



Faculty of Computer Science and Information Technology

E-Learning Solar System for Primary School Year 3 Students

Nurul Alia binti Aizad

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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Permanent Address

KM.18, Jalan Tok Andak 1
Kg. Serkam Timur, 77300
Merlimau, Melaka

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Validated by

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Ts. Nurfaeza Binti Jali
Senior Lecturer
Faculty of Computer Science and Information
Technology
Universiti Malaysia Sarawak

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Table of Content

DECLARATION	iii
ACKNOWLEDGEMENT	iv
LIST OF FIGURES	viii
LIST OF TABLES.....	x
ABSTRAK.....	xi
ABSTRAK.....	xii
CHAPTER 1: INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Problem Statement	1
1.3 Scope.....	2
1.4 Aim and Objective	3
1.5 Brief Methodology.....	3
1.5.1. Analysis	4
1.5.2. Design.....	4
1.5.3. Development.....	4
1.5.4. Implementation.....	4
1.5.5. Evaluation.....	4
1.6 Significance of Project.....	4
1.7 Expected Outcome	4
1.8 Project Report Outline	5
CHAPTER 2: LITERATURE REVIEW	7
2.1 Introduction.....	7
2.2 Overview of Objectives	7
2.3 Review on Similar Existing Systems	7
2.3.1 Space Place	7
2.3.2 Enchanted Learning-Our Solar System	11
2.3.3 Space for Kids	13
2.3.4 Table of Comparison	16
2.3.5 Review of the Proposed System.....	16
2.4 Summary	17
CHAPTER 3: METHODOLOGY	18
3.1 Introduction.....	18

3.2	Methodology	18
3.3	Analysis.....	18
3.3.1	Questionnaire.....	19
3.3.2	Characteristic of Learner	27
3.3.3	Functional Requirement	28
3.3.4	Non-Functional Requirement	28
3.4	Design	30
3.4.1	Lesson Planning.....	30
3.4.2	Content of Lesson.....	31
3.4.3	Activity Diagram	33
3.4.4	Use Case Diagram	34
3.4.5	Sequence Diagram.....	51
3.4.6	Class Diagram	52
3.4.7	Interface Design.....	53
3.5	Development	59
3.6	Implementation	59
3.7	Evaluation	59
3.8	Summary	60
	CHAPTER 4: IMPLEMENTATION.....	61
4.1	Introduction.....	61
4.2	Installation and Configuration of System’s Components.....	61
4.2.1	Notepad++.....	61
4.2.2	Scratch 3	62
4.3	Configuring Database Connection	63
4.4	Modules for e-Learning Solar System	63
4.4.1	Register Module	63
4.4.2	Login Module	64
4.4.3	Main Page Module.....	65
4.4.4	User Profile Module	66
4.4.5	Score Summary Module.....	66
4.4.6	Download module.....	67
4.4.7	Quiz module.....	67
4.4.7.1	Multiple Choice Question (MCQ) Quiz.....	67
4.4.7.2	Drag and Drop Quiz.....	69

4.4.8	Game Module	70
4.4.8.1	Shooter Game.....	70
4.4.8.2	Crossword Game.....	70
4.4.9	Animation Module	71
4.4.10	Content Module	71
4.5	Summary	73
CHAPTER 5: TESTING		74
5.1	Introduction.....	74
5.2	Functional Testing.....	74
5.2.1	Unit Testing	74
5.2.2	System Testing	81
5.3	Non-Functional Testing	82
5.3.1	Reliability Testing	83
5.3.2	Availability Testing.....	83
5.3.3	Usability Testing	84
5.4	Summary	87
CHAPTER 6: CONCLUSION AND FUTURE WORK.....		88
6.1	Introduction.....	88
6.2	Objective Achievements	88
6.3	Project Limitations.....	89
6.4	Future Works.....	89
6.5	Conclusion	89
REFERENCES		90
Appendices.....		92
Appendices A: Questionnaire for Collecting Data from Primary School Teacher.....		92
Appendices B: Questionnaire for Usability Testing for Student		94
Appendices C: Questionnaire for Usability Testing for Teacher		95
Appendices D: Evaluation Session with Primary School Year 3 Students		96

LIST OF FIGURES

Figure 1. 1 ADDIE Methodology(Lumen Learning, 2022).....	3
Figure 2. 1 Main page of Space Place Web Learning (NASA, 1998)	7
Figure 2. 2 Games in Space Place.....	8
Figure 2. 3 Explore Mars Game.....	9
Figure 2. 4 Media Section in Space Place.....	9
Figure 2. 5 Crafts Section in Space Place	10
Figure 2. 6 Parents and Educators Section in Space Place	10
Figure 2. 7 Main Page of Enchanted Learning-Our Solar System(Enchanted Learning, n.d.)	11
Figure 2. 8 Tutorial in Enchanted Learning-Our Solar System	12
Figure 2. 9 Puzzle Game in Enchanted Learning-Our Solar System.....	12
Figure 2. 10 Crafts in Enchanted Learning-Our Solar System	13
Figure 2. 11 Main page of Space for Kids(ESA, 2020).....	13
Figure 2. 12 Learn Section in Space for Kids	14
Figure 2. 13 Teachers Section of Space for Kids.....	14
Figure 2. 14 Games in Space for Kids	15
Figure 2. 15 Multimedia in Space for Kids.....	15
Figure 3. 1 ADDIE model.....	18
Figure 3. 2 Bar Chart of Respondents' Gender.....	19
Figure 3. 3 Bar Chart of Respondents' Age.....	20
Figure 3. 4 Bar Chart of Respondents' Teaching Experience (years)	20
Figure 3. 5 Bar Chart of Teaching Subject	21
Figure 3. 6 Bar Chart of Teaching Materials Used.....	22
Figure 3. 7 Bar Chart of Devised Provided by School for Students Use.....	23
Figure 3. 8 Pie Chart of Preference Teach using Web Learning System	23
Figure 3. 9 Pie Chart of Preference Game Based element in Web Learning System	24
Figure 3. 10 Pie Chart of Preference Compilation Notes in Web Learning System	24
Figure 3. 11 Bar Chart for Question 7	25
Figure 3. 12 Pie Chart of Preference Web Learning System in Malay	26
Figure 3. 13 Pie Chart for Question 9	27
Figure 3. 14 Activity Diagram	33
Figure 3. 15 Use Case diagram of e-Learning Solar System.....	34
Figure 3. 16 Sequence Diagram.....	51
Figure 3. 17 Class Diagram	52
Figure 3. 18 Login Page of the Proposed Project	53
Figure 3. 19 Registration Page of the Proposal Project	54
Figure 3. 20 Homepage of the Proposed Project	54
Figure 3. 21 e-Learning Solar System pages	55
Figure 3. 22 Quiz Page.....	56
Figure 3. 23 Fun Activity Page	56
Figure 3. 24 Quiz 1 Page.....	57
Figure 3. 25 Quiz 2 Page.....	57

Figure 3. 26 Fun Activity Page	58
Figure 3. 27 Game Page.....	58
Figure 3. 28 User Profile Page.....	59
Figure 4. 1Usage of using Notepad++	61
Figure 4. 2 Block Codes in Scratch Application	62
Figure 4. 3 Creating costume in Scratch application.....	62
Figure 4. 4 XAMPP Control Panel.....	63
Figure 4. 5 Registration Page of e-Learning Solar System.....	64
Figure 4. 6 Log In Page of e-Learning Solar System	64
Figure 4. 7Main Page of e-Learning Solar System.....	65
Figure 4. 8 User Profile Page of e-Learning Solar System.....	66
Figure 4. 9 Score Summary of e-Learning Solar System	66
Figure 4. 10 Download button of Sun poster	67
Figure 4. 11 Multiple Choice Question Quiz.....	68
Figure 4. 12 Submit and Try Again Buttons of MCQ Quiz	68
Figure 4. 13 Drag and Drop Quiz	69
Figure 4. 14 Shooter Game	70
Figure 4. 15Crossword Game	71
Figure 4. 16 Orbit Animation.....	71
Figure 4. 18 Planet Page of e-Learning Solar System.....	72
Figure 4. 17 Orbit Planet Page of e-Learning Solar System	72
Figure 4. 19 Solar System Balloon Activity Page.....	73
Figure 4. 20 Solar System Balloon Activity Page.....	73

LIST OF TABLES

Table 2. 1 Comparison of the features of the existing system	16
Table 3. 1 Characteristic of Learner	27
Table 3. 2 Software Requirement for e-Learning Solar System	29
Table 3. 3 Hardware Requirement for e-Learning Solar System.....	29
Table 3. 4 Lesson Planning.....	30
Table 3. 5 List of Subtopic and Learning Style	31
Table 3. 6 Use Case Login.....	35
Table 3. 7 Use Case Register	35
Table 3. 8 Use Case Learn Solar System.....	36
Table 3. 9 Use Case Learn The Sun.....	37
Table 3. 10 Use Case Learn Planets.....	37
Table 3. 11 Use Case Learn Planetary Orbit.....	38
Table 3. 12 Use Case Planetary Distribution Time.....	39
Table 3. 13 Use Case Fun Activity	40
Table 3. 14 Use Case Interactive Card Activity	41
Table 3. 15 Use Case Learn Solar System Balloon Activity	42
Table 3. 16 Use Case Orery of Solar System Activity	43
Table 3. 17 Use Case Let's Colour Activity	44
Table 3. 18 Use Case Attempt Quiz.....	45
Table 3. 19 Use Case Attempt Quiz 1.....	46
Table 3. 20 Use Case Attempt Quiz 2.....	47
Table 3. 21 Use Case Play Game.....	47
Table 3. 22 Use Case Shooter Game	48
Table 3. 23 Use Case Crossword Game.....	49
Table 3. 24 Use Case Record Point	50
Table 5. 1 Test Case of System Menu	74
Table 5. 2 Test Case of Login Page	76
Table 5. 3 Test Case of Register Page	76
Table 5. 4 Test Case of Quiz.....	77
Table 5. 5 Test Case of Game.....	79
Table 5. 6 Test Case of User Profile	81
Table 5. 7 Test Case of System Testing.....	81
Table 5. 8 Test Case for Reliability Testing	83
Table 5. 9 Test Case of Availability Testing	83
Table 5. 10 Results of Usability Testing.....	84
Table 5. 11 Results of usability testing for e-Learning Solar System system functionality (student)	85
Table 5. 12 Results of usability testing for e-Learning Solar System system functionality (teacher)	86
Table 6. 1 List of Objectives and Achievements	88

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 approach where 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.

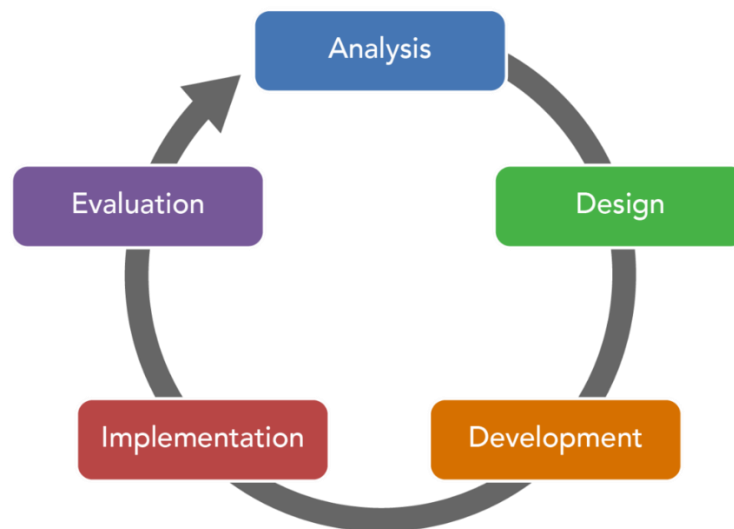


Figure 1. 1 ADDIE Methodology(Lumen Learning, 2022)

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 further 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

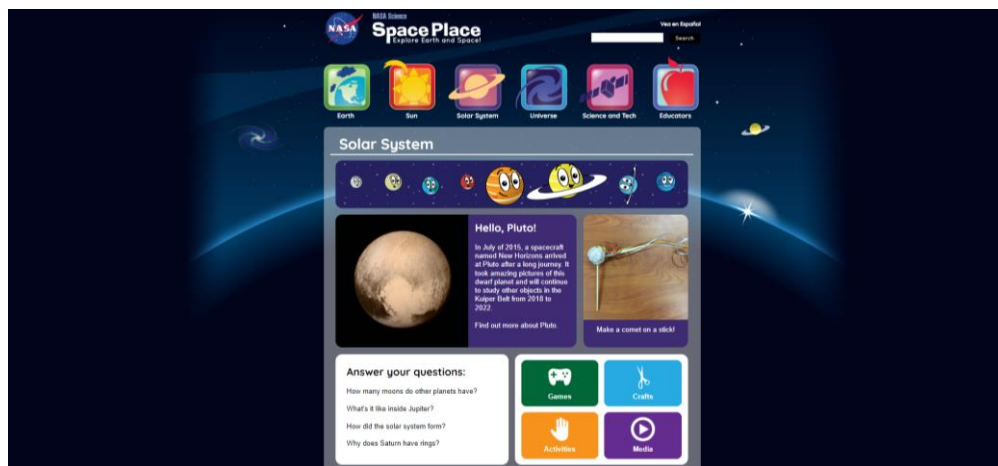


Figure 2. 1 Main page of Space Place Web Learning (NASA, 1998)

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.

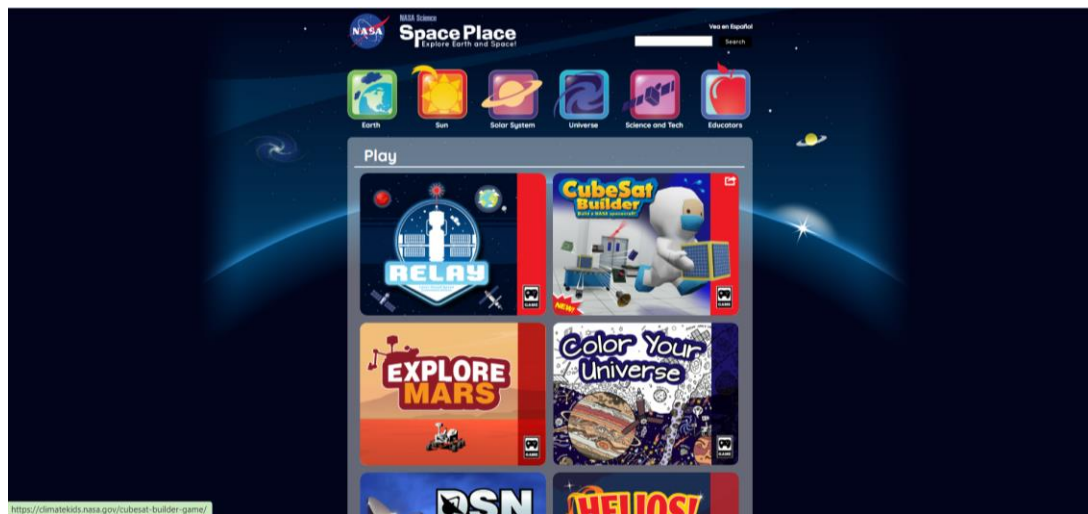


Figure 2. 2 Games in Space Place

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.

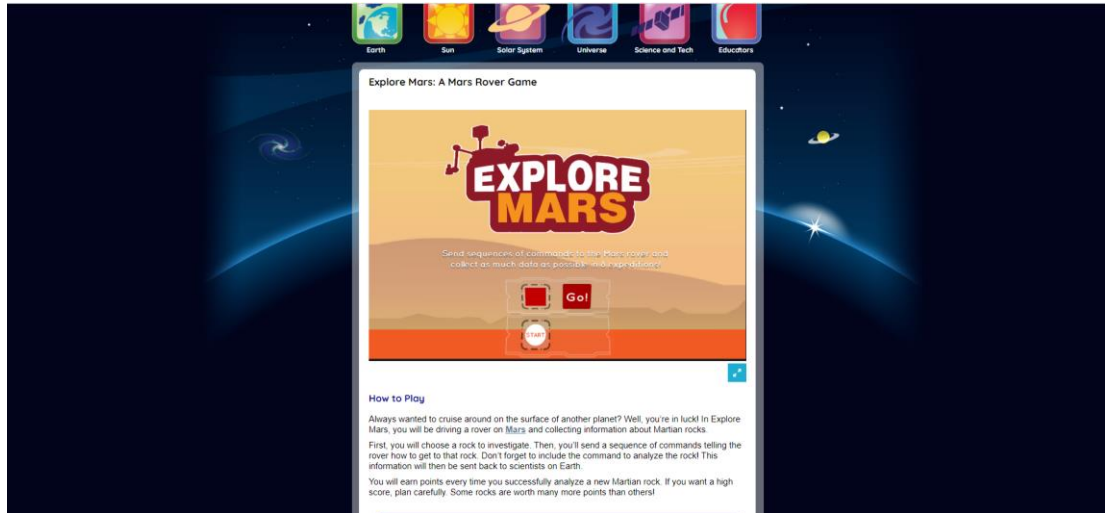


Figure 2. 3 Explore Mars Game

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.

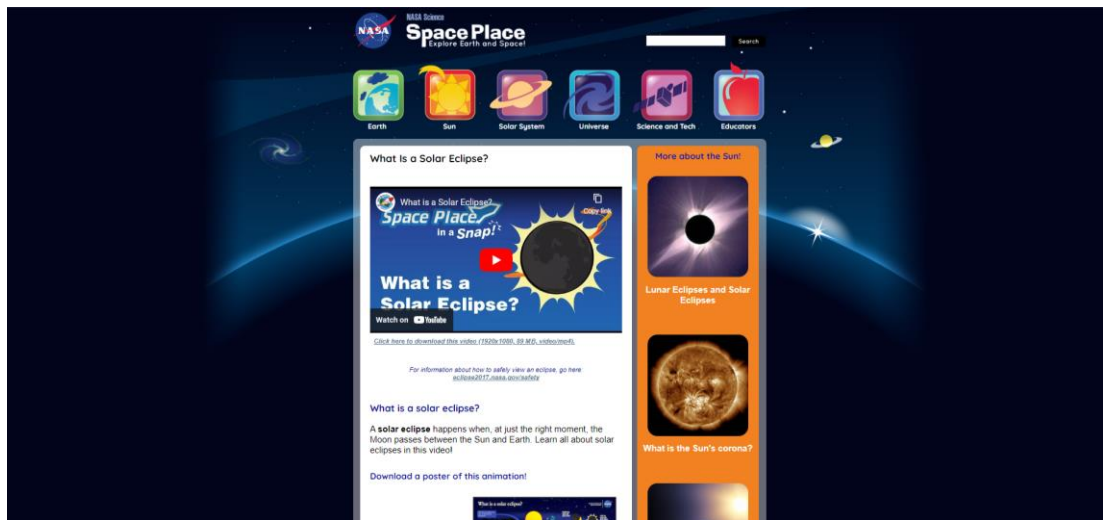


Figure 2. 4 Media Section in Space Place

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,

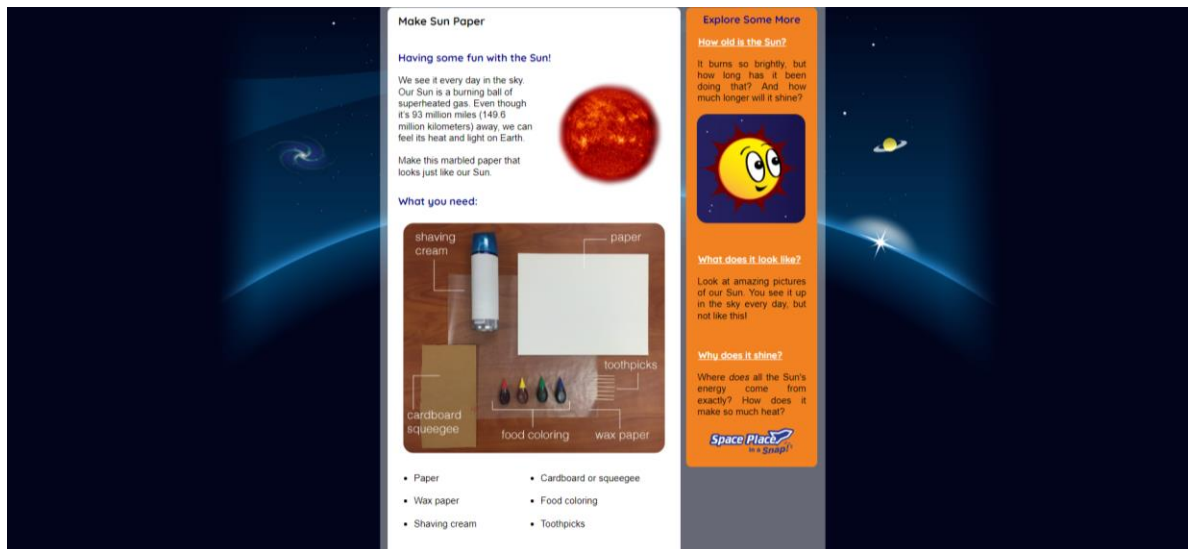


Figure 2. 5 Crafts Section in Space Place

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

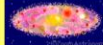
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Table of Contents	Enchanted Learning	Site Index
All About Astronomy		
Our Solar System		
The Sun	The Planets	The Moon
Asteroids	Kuiper Belt	Comets
Meteoroids	Stars	Glossary Astronomers
Printables, Worksheets, and Activities		



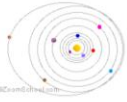
Our Solar System



All About the Solar System	Orbits	The Ecliptic	Where is our Solar System?	Exploring the Solar System	Extremes	Learning Activities
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All About Our Solar System

Our solar system consists of the sun, planets, dwarf planets (or plutoids), moons, an asteroid belt, comets, meteors, and other objects. The sun is the center of our solar system; the planets, over 61 moons, the [asteroids](#), [comets](#), [meteoroids](#) and other rocks and gas all orbit the [Sun](#).



The Planets
The nine planets that orbit the sun are (in order from the Sun): [Mercury](#), [Venus](#), [Earth](#), [Mars](#), [Jupiter](#) (the biggest planet in our Solar System), [Saturn](#) (with large, orbiting rings), [Uranus](#), [Neptune](#), and [Pluto](#) (a dwarf planet or plutoid). A belt of asteroids (minor planets made of rock and metal) orbits between Mars and Jupiter. These objects all orbit the sun in roughly circular orbits that lie in the same plane, the ecliptic (Pluto is an exception; this dwarf planet has an elliptical orbit tilted over 17° from the ecliptic).

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.