK SETUJU   2: TIDAK SETUJU   3: NEUTRAL   4: SETUJU   5: SANGAT SETUJU

Bahagian A: Kebolehgunaan Sistem

Bil.	Keterangan	Skala				
1.	Saya berpendapat bahawa ia adalah mudah untuk memahami dan menggunakan aplikasi pembelajaran web ini.	1	2	3	4	5
2.	Saya berpendapat bahawa saiz tulisan yang digunakan untuk aplikasi ini adalah sesuai.	1	2	3	4	5
3.	Saya dapati nota sistem suria dalam aplikasi pembelajaran web ini menarik dan mudah difahami.	1	2	3	4	5
4.	Saya rasa warna yang dipilih untuk aplikasi ini sesuai dan menarik.	1	2	3	4	5

Bahagian B: Kefungsian Sistem

Bil.	Keterangan	Skala				
1.	Saya fikir ia adalah mudah untuk mendaftar dan log masuk dalam aplikasi pembelajaran web ini.	1	2	3	4	5
2.	Saya mendapati ia menarik untuk digunakan sebagai bahan pengajaran bilik darjah.	1	2	3	4	5
3.	Saya berpendapat bahawa aplikasi ini dapat membantu saya menjimatkan masa dalam menyediakan bahan pengajaran bilik darjah.	1	2	3	4	5
4.	Saya percaya kehadiran aplikasi pembelajaran web ini dapat meningkatkan minat pelajar terhadap pembelajaran sistem solar.	1	2	3	4	5
5.	Saya mendapati ciri-ciri sistem tersebut sesuai untuk murid sekolah rendah.	1	2	3	4	5
6.	Saya mendapati bahawa kuiz dapat menilai kefahaman pelajar dalam sistem suria.	1	2	3	4	5
7.	Saya mendapati bahawa permainan dalam aplikasi pembelajaran web sesuai untuk pelajar sekolah rendah.	1	2	3	4	5
8.	Saya rasa saya akan menggunakan aplikasi pembelajaran web ini pada masa hadapan.	1	2	3	4	5

Bahagian C: Penilaian Keseluruhan

Bil.	Keterangan	Skala				
1.	Sejauh manakah anda berpuas hati dengan pengalaman menggunakan aplikasi ini?	1	2	3	4	5

Appendices D: Evaluation Session with Primary School Year 3 Students