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English is Fun! – English Strange and Funny: The Development of E – Learning System for Secondary School Student

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Abstract: Vocabulary is one of the most comprehensive but difficult aspect of English for foreign learners to master thoroughly including the words categorized as homophone and homograph. Homophone refers to any word with the same pronunciation as another word but has a different meaning and spelling whereas, Homograph refers to words with the same spelling but different pronunciation and meaning. However, most Malaysian students cannot speak English confidently due to lack of vocabulary. Students' limited knowledge of English words is one reason they are not well-versed in the existence of different words in English. Hence, an E – Learning System for Secondary School Student is developed. The main objective is to design English E – Learning System using structures and web system approach. This system is targeted to secondary school students aged 16 years old. The colour and design of the system are more attractive for the target user to learn English. ADDIE models are used to conduct this study and a few software's are used to develop the system. This project will be conducted to allow students learn homophone and homograph in English language and so will help them to have a wide range of vocabulary.

Keywords: E-Leaning Web System, Homophone, Homograph, ADDIE Model

1. Introduction

Digital technologies manage IR 4.0, presenting future education models emphasizing intelligent, mobile, comprehensive, and virtual education and skill development (2,3). As a result, teachers must adapt their teaching techniques to meet the needs of IR 4.0. Malaysia is a developing country, yet despite the government's declaration that 21st Century Learning Method (PAK-21) must be completely adopted beginning in March 2018, most schools in Malaysia continue to use conventional/outdated learning methods (1). Therefore, the developer decided to develop an E - Learning web system which offers better understanding regarding homophone and homograph specifically for English language.

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English language is a common second language for many Malaysians. However, past research has shown that many Malaysian students are facing problem in grasping the language (4,5,6). Vocabulary is one of the most comprehensive and difficult aspects of English for foreign learners to master thoroughly. Other difficulties in learning and using English vocabulary include the words categorized as homophone and homograph (7,8). Hence, it is understandable that Malaysian students often face problems when learning English as there are many words in English language could be confusing.

Based on past research, most Malaysian students cannot speak English confidently due to lack of vocabulary (4,5). Students' limited knowledge of English words is one reason they are not well-versed in the existence of different words in English. Unfortunately, English vocabulary for a daily living requires more time and is more difficult to master by foreign learners than English grammar. Thus, the developer decided to design English E - Learning Web System using structured or web system approach. the fact that students are required to write more extended essays and encounter more complicated language questions. Therefore, this project's scope is limited to secondary school students, especially form 4 students.

This report is divided into six sections. The project of the system that is going to be built is discussed in the first part of the paper. This chapter will analyze the problem and the aim of the project. The second part of the paper will discuss the literature review done for the system and the current system used by users. The next part of this paper explains the methodology used to develop the system and activities carried out in each phase. The following section will have a detailed explanation on the requirements needed in the system and the process that works in the system. In this section, a Context Diagram, Data Flow Diagram Level 0 (DFD Level 0), Data Flow Diagram Level 1 (DFD Level 1) and Entity Relationship Diagram (ERD) will be exhibited. Next part of this paper will explain about the implementation and testing phases, applying the test cases and interface accordingly. The final section of this paper will review the advantages and disadvantages of the system, as well as provide recommendations for future improvements and make conclusions about the project.

2. Related Work

2.1 E – Learning System

In general, computers and the internet were just recently introduced, allowing for the expansion of learning tools and approaches. The first computer, presented by MAC in 1984, paved the way for computers to be found in every home (9). Furthermore, the emergence of the internet has allowed individuals to learn about certain areas and build specific skill sets. As a result, people all over the world have begun to have access to online knowledge, which has led to the development of e-learning opportunities. E-learning, according to Clark, Mayer and Thalheimer (2003), is defined as instructions supplied via digital devices which aim is to assist interactive learning.

The use of information and communication technology as resources in enabling access to online teaching and learning has been made possible by e-learning (11). The use of electronic technologies in learning is now widely employed around the world and is referred to as e-learning. E-learning stands for electronic learning, which is defined as the acquisition of knowledge via the use of technology and media (10). Because to the widespread adoption of e-learning platforms, educational curricula can now be accessed outside of traditional classrooms without restriction. There are numerous E-learning systems in use today.

Time is one of the challenges that both learners and teachers must deal with in learning, along with locational constraints (13). In the case of face-to-face learning, the location restricts attendance to a set of learners who live in the region, and in the case of time, it restricts attendance to those who can attend at a given time. E-learning, on the other hand, makes learning easier by eliminating the need to schedule when and where everyone who is interested in a course may attend.

2.2 E – Learning and Learning styles

When it comes to teaching methods and delivery, the focus has always been on the student's learning style. Teachers and instructors will need to find strategies to cope with their teaching approaches as teaching styles have evolved and will continue to evolve in order to ensure effective instruction. This issue has also been on the rising ever since the world is hit by the deadly pandemic, Covid-19. Despite the fact that there has been a shift from traditional to online learning, there has always been a concern about students' learning styles. The method by which the learner organizes, processes, depicts, and combines this knowledge and stores it in his cognitive source is referred to as learning style (13).

There are several learning style models available, including the VARK model, which is one of the most well-known. The VARK model provides a more thorough examination of information processing preferences (15). The VARK model, established by Fleming and Baume (2006) (13), consists of four students' preferred learning styles. The letter "V" stands for visual and refers to the visual style; the letter "A" stands for auditory and refers to the auditory style; the letter "R/W" stands for "write/read" and refers to the reading/writing style; and the letter "K" stands for the word "Kinesthetic" and refers to the practical style. Furthermore, VARK divides the visual category into graphical and textual learners, as well as visual and read/write learners (14).

Adaptation based on a mix of learning style and information level generates significantly greater learning gains, according to Dobson (2010) (16). Researchers have recently begun to focus on how to tailor e-learning experiences by taking into account personal factors such as the student's preferred learning style. Adaptive learning systems address personal learning issues by providing learners with courses tailored to their unique needs, such as learning styles. Figure 1 shows VARK Learning Style adapted from Fleming and Baume



Figure 1: VARK Learning Style adapted from Fleming and Baume (2006)

2.3 E – Learning and English Vocabulary Learning

Research on the use of e-learning tools in the classroom demonstrates that Information and Communication Technology (ICT) creates a supportive and motivating environment for students to raise their quality and quantity of basic skills (17). Zoro (2018) (18), who did a study on an effective online resource called Kahoot, an online game simulating a quiz that is widely used by schools, confirmed the research's findings. In general, the majority of students participated in the class and used e-learning devices such as their laptops and mobile phones, which increases their motivation to study English.

Licorish, George, Owen and Daniel (2017) (20) proposed that students will be able to study more effectively and independently if they are consistently motivated throughout the entire instructional process. E-learning has unquestionably aided in the improvement of students' fundamental skills by increasing classroom involvement (19). With the aid of e-learning, students were able to acquire numerous techniques, including memory, cognitive, compensatory, metacognitive, affective, and social strategies, throughout the course of the class. Based on e-learning, Harris and Rutledge (2007) (20) determined that the predictors of teacher quality and effectiveness are reasoning ability, character traits, and educational background.

It is also stated that teachers must be committed and enthusiastic about the teaching process if they wish to witness an increase in the academic performance of their students. As indicated by Sikand & Kauts, the majority of primary and secondary schools have restructured their education techniques and approaches to raise the teaching effectiveness, which will increase the English language teacher's motivation (21,22). Through e-learning, teachers in the 21st century are embracing and adapting new teaching tactics and approaches to create a balanced and positive learning environment (23).

2.4 E – Learning and English Vocabulary Learning

A comparison between an existing application and a proposed application is shown in **Table 1**. Three different applications are being discussed: Learn English Language, Online Teacher UK and Twinkl. All these websites covered the learning material in homophone and homograph word.

Table 1: Application's Comparison

Features/System	Learn English Language	Online Teacher UK	Twinkl	English is Fun!
User signup and login	X	√ Email and password	√ Email and password	√ Username and password
Subscription for free	√	X	X	√
Definition of homophone	√	√	√	√
Definition of homograph	X	X	√	√
Meaning for each homophone words	X	√	√	√
Meaning for each homograph words	X	X	√	√
Simple sentence for homophone	X	√	√	√
Simple sentence for homograph	X	X	X	√
Pronunciation of the words (Audio)	√	X	X	X
Picture (if any) for homophone	X	X	√	√
Picture (if any) for homophone	X	X	√	√
Quizzes	X	√	√	√
Quiz Result	X	X	X	√

The developer decided to add a new module in the proposed application, homograph. The developer will also provide quizzes module to evaluate user's knowledge. The quiz result also will be displayed for user to know the level of their knowledge in learning homophone and homograph in English.

3. Methodology

ADDIE model is a general instructional design model that helps instructional designers and system developers develop and maintain learning products. This is an iterative feedback approach, which implies that the outcomes of the evaluation phase are returned to the feedback, thus completing the cycle, and allowing for further improvement of the learning product (24).

3.1 Analysis Phase

The developer's attention is focused on the targeted users and the characteristics of the system. Another essential element of the system is adapting to each student or teacher's degree of ability and understanding. This is to ensure that the student's prior knowledge will not be repeated, and the emphasis will be placed on subjects and lessons that they have not yet had the chance to discover and learn. This system will help students understand more about vocabulary, especially in homophones and Homographs in English. The targeted user for this system is a secondary school student aged 16 years old. Most students in Malaysia have difficulties differentiating a few words with the exact spelling but different pronunciations and have different spelling but the same meaning. Hence, the developer must ensure the goals and objectives of this project will be achieved at the end of this project.

The analysis and design explore the analysis and design of the 'English is Fun!' system. System design is very important in this process. Design is the process of identifying sub-problems and designing solutions to those sub-problems. In contrast, the analysis identifies inputs, outputs, and the entire process to solve problems. Context diagrams, entity-relationship models and data flow models are some of the model designs that have been used. The context diagram will be briefly discussed, and the level 0 data flow diagram will be used to explain it in further detail. An entity-relationship diagram is also created for this system's database design, which will be used to develop the system.

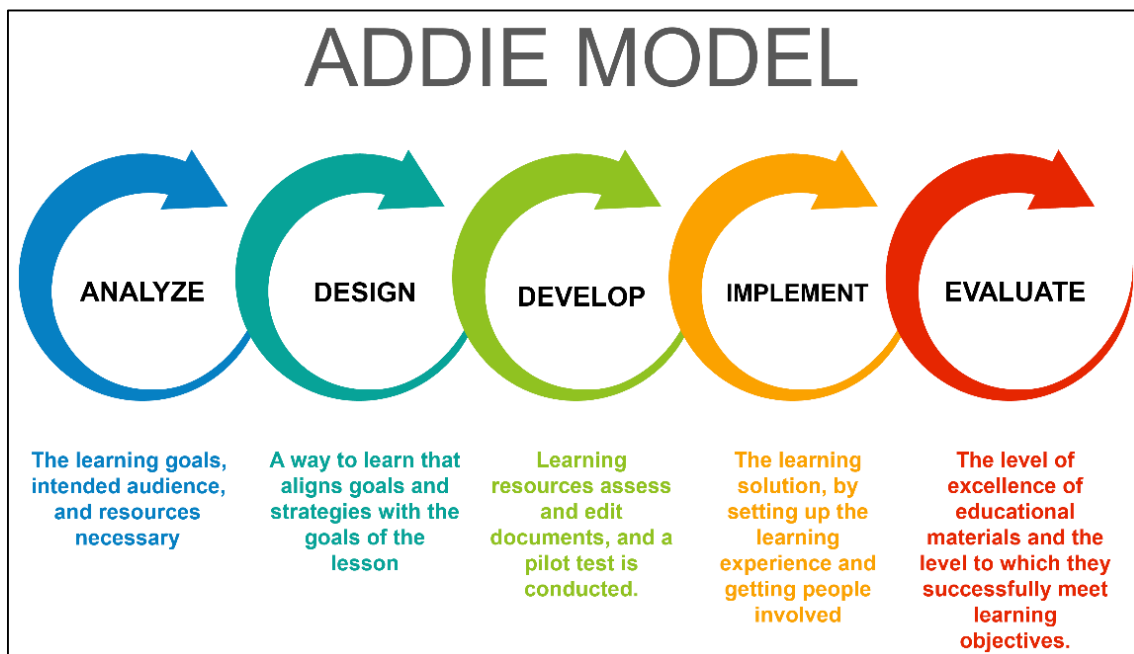


Figure 2.1: ADDIE Model

3.1.1 Requirement Analysis

Functional requirements are where the developer must implement the user requirement features to complete the development process. **Table 2** shows the functional requirements to develop this system such as User, Homophone Words module, Homograph Words modules and Quizzes module.

Table 2: Functional Requirements

No.	Modules	Functionalities
1.	User	This module need user to login into the system by entering username and password.
2.	Homophone Words Module	<ul style="list-style-type: none"> Shows the meaning of homophone. Shows examples of the word, the meaning of the words and short sentence. Users allow to choose any words.
3.	Homograph Words Module	<ul style="list-style-type: none"> Shows the meaning of homograph. Shows examples of the word, the meaning of the words and short sentence. Users allow to choose any words.
4.	Quizzes Module	<ul style="list-style-type: none"> Displays a few types of quiz. Allow user to answer the quiz. It will show the result of the quiz.

3.1.2 Requirement Analysis

Table 3 explains the user requirements analysis and explains how the system works between client and admin.

Table 3: User Requirement Analysis

	Requirements
Student (Client)	<ul style="list-style-type: none"> Students allow to choose Homophone or Homograph words for learning process. Student should be able to answer the quizzes provided by admin to know the level of knowledge about homophones and homographs. Student will get the result of the quiz.
Teacher (Admin)	<ul style="list-style-type: none"> Teacher needs to input the username and password for login process. Teacher be able to add, update and delete the quiz in the system.

3.1.3 DFD Context Diagram (DFD CD)

Figure 2.2 shows the context diagram for English is Fun! E-Learning Web System. This system requires student and teacher to log into the system. The users are then allowed to choose modules provided by the system. The student must answer some types of questions designed to determine the level of knowledge about homophones and homographs. Then, the result of the quiz will display.

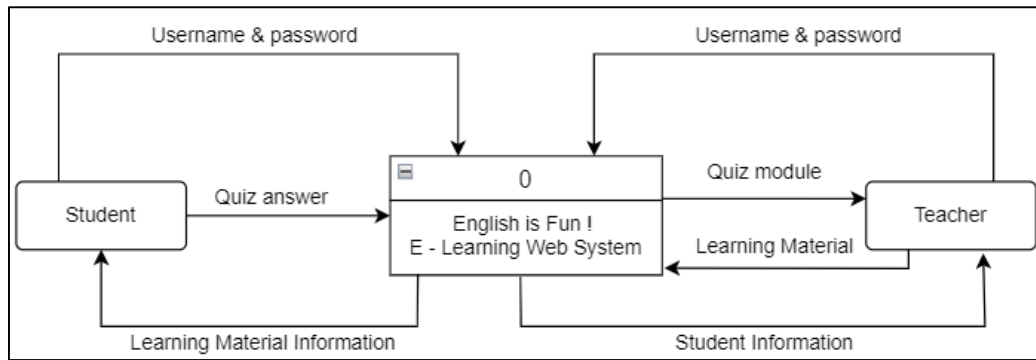


Figure 2.2: DFD Context Diagram (DFD CD)

3.2 Design Phase

This phase is a standard design to prepare to meet the system development needs. This phase hints the developer on the system's structure through a storyboard. For example, it shows how the system works. Also, context diagrams, entity-relationship models and data flow models are some of the model designs that have been used. The system requirements analysis will be conducted during this chapter through diagrams to help assess the actual system needs. The context diagram will be briefly discussed, and the level 0 data flow diagram will be used to explain it in further detail. An entity-relationship diagram is also created for this system's database design, which will be used to develop the system.

3.2.1 System Architecture

The DFD Level 0 is a process detail from Context Diagram. The purpose of this diagram is to provide a more detailed explanation of how a system works. The DFD Level 0 has four processes: login process, module process, quiz process, and result process. The database is divided into the following tables: Teacher, Student, Class, Topic, Question and Quiz. **Figure 2.3** shows a DFD Level 0 diagram from which entities and context diagrams may be collected to see the process in more detail.

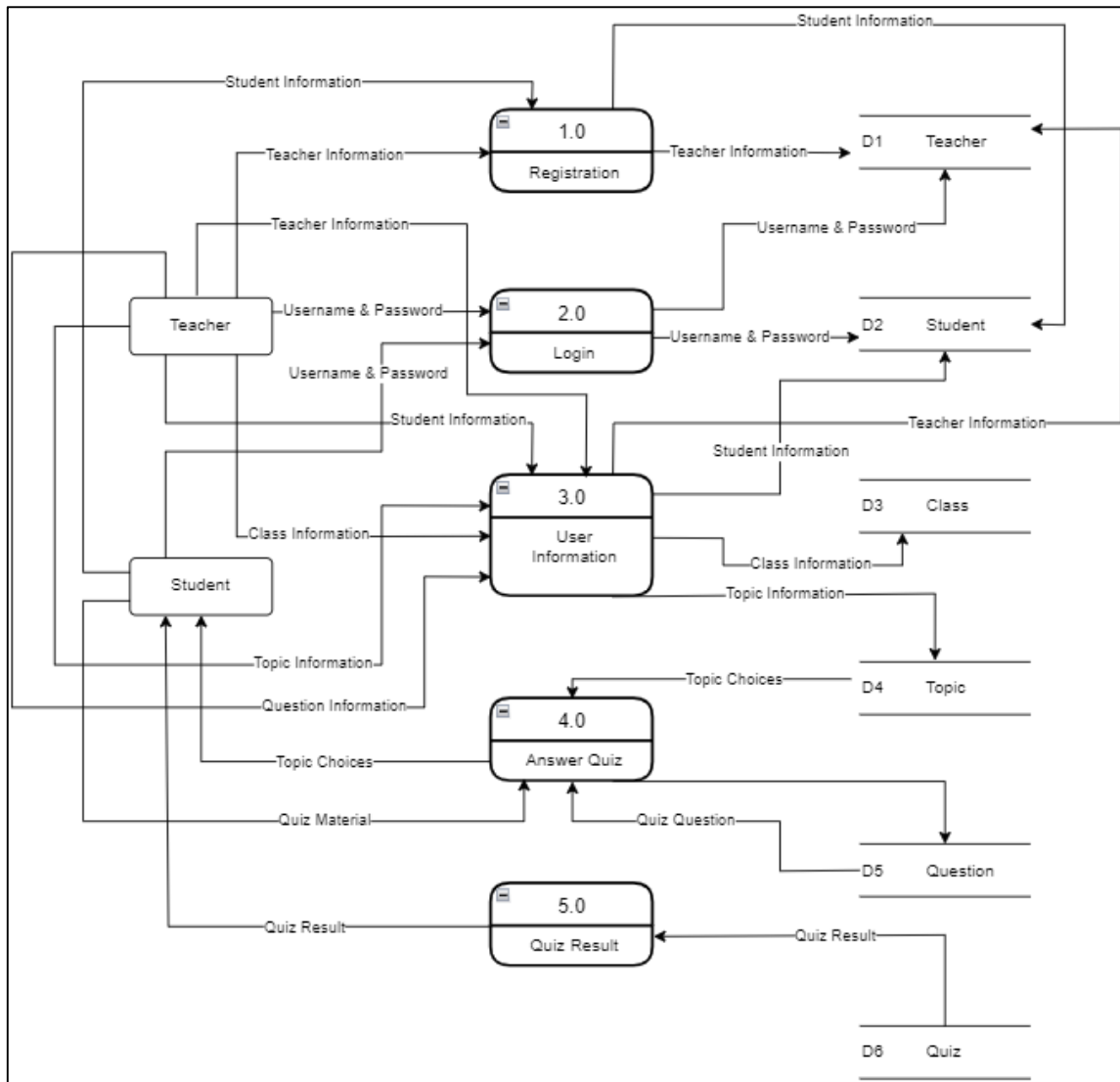


Figure 2.3: DFD Level 0

3.2.2 Database Design

The entity Relationship Diagram (ERD) represents the relationships between the entities involved in a system. Each entity has its own attributes and functions to support the other entities. For example, **Figure 2.4** shows the ERD for English is Fun! E-Learning Web System.

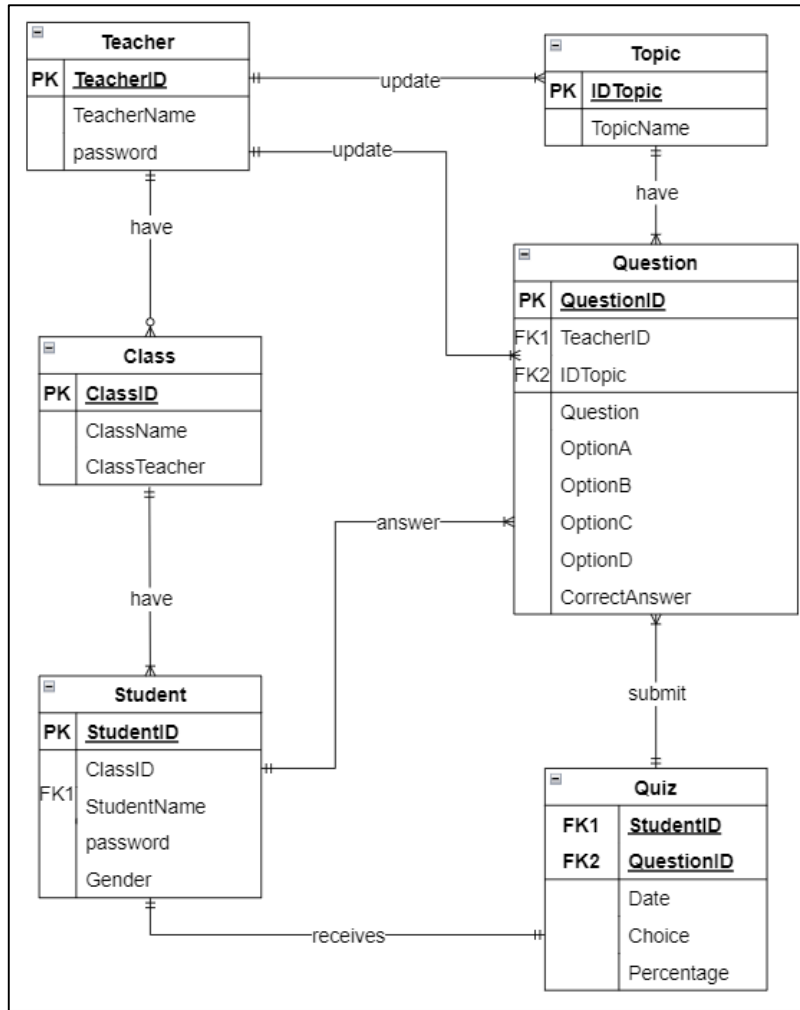


Figure 2.4: Entity Relationship Diagram (ERD)

3.2.3 Interfaces Design

There are three modules' homophones, homographs, and quizzes. Users need to learn about homophones and homograph modules before answering the quiz. **Figure 2.5** shows the user is required to log into the system using the correct username and password and the system will go to the following interface. **Figure 2.6** shows the system's homepage, and the user can choose either Homophone module, Homograph module or Quizzes module. For example, when user choose Homophone Module, the system will redirect user to next interface as shown in **Figure 2.7**. After finished the learning process, user is allowed to answer the quizzes provided and the results will be displayed.



Figure 2.5: Login Page

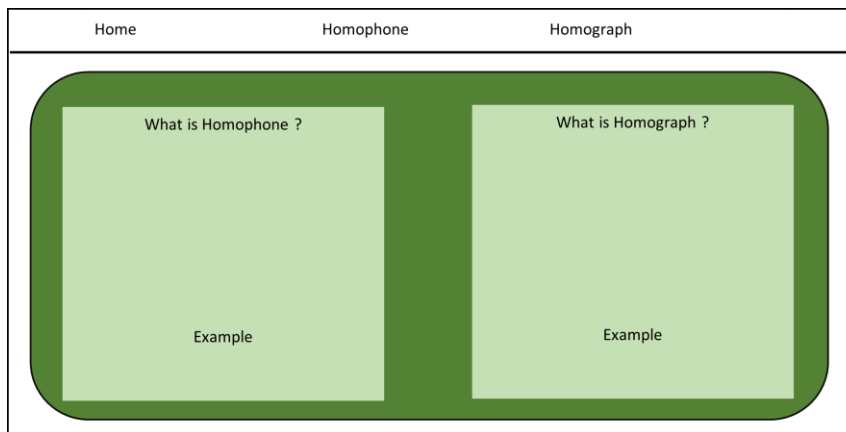


Figure 2.6: Homepage

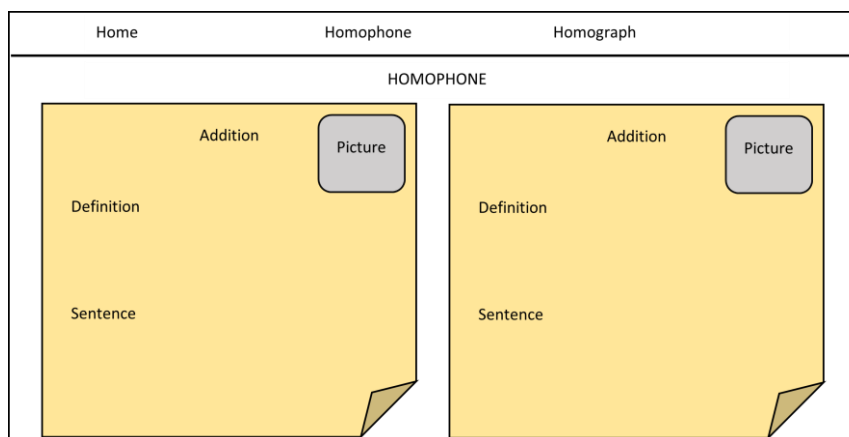


Figure 2.7: Homophone Word

3.3 Development Phase

This phase includes system development, planning and designing based on a built-in storyboard using a few software as following:

Table 3: Hardware and Software

Hardware	Software
Acer laptop intel core i5-62000U, 4GB (RAM)	Google Chrome
Wacom Pen Tablet (Standard USB Type-A port)	Xampp
	Bracket

3.4 Implementation Phase

The implementation phase aims to determine if the developed system meets the objective needs and is acceptable for usage by target users in secondary school age 16 years old, as determined in the objective. Also, in this phase, the systems ready to be implemented are installed on the smartphone or tablet. During this stage, the system will be tested by students and teacher in secondary school. The testing session will be limited to a maximum of 25 students and two teachers in order to gain experience and feedback from the respondents.

**Figure 2.8: Login Page**

The login module provided both the student and the teacher access to the English is Fun! System. The username and password are not fixed and set. The users must enter the username and password they created in the login form, as shown in **Figure 2.8** for students and teacher. Users will be led to the system homepage when they click the login button.

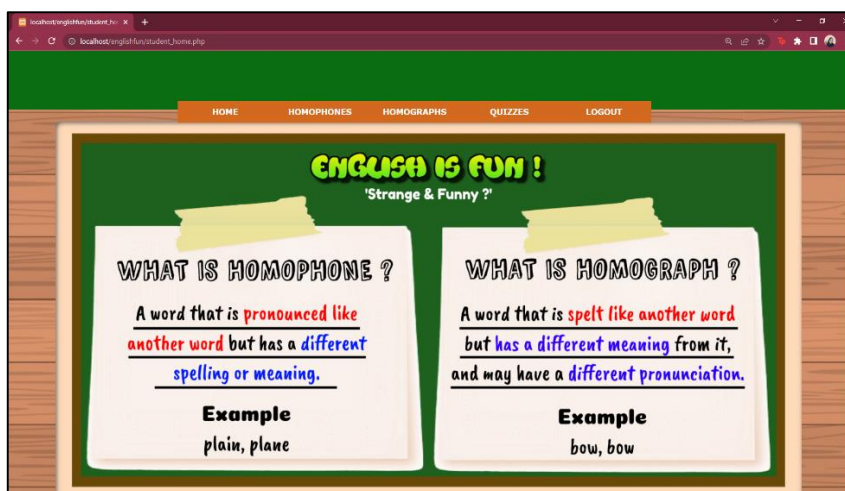


Figure 2.9: Homepage

Figure 2.9 displays the design of the main page for English is Fun system for student’s interface. It will display the meaning of homophone and homograph. There are five buttons in the menu bar: Home, Homophone, Homograph, Quizzes and Logout. The logout button on the right-side enabled users to leave the system.



Figure 2.10: Homophone Word

Figure 2.10 shows the interface when the user clicks on the homophone list, which the system will redirect the user to this interface, and it will display the meaning of the word, sentence, and picture (if any).

Topic	HOMOPHONE QUIZ - SET A
NUMBER OF RIGHT	3
NUMBER OF WRONG	2
TOTAL QUESTION	5
RESULT	60 %

Figure 2.11: Quiz Result

Figure 2.11 shows the quiz result after the user completes answering the question. The result will show the number of correct answers, wrong answers, and the quiz percentage for the set.

3.5 Evaluation Phase

The goal of the evaluation phase is to identify whether the objectives have been achieved. In addition, getting feedback or comments from targeted users in the previous phase will help the developer improve the system's overall efficiency and success rate. For example, the developer's respondents to evaluate 'English is Fun!' system are students and teachers in secondary school.

4. Results and Discussion

The testing phase executes once the whole system has been developed and is ready to use. Testing is necessary to guarantee that the system can meet the system requirements. The test table is created to examine the system's tests.

4.1 Test Cases

One must first test the developed system's function to complete the testing process. The test cases have been compiled into a summary that can be seen in **Table 4** below.

Table 4: Example of presenting data using a table

No.	Test Cases	Description	Status
Test Case Login & Signup (TEST_01)			
1.	TEST_01_01	Teacher and student enter correct username and password.	PASS
2.	TEST_01_02	Teacher and student enter incorrect username and password.	PASS
Test Case Signup (TEST_02)			
1.	TEST_02_01	New teacher and student register new username and password.	PASS
2.	TEST_02_02	New teacher and student register existing username and password.	PASS
Test Case Homophones (TEST_03)			
1.	TEST_03_01	Student clicking on each word in homophone list.	PASS
Test Case Homographs (TEST_04)			
1.	TEST_04_01	Student clicking on each word in homograph list.	PASS
Test Cases Quizzes (TEST_05)			
1.	TEST_05_01	Students need to choose question set for evaluation.	PASS
2.	TEST_05_02	Students need to answer all the questions in each set.	PASS
3.	TEST_05_03	Students will receive the evaluation mark.	PASS
4.	TEST_06_04	Students allow to answer another set.	PASS
Test Case Teacher (TEST_06)			
1.	TEST_06_01	Teacher clicks 'Add' and redirect to add form to insert new teacher details with "Successfully Added" alert.	PASS
2.	TEST_06_02	Teacher clicks 'Update' to update teacher details in database with "Successfully Updated" alert.	PASS
3.	TEST_06_03	Teacher clicks 'Delete' to delete teacher in database with "Successfully Deleted" alert.	PASS
4.	TEST_06_04	Teacher clicks 'List' to view the list of teachers added in the database.	PASS

Table 4: (continued)

Test Case Student (TEST_07)			
1.	TEST_07_01	Teacher clicks 'Add' and redirect to add form to insert new student details with "Successfully Added" alert.	PASS
2.	TEST_07_02	Teacher clicks 'Update' to update student details in database with "Successfully Updated" alert.	PASS
3.	TEST_07_03	Teacher clicks 'Delete' to delete student in database with "Successfully Deleted" alert.	PASS
4.	TEST_07_04	Teacher clicks 'List' to view the list of students added in the database.	PASS
Test Case Class (TEST_08)			
1.	TEST_08_01	Teacher clicks 'Add' and redirect to add form to insert new class details with "Successfully Added" alert.	PASS
2.	TEST_08_02	Teacher clicks 'Update' to update class details in database with "Successfully Updated" alert.	PASS
3.	TEST_08_03	Teacher clicks 'Delete' to delete class in database with "Successfully Deleted" alert.	PASS
4.	TEST_08_04	Teacher clicks 'List' to view the list of classes added in the database.	PASS
Test Case Topic (TEST_09)			
1.	TEST_09_01	Teacher clicks 'Add' and redirect to add form to insert new topic details with "Successfully Added" alert.	PASS
2.	TEST_09_02	Teacher clicks 'Update' to update topic details in database with "Successfully Updated" alert.	PASS
3.	TEST_09_03	Teacher clicks 'Delete' to delete topic in database with "Successfully Deleted" alert.	PASS
4.	TEST_09_04	Teacher clicks 'List' to view the list of topics added in the database.	PASS
Test Case Question (TEST_10)			
1.	TEST_10_01	Teacher clicks 'Add' and redirect to add form to insert new question details with "Successfully Added" alert.	PASS
2.	TEST_10_02	Teacher clicks 'Update' to update question details in database with "Successfully Updated" alert.	PASS
3.	TEST_10_03	Teacher clicks 'Delete' to delete question in database with "Successfully Deleted" alert.	PASS
4.	TEST_10_04	Teacher clicks 'List' to view the list of questions added in the database.	PASS

4.2 User Acceptance Testing

Testing for user acceptability is carried out by a person who uses the tested system. This testing aims to determine whether the system has met the requirement. This testing was done by secondary school students aged 16 years old and one Sekolah Menengah Kebangsaan Aminuddin Baki teacher. The users were provided with a questionnaire that they could evaluate on depending on the system that was shown to them, and this questionnaire was produced and delivered to them. The result collected from system users is shown in **Table 5**.

Table 5: User Acceptance Testing

No.	Question	Variables	%	N
Part A – Website Design				
1	I like the design of the website	Very Satisfied	46.2	12
		Satisfied	53.8	14
2	I like the colours of the website	Very Satisfied	53.8	14
		Satisfied	42.3	11
		Neutral	3.8	1
3	I like the text (font size and font colours)	Very Satisfied	46.2	12
		Satisfied	50	13
		Neutral	3.8	1
Part B – Website Navigation				
1	I can navigate to other pages easily	Very Satisfied	57.7	15
		Satisfied	42.3	11
2	The links take me to the relevant pages	Very Satisfied	73.1	29
		Satisfied	26.9	7
3	I can use all the features provide by the website	Very Satisfied	69.2	18
		Satisfied	30.8	8
Part C – Website Content				
1	The content of the website is relevant	Very Satisfied	69.2	18
		Satisfied	30.8	8
2	I now understand Homophone word	Very Satisfied	69.2	18
		Satisfied	26.9	7
		Neutral	3.8	1
3	I now understand Homograph word	Very Satisfied	69.2	18
		Satisfied	26.9	7
		Neutral	3.8	1
4	The content presented in the right format	Very Satisfied	61.5	16
		Satisfied	34.6	9
		Neutral	3.8	1

5. Conclusion

In conclusion, English is Fun! – Strange and Funny will be developed as an E-Learning Web System that helps students master homophones and homographs in the English language. According to the system requirements and scope, this system has been successfully achieved. The methodology used in the development of this system is ADDIE Model. The software used in developing the system is Xampp and Bracket. English is Fun Web System has been developed consistently with the design described in the design phase. The navigation in this system is working successfully. Even though this system has been developed well, there are still need an improvement to make this system even better. The first recommendation is to create search navigation for user's convenience of searching the words they want. The second recommendation is the quiz module can have different type of question, such as drag/drop and word cross. The third recommendation is to improve user experience to make it more mobile user-friendly interface.

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