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Visual-based Vocabulary Assistance Application

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***Abstract*—English is still challenging among non-native speakers especially students. Mastering new words daily is vital to improve the vocabulary. Visual approach is expected to be more interesting to increase students' memories. Hence, we propose Visual-based Vocabulary Assistance Application (ViVA), a learning application that is developed to assist secondary school students in the higher form to master their English vocabulary. ViVA uses the visual-based approach such as animation, informative diagram, and pictures as the basis of learning to help students understand the learning material easily. In addition, students are also able to measure their understanding by attempting the given assessments. Formative and summative assessments are available through ViVA. The questions of formative assessment are classified according to the topics covered in the learning materials. On the other hand, summative evaluation questions cover all the proposed topics. ViVA also provides the function to check their performance and allows them to track their progress and plan for improvement. Furthermore, the goal of developing ViVA in a Web-based environment is to make it easier for students to access ViVA from any devices. Therefore, ViVA may be readily assessed by students by having the Internet connection and any devices. Vocabulary.com and FreeRice.com are the existing systems that are being used to be the reference to develop better features in ViVA in order for ViVA to improve the limitations in such applications. The Rational Unified Process (RUP) methodology was applied for software development according to the project requirements.**

Keywords-Web-based application; educational application; English vocabulary; visual approach; secondary students

I. INTRODUCTION

Vocabulary represents one of most crucial skills that are required when teaching and learning a foreign language. Indeed, it is the main tool for students who aim to use English effectively [1]. Vocabulary represents a large scope in the English language. Therefore, there is no limitation of age to enhance their vocabulary knowledge. Usually, vocabulary is being developed with age, the circle of communication, and the surrounding. However, in this technology area, anyone can expand their vocabulary knowledge without depending on their age.

Students should be the focus in empowering the English vocabulary. In order to succeed in the society and their future career, they need good vocabulary knowledge to help them strengthen their confidence in English communication and writing skills. In addition, developing these skills can pave the way for learning in language, the arts, sciences, technology, and mathematics [2].

Online learning has shown significant growth over the last decade, as the Internet and education combine to provide people with the opportunity to gain new skills [3]. Moreover, students usually use the search engine to find any queries regarding their assessment. Koksal [3] also reports that most respondents (80%) know the Internet and use search engines since their junior secondary school, and a small percentage of them (20%) have known the Internet and have used search engines since their elementary school. Therefore, a Web-based vocabulary application will be beneficial for students to use as their learning platform and do some practice to improve their English language proficiency.

The following Section 2 describes the problem background, followed by the methodology in Section 3. Section 4 elaborates the analysis and design. While Section 5 describes the implementation of the proposed application. Finally, Section 6 concludes the project and its possible future work.

II. PROBLEM BACKGROUND

The main language of communication for most Malaysian students is Malay. They rarely speak English at home and school. A study by Yamat et al. [4] states that "The main language of communication at home was the Malay language". Therefore, Malaysian students always have a dilemma to use English in their daily communication. They will feel a lack of confidence and scared that they will make mistakes and embarrass themselves.

Pintar Foundation chairman Arshad Ayub recently told Free Malaysia Today that "Malaysian Students have poor English because they are not interested in learning" [5]. However, as reported in New Straits Times [6], the problems with learning the language could be linked to uninspiring

teaching materials and noted that the teaching of English in schools and institutions of higher learning have been based on a grammar-structured approach which can lead to boredom, lack of interest, and limited motivation. Thus, we can conclude that it is important to provide attractive teaching and learning materials to catch the students' attention to learn and motivate them to improve themselves. Therefore, the transformation needs to be implemented by using a visual-based approach such as informative diagrams, animations, and pictures in the learning materials to develop attractive learning materials.

III. METHODOLOGY

SDLC is a process that produces software with the high quality and lowest cost in the shortest time [7]. This method is used in ViVA to ensure that the design, development, and testing procedures are compliant with high-quality software. SDLC organizes the task that should be carried out at each stage of the development process. There are six phases of software development included in the SDLC methodology. The phases or known as standard software engineering activities are requirement analysis, planning, software design, software development, testing, and deployment [7]. Furthermore, various methods, such as waterfall, spiral, agile, and RUP, may be used to execute SDLC in developing software.

The choosing criteria for the methodology are based on the targeted market, project context, and business requirements. After evaluating these criteria, the RUP was selected to be used in the development of ViVA. RUP works in iterative ways, which perform different iterations [8]. Each iteration will perform four phases and each phase will perform all the standards of software engineering activities (See Fig. 1). Inception, elaboration, construction, and transition are the phases of RUP. Inception phase where the scope and the domain of the project will be figure out. Next, the elaboration phase will focus on the domain analysis and define the basic architecture for the system. After that, followed by the construction phase, this phase will encompass the majority of development activities and is where the majority of implementation takes place. The final phase of RUP is the transition phase, where the system goes from development into production. There are many advantages of RUP, especially for the single developer. One of the advantages of RUP is allow for the adaptive capacity to deal with changing requirements throughout the development life cycle, whether they be from customers or from within the project itself [8].

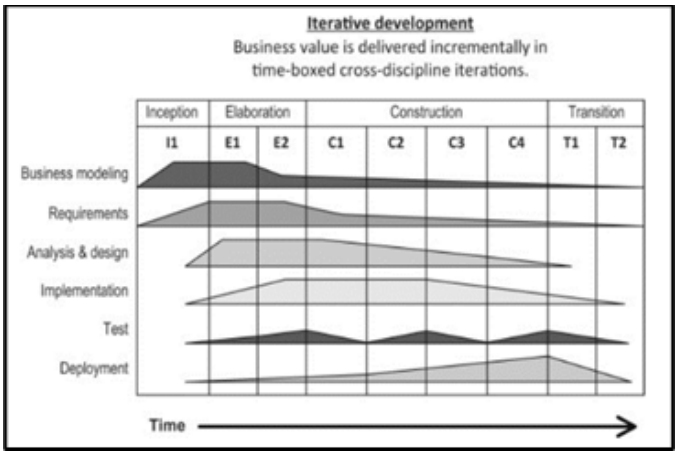


Figure 1. RUP Diagram [9]

IV. ANALYSIS AND DESIGN

Requirement analysis is the process of analyzing, refining, and scrutinizing the requirements obtained to produce consistent system requirements of ViVA. There are four phases involves in the software requirement analysis. Eliciting requirements is the first phase, and this is where the data gathering process should begin. ViVA used Google form survey as its data-gathering technique. The survey has been distributed among the secondary school students in the higher form as they are the targeted users of ViVA. The second phase is requirements analysis, in which all the acquired requirements are evaluated to see if they are acceptable for implementation in the system. User stories, use cases, process specifications, and other types of documentation will be created during the following step, requirements modeling. The last phase is review and retrospective, intending to make any necessary adjustments.

The use case diagram of ViVA includes one actor and eight use cases (see Fig. 2). Student is the actor, and the use cases are Register Account, Manage Account, View Learning Materials, Attempt Formative and Summative Assessment, Review Formative and Summative Assessment and View Performance.

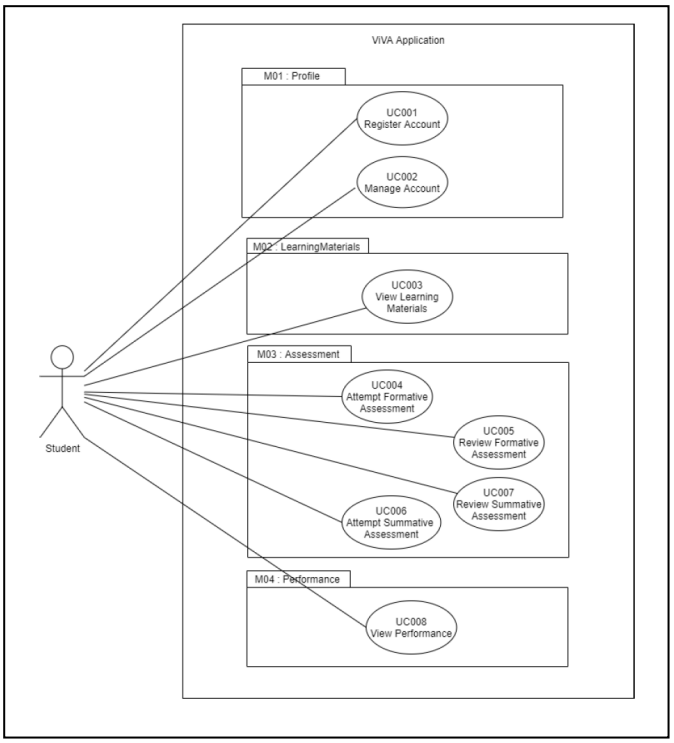


Figure 2. Use Case Diagram of ViVA

Use Case : UC001 – Register Account

Actor : Student

Description : The student should be able to register the ViVA account with entering the non-registered user details and received the verification link through the registered email address.

Use Case : UC002 – Manage Account

Actor : Student

Description : The student should be able to view their profile details and make changes to the selected details.

Use Case : UC003 – View Learning Materials

Actor : Student

Description : The student should be able to view the learning materials by topic and by vocabulary word.

Use Case : UC004 – Attempt Formative Assessment

Actor : Student

Description : The student should be able to attempt the formative assessment (exercise) by topic provided in ViVA.

Use Case : UC005 – Review Formative Assessment

Actor : Student

Description : The student shall be able to view the formative assessment result (exercise) after submitted the assessment.

Use Case : UC006 – Attempt Summative Assessment

Actor : Student

Description : The student should be able to attempt the summative assessment (examination) that covered all topics in ViVA.

Use Case : UC007 – Review Summative Assessment

Actor : Student

Description : The student shall be able to view the summative assessment result (examination) after submitted the assessment.

Use Case : UC008 – View Performance

Actor : Student

Description : The student shall be able to vie their score for every assessment and get their ranking for ViVA.

In the design, an effective user interface is one in which the user can easily navigate around the system without exerting too much effort while still achieving the desired result. This is the most crucial condition that all of interfaces have implemented in the proposed ViVA accordingly. Moreover, the interface is designed based on the interests and level of navigation of the secondary school students. Therefore, they will feel interested to learn and can understand easily how to navigate through ViVA. Fig. 3 to Fig. 9 show the interfaces for ViVA.

Figure 3. ViVA's Login Page

Figure 4. ViVA's Register Page

Figure 5. ViVA's Home Page

Figure 6. ViVA's Note Page

Figure 7. ViVA's Assessment Page

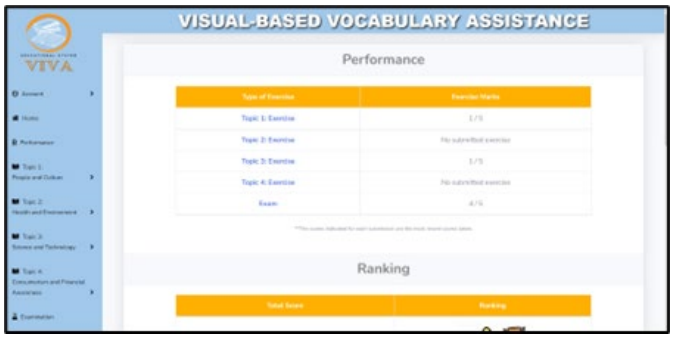


Figure 8. ViVA's Performance Page

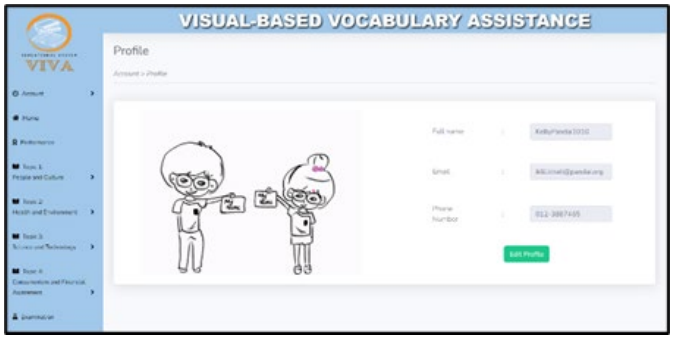


Figure 9. ViVA's Profile Page

V. THE IMPLEMENTATION

Regarding the implementation, Windows 11 was used as the operating system to run the software that were needed in the development. NetBeans and XAMPP were the software used to develop ViVA. The detailed descriptions regarding this software are as follows.

1) NetBeans: An open-source integrated development environment (IDE) for application development. As mentioned, the development of ViVA used Windows 11 as the operating system to meet one of the objectives of this project that is to develop ViVA in a Web environment. Therefore, NetBeans is the appropriate IDE that can fulfill the requirements. Fig. 10 and Fig. 11 show the sample of code and structure of folder in NetBeans under ViVA's project.

Figure 10. JSP page in ViVA's NetBeans

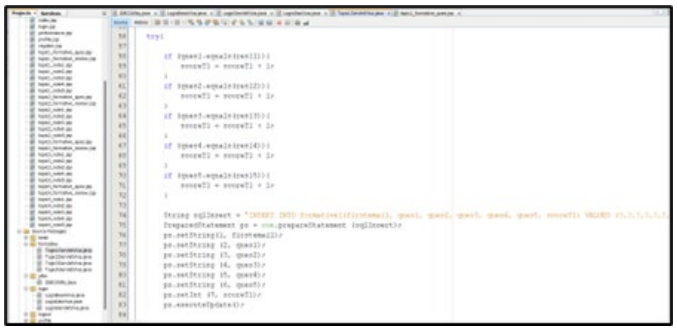


Figure 11. Servlet page in ViVA's NetBeans

2) XAMPP: An open-source of web-server solution that allows cross-platform. During the development process, the Apache and MySQL module need to be run first before running the Visual-based Vocabulary Assistance Application (ViVA) application. Next, to close the server there are a few steps need to be followed to keep XAMPP from crashing. First, when close the NetBeans application, make sure the Tomcat module have been stopped. After that, stop the MySQL and Apache modules. Then only XAMPP can be closed. See Fig. 12 for the example of database tables in ViVA's XAMPP.

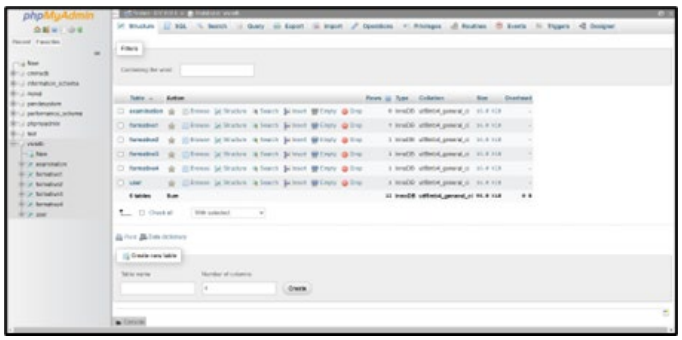


Figure 12. ViVA's XAMPP

Testing is one of the phases in SDLC where it is the important phase to detect or trace any bugs and errors in the system. There is a bunch of testing method to be implemented. However, the selected testing method for ViVA was black box testing. The testing covered the functionalities of ViVA based on the requirements and specifications. By using black box, only the input and output will be the focus of this testing. Fig. 13 is one of the examples for the black box testing that had been executed for ViVA.

Test Case ID	TC004_01	**Test Case Description**	Attempted the formative assessment according to the provided details.		
Created By	Iklil	**Version 1.0**			
QA Tester's Log					
Tester's Name	Syahirah	**Date Tested**	9/6/2022	**Test Case (Pass/ Fail/ Not Executed)**	Pass
S #	**Prerequisites:**	**S #**	**Test Data Requirement**		
1	User must login into ViVA	1	Question 1: A Question 2: C Question 3: A Question 4: B Question 5: C		
Test Conditions	Validate that the attempt of the formative assessment is successful when all the questions have been answered.				

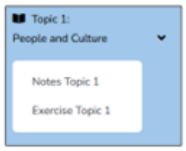
Step #	**Step Details**	**Expected Results**	**Actual Results**	**Pass/ Fail/ Not executed/ Suspended**
1	Select 'Topic 1: People and Culture' at the side navigation menu	The application will display the dropdown menu		Pass
2	Select 'Exercise Topic 1'	The question page will be displayed		Pass
3	Enter the answer as provided			Pass
4	Click on 'Submit' button	The application will navigate to the result page		Pass

Figure 13. An example of documented testing

VI. Conclusion and Future Work

In summary, ViVA is an educational Web application that was developed using the MVC framework of NetBeans IDE and consists of several languages such as Java, CSS, and HTML. The server that was used for the development was XAMMP with PhpMyAdmin as the database. It aimed for the use of secondary school students to enhance their vocabulary knowledge. It creates an attractive learning environment for students by providing visual-based learning materials. ViVA can also track users' performance by calculating the score from the attempted assessments.

For the future improvement, the design of the learning materials can be improvised to make sure that it is more attractive for the users. Moreover, the scope of topic in ViVA can be extended in order to enhance the effectiveness of learning materials in ViVA for the benefits of targeted secondary level students.

ACKNOWLEDGMENT

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