Grammar Me: The Development of E-Learning Web System to Enhance Grammar Learning Experience Towards Education 4.0

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Abstract: Grammar plays a significant role in English communication as it keeps sentences well-structured and meaningful. However, many students failed to communicate English fluently.Therefore, to minimize the problem of grammar inefficiency, a system has been developed.Virtual learning through the Grammar Me allows learning grammar through quizzes and interactive learning modules. The ADDIE-based method is used as a methodology to develop this application. The system is developed using Notepad++ with phpMyAdmin as the database to keep all data and Adobe Illustrator 2020 to illustrate graphics. The main language for this system is PHP, HTML, CSS, and JavaScript. Meanwhile, Hostinger is used for website hosting. From questionnaire findings, almost every user was very satisfied with the system. Lastly, the system is suggested to have multiple choice quizzes and a suitable interface for targeted users.

Keywords: E-learning, Database, System, ADDIE, PHP, HTML.

1.   Introduction

   English is a second language here in Malaysia; this language has been taught to all from pre-school to secondary school. The English language plays a significant role in communication in this modern era of Science, technology, and communication. In this era of the Fourth Industrial Revolution (IR4) and Artificial Intelligence (AI), learning and speaking English can be considered an asset. It opens myriad opportunities for employment and indispensable tools to study and acquire knowledge. To ensure students have a great kick start of a good grasp of the English language skills, the government has considered implementing English as one of the compulsory curricula of primary and secondary schools. Then, to make an effort wide, higher educational institutions use English as the medium of instruction and teach science and mathematics-related subjects.

Even though English has been taught and learned for several years yet many students still fail to communicate fluently using this second language. This matter has been an eye-opener because, according to [2], English is the most spoken language in the world. Nowadays, many jobs require an English speaker as one of the job requirements. Therefore, lack of English proficiency links to missing soft skills, not passing the Malaysian University English Test (MUET) as a degree entrée and leads to the statistic of unemployment in the future. The issue that causes poor English proficiency among school students is that students lose interest and confidence in studying since English instructors are not well-trained to teach and give them excessive grammatical exercises. Second, students find English class uninteresting since it does not include any talents or arts, just essays, speaking tests, and practices. Finally, when students engage with one another, they utilize their original language.

Therefore, in order to combat these matters, Grammar Me e-learning website has been developed. The main goals were to create an educational program that permits and promotes virtual teaching and self-learning, to construct a Visual, Auditory, and Kinesthetic learning application, and to build a more sustainable system than the conventional learning techniques. This system is targeted to students aged 15-17 years old and has 4 different modules included such as Learning, Quizzes, Achievement, Login, and Registration. It is expected to educate students outside of the classroom without the constraints of bad internet connection and forgetting physical notebooks. To add, this application expected the user to be engaged in interactive learning

To summarize the major principles of this project, which aimed to design an education system that helps secondary school pupils thrive in their grammar. Following that it describes the main issue of learning grammar concerns that prompted the creators to create this software. The main issues are that students find English classes dull, teachers lack the necessary teaching skills, and students lack English language practice. Meanwhile, there are three key objectives to be met such as to develop an e-learning system that allows and encourages virtual teaching or self-learning, to design a Visual, Auditory, and Kinesthetic English learning system, and to build an e-learning system that is more sustainable than traditional learning methods.

This report consists of five sections. The first section mainly discusses the project background where objectives, problems, and targeted user. The second part of the paper will discuss thoroughly on literature review done for the system and the current system. The next part of this paper explains more about the methodology used to develop this system where the Context Diagram, Data Flow Diagram Level 0 (DFD Level 0), and Entity Relationship Diagram (ERD) will be exhibited. Then, the next part will explain about testing phases and test cases. Lastly, the final section will discuss more on system advantages, disadvantages as well as system recommendations.

2. Related Work

2.1   Technology

As the world is reaching the era of the Revolution Industrial 4.0, learning with technology has been developing in a significant manner. Malaysia Higher Education has implemented an education 4.0 program like it is in line with Revolution Industrial 4.0. This program aimed to provide graduates with capabilities in the digital-driven industry. People now are more adapting and attached to technologies as everything is easier with technology. Therefore, with the rapid development of technologies, teachers/educators must be able to be technology literate and improve their quality of teaching along with the development of the era. Based on research that was conducted by [3] suggested that almost 60% of students find half of their traditional learning boring. Hence, this gives an insight that by using technology for education, man might change the percentage of students interested in learning to increase. An E-learning system is a tool or medium that is used in the education or learning process to

be more effective and can be easily observed and used by students. Hence, using an e-learning system may increase students' interest in learning and increase learning performance. Then, using education applications can make students more engaged and active in learning activities.

2.2   Grammar

Grammar is a significant element of a language. By mastering grammar, one's will be able to master any language skills. Therefore, grammar should be studied in depth so that students will have excellent language proficiency skills. It is not undeniable that grammar might be considered a difficult and boring subject to learn. Even people who learned grammar from the start have a problem with constructing sentences and have multiple grammar mistakes when writing technical papers. Thus, learning grammar is a lifetime subject. To start, what is the definition of grammar? According to [4] is the system of principles, conditions, and rules that are elements of properties common to all languages. The rules of UG provide a basic blueprint that all languages follow [5]. The next definition stated from [6] is grammar is the rules in a language for changing the form of words and joining them into sentences. As a human being, man can never be too far from making mistakes. Hence, making grammar mistakes is expected, but it will interrupt readers' experience to read what was written or listeners understand what was said. Many studies have been done on grammatical errors in writing. There is a study that had been done by [7] assessing 30 freshman students in the English Language Teaching Department at a Turkish university's written work for grammar faults. According to their results of proficiency tests, the students were divided into two groups (each with 15 students), with one group performing better than the other. The written work of the students was graded, and any grammar faults were recorded. The following sorts of errors were discovered during the investigation: Articles, subject-verb agreement, and word plurality are all terms that can be used to describe something, word order and pronouns were the main faults.

2.3   Similar Related System

A comparison between an existing system and a planned application is shown in the **Table 1** below. iPractise, MyEnglishPages, and Perfect English Grammar are the comparative systems being discussed. These programs have two aspects in common in their systems: quizzes and quiz results. The user's login and achievement page, which keeps track of the user's achievements, are both missing from the designs.

Table 1: Comparison of system features

Features/System	iPractise	MyEnglishPages	Perfect English Grammar	Grammar Me
User login	X	X	X	√
Simple Notes	X	√	√	√
Video learning	X	√	√	√
Quiz	√ multi-choice question	√ Scroll down menu	√ Writing	√ multi-choice question
Time taken	√	X	X	X
Quiz result	√	√	√	√

Hence, based on the table above it can be concluded that the Grammar Me system has most of the features in order to develop a good quality and reliable system. Grammar Me included user login, simple notes, video learning, quiz, quiz results, and an achievement page.

### 3.	Methodology

ADDIE methodology was used throughout the process of the development Grammar Me system. The process involved is analysis, design, development, implementation and evaluation [8]. The main goal of this methodology is to provide a structured method throughout the development of the system. **Figure 1** below shows the ADDIE model.
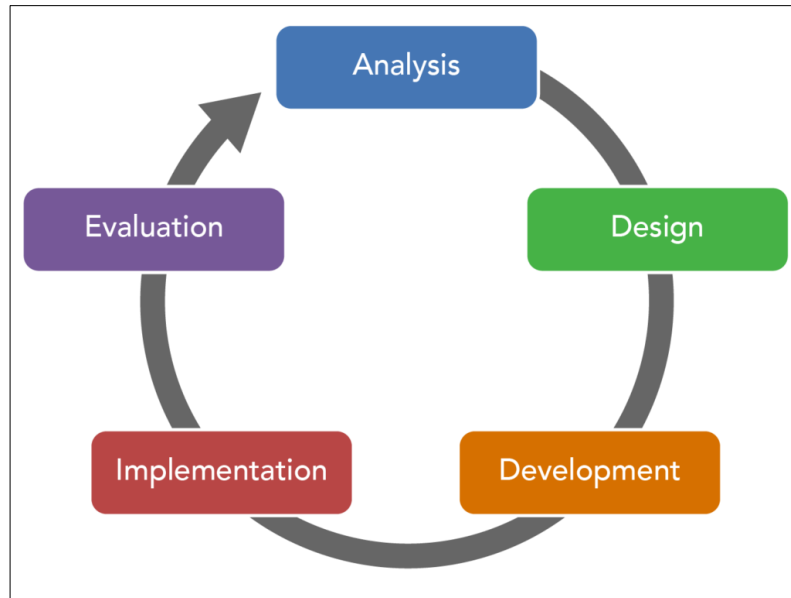

Figure 1: ADDIE model (Morgan, 2012)

### 3.1	Analysis phase

The problem with existing applications on Google, Safari, App Store, and Play Store were analyzed thoroughly during this phase to ensure the system that has been developed can function properly and meet users' requirements. All the systems and apps were analyzed by the pros and by the navigation system, user-friendliness, and system function. Furthermore, a problem statement was created during this phase to highlight the central issue in the background of this project. Target users were selected during this stage to make the scope of the application more focused.

### 3.2	Design Phase

During this phase, the strategy for this project was planned and revised. **Figure 2** below shows the storyboard has been illustrated to make it easier to visualize the concepts. As a result, it helps speed up the application development that has been conceptualized.
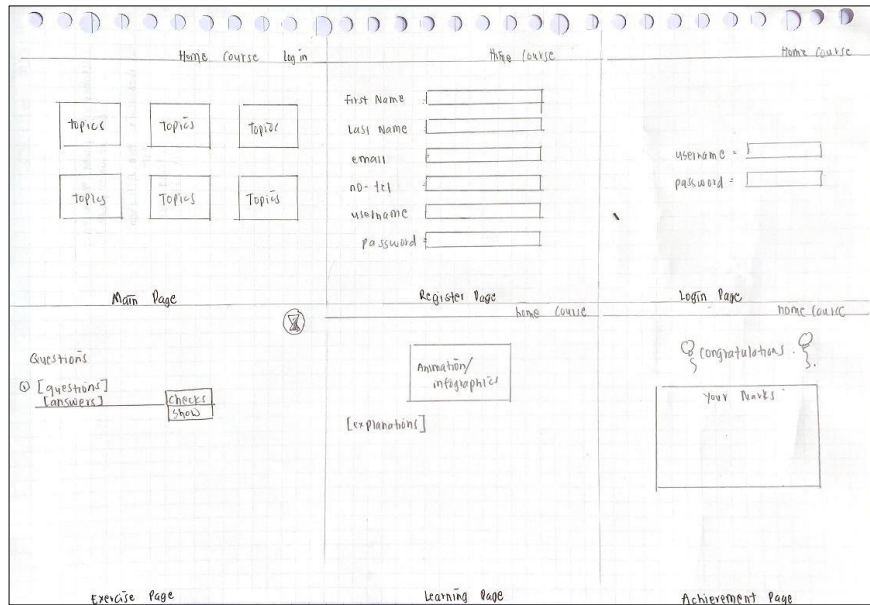
Figure 2: Storyboard

3.2.1 System Architecture

Figure 3 shows the Context Diagram for the Grammar Me e-learning system. This system has can be assessed by the admin and used. The new user needed to register by inserting their information such as email, username, and password in the registration form given. Meanwhile, the existing users will need to insert their username and password before login. Admin will log in using email and password. Admin able to add, edit, view, search and delete learning material. Not only that, the admin will be able to add, delete, view, and search quizzes. The admin will receive quiz marks from users.
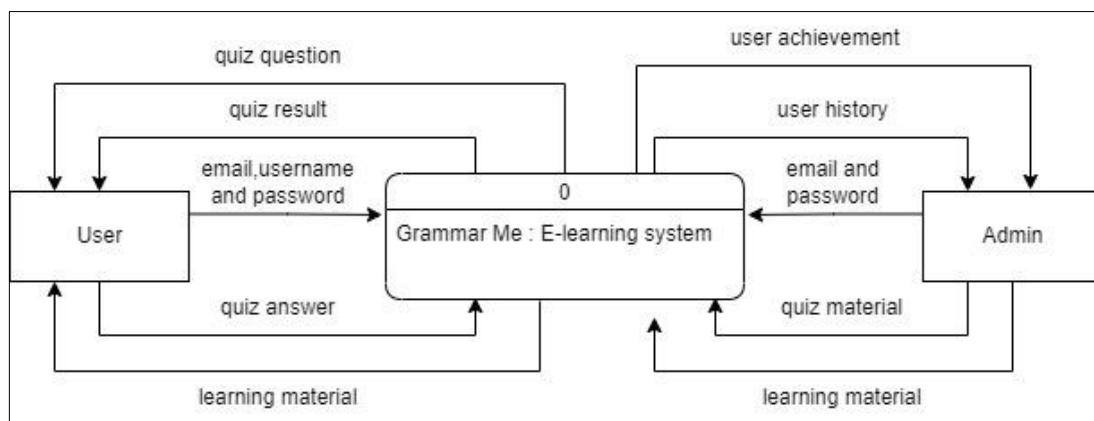

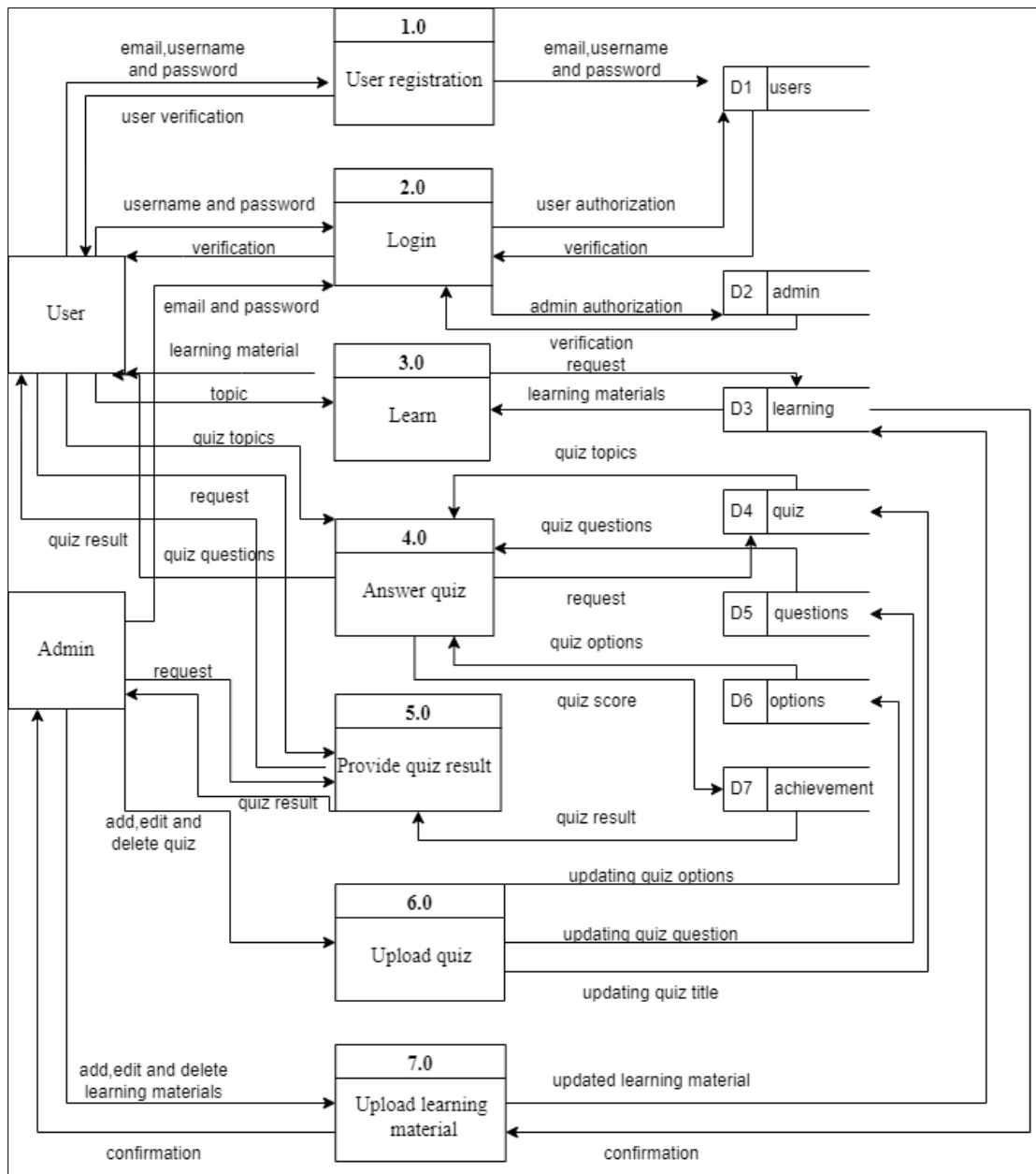**Figure 3: Data Flow Diagram Context Diagram of Grammar Me: E-learning System**

Figure 4: Data Flow Diagram Level 0

Figure 4 shows more details of the process in the Context Diagram. The main purpose of this diagram is to show more detail on the process of the system. Data Flow Diagram Level 0 has 7 processes such as user registration, login, learn, upload quiz, answer quiz, and provide quiz result.
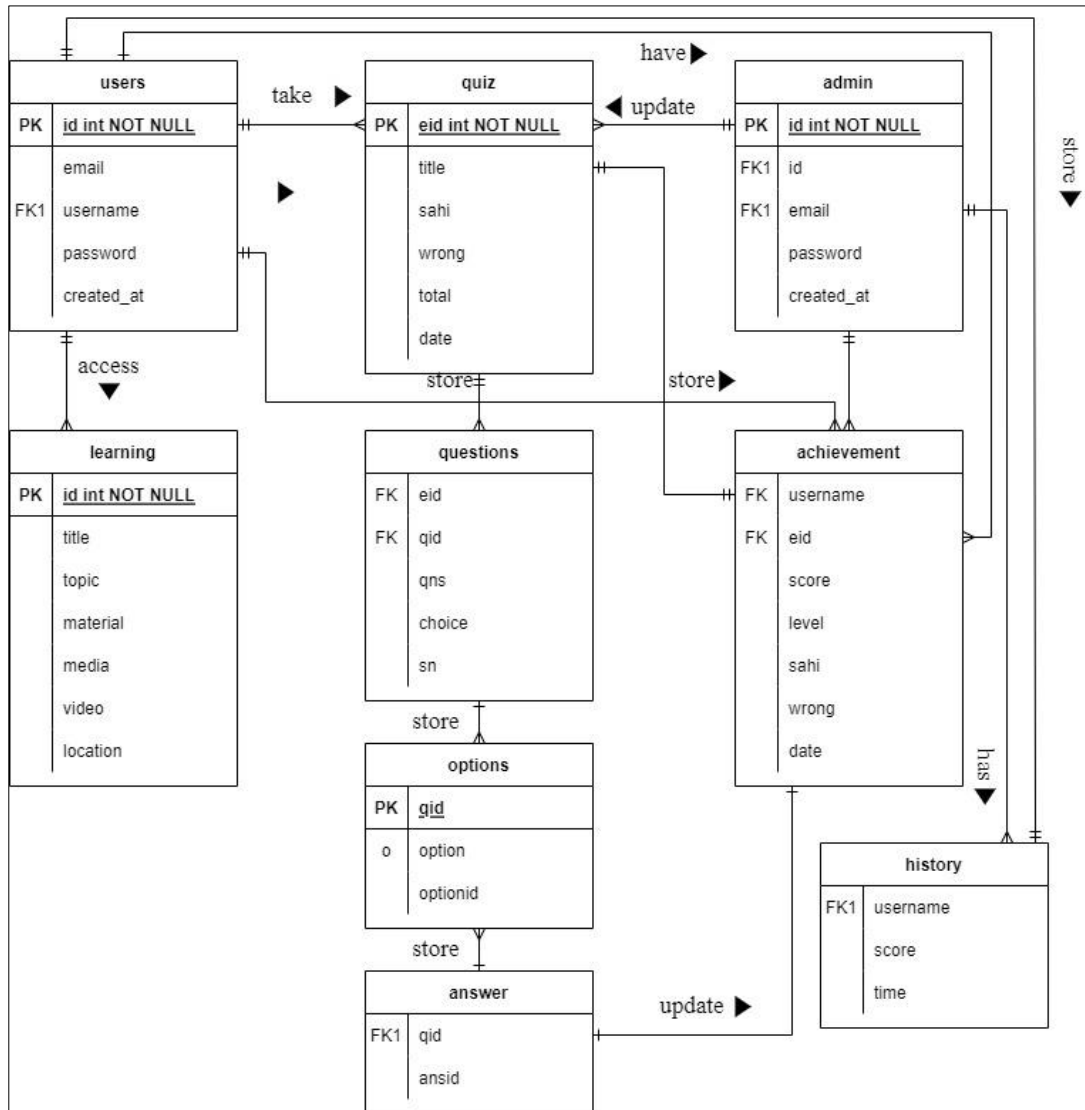
Figure 5: Entity Relationship Diagram

Figure 5 shows the ERD diagram. ERD, known as an entity-relationship diagram, is a graphical representation of the structural diagram used in the database. The ERD diagram shows nine entities: users, admin, learning, quiz, questions, options, answer, history, and achievement. Each entity has its attributes as well as the relationship between them.

3.3   Development Phase

   In this phase, the application was developed and structured material graphically with suitable tools such as Notepad++, Adobe Illustrator 2022, and Canva to illustrate the user interface design for Grammar Me application. Stunning visuals are the primary purpose for this phase as they can attract users to use the application. Meanwhile, Hostinger is used for website hosting. At the same time, XAMPP is for the localhost control panel. This system uses PHP, HTML, CSS and, JavaScript as the primary programming language.

Table 2: Hardware and Software

Hardware	Software
HP laptop model core i3	Notepad++ Hostinger Adobe Illustrator 2022 XAMPP Canva

Table 2 shows the hardware and software used to develop this website.

3.4   Implementation Phase

The implementation phase is where the system is tested to see if the application meets the user requirements and fits the goals and objectives created during the Analysis phase. The system is ready for students and teachers to use and analyze things that need improvement and correction. The outcome of this stage will be gathered for the Evaluation phase.

3.4.1   Functional Requirements and Non-Functional Requirements

Table 3 below shows functional requirement that consists of login module, registration module, learning module, quiz module, and achievement module.

Table 3: Functional Requirements

No	Modules	Functionalities
1.	Login Module	• The application user to login into the system using username and password. • The application alert user for incorrect username or password. • The application allows users to put valid username and password. • The application should redirect the user to Main Menu once successfully logged in.
2.	Registration Module	• The application allows any new user to register before login. • The application shows notify username taken and disallow duplicate username. • The application should show any error when empty field is found
3.	Learning Module	• The application shows learning module for user to learn. • The application shows learning topics. • The application allows users to pick any options of topics.

Table 3: (cont.)

4.	Quiz Module	• The application should display quiz options. • The application should allow user to answer quiz. • The application should show correct answer. • The application should show any incorrect answer.
5	Achievement Module	• The application should display user achievement and marks

Table 4 below shows non-functional requirements that are significant for the system such as performance, security, and operation

Table 4: Non-Functional Requirements

No	Requirements	Descriptions
1.	Performance	The application should be able to use anywhere and anytime.
2.	Security	Only user can access their own account with username and password
3.	Operational	• The system should be user friendly • The system should be easily updated and maintained.

Non-functional requirements are significant for the system as it is the main core of the system. Without it, the system will lack user-friendliness, security, and performance.

3.4.2 Interface Design

The interface designs are developed based on the storyboard sketch performed in the previous phases, as mentioned in the previous section. The main focus of creating an interface design is to have a user-friendly interface that looks sleek and nice. Systems have been considered in designing an interface to avoid users feeling annoyed with the chosen font, color, and design. Next, this section will show the multiple core interface design of the Grammar Me e-learning system. **Figure 6** below shows the Grammar Me student's login page. The user will need to click on the Login button after inserting the form. If the user does not have any existing account user will need to click on the Register button.
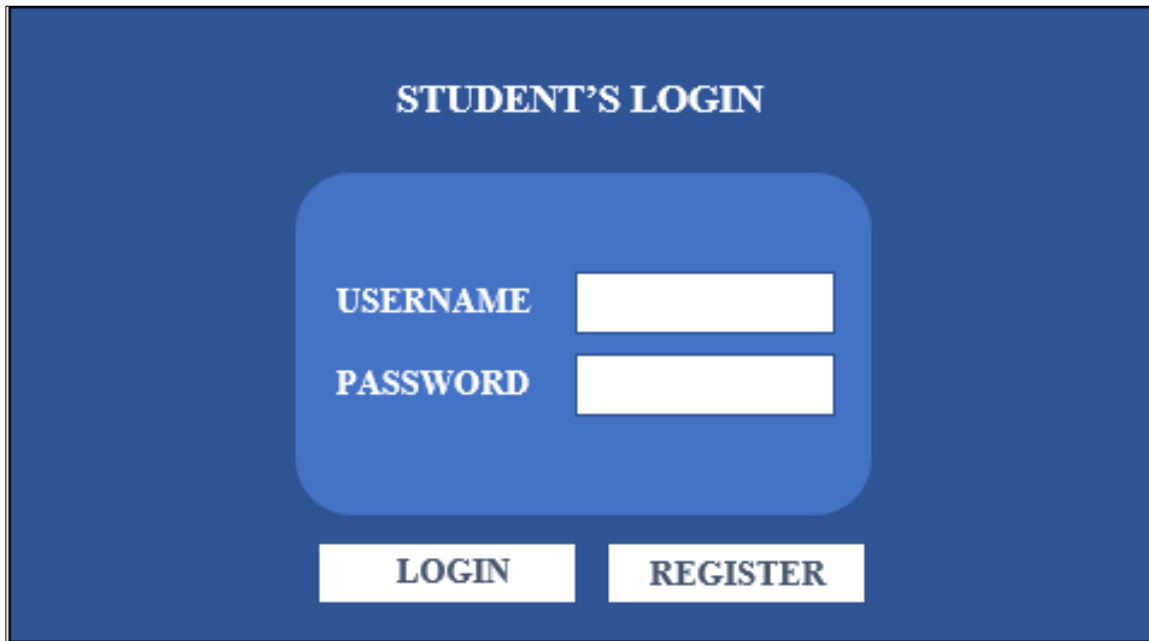
Figure 6: Login page

Figure 7 shows the quiz page where the Start button indicates the quiz will start while the Restart button indicates the user has already answered the quiz and is ready to re-answer it again.
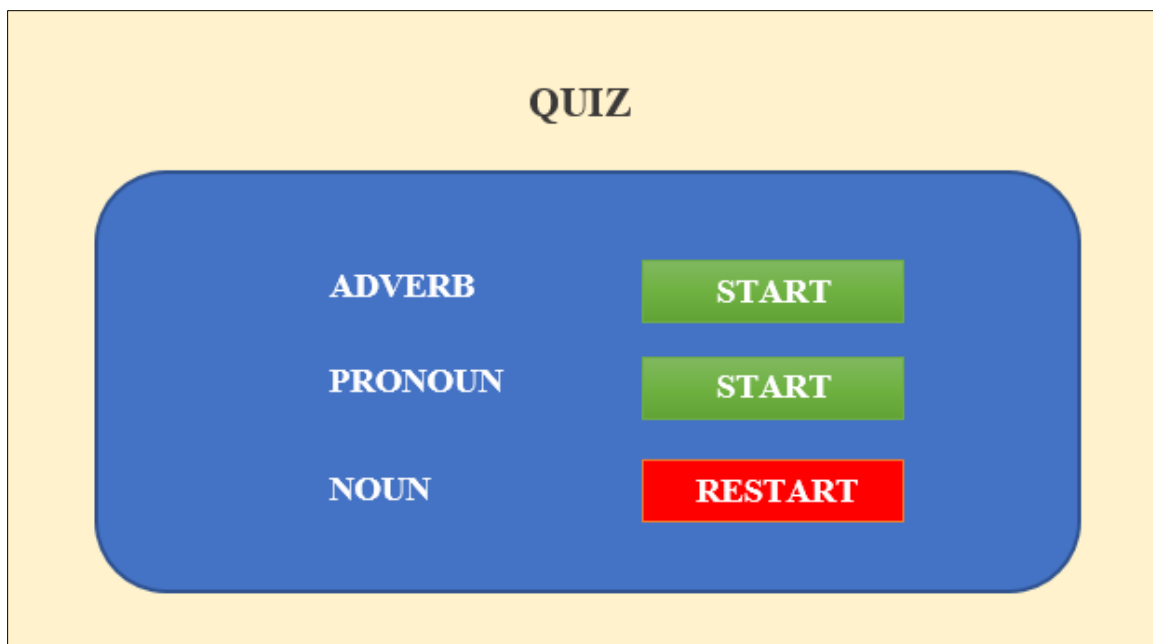

Figure 7: Quiz page

Figure 8 shows Grammar Me admin dashboard where the admin is allowed to add, edit, delete and view learning and quiz materials. Not only that, the admin is allowed to see the user's achievement and history.
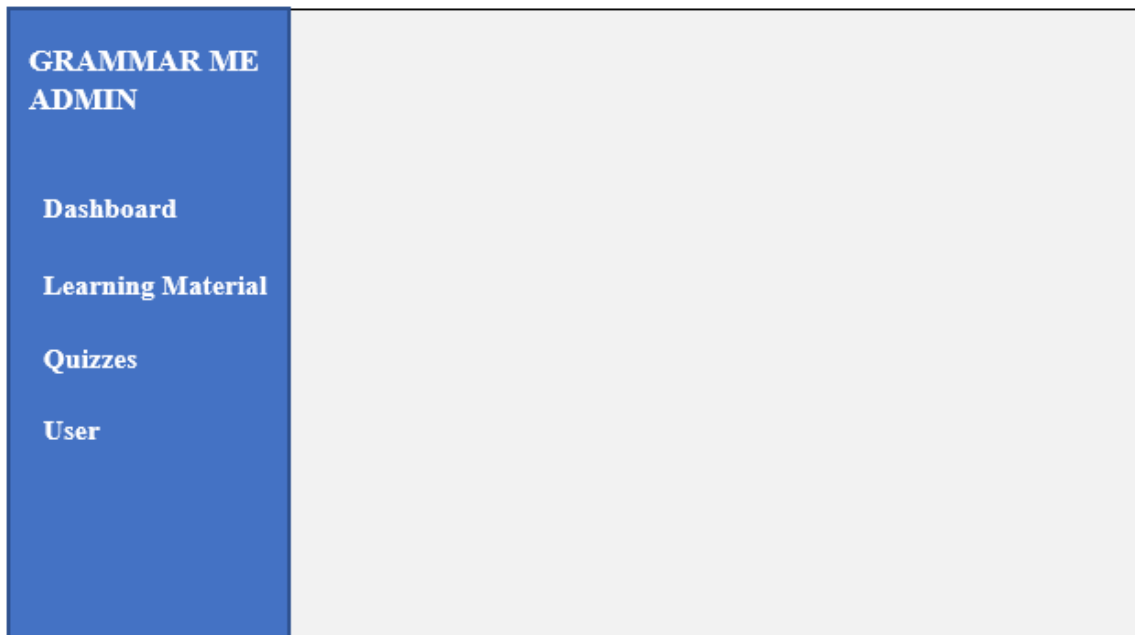

GRAMMAR ME ADMIN

Dashboard

Learning Material

Quizzes

User

Figure 8: Admin dashboard

3.5   Evaluation Phase

The evaluation phase is performed to ensure the system does not encounter any error and run flawlessly. This phase is where the effective correction will be made if there is any fault in the system. In order to analyze the website's effectiveness, the system will be done by the end-user, students, and teachers. System testing will be carried out to ensure the system is user-friendly and effective.

4.   **Results and Discussion**

As we discussed earlier in the previous section, system testing, and evaluation are significant in developing a system as it helps to determine if there is any error or fault in the flow of the development project. Furthermore, evaluation is done to get an honest opinion from the end-user about the system. Hence, to make a significant evaluation, respondents will need to review the system. Therefore, a working system is very much needed. **Figure 9** the Grammar Me main page, which is where the user will see the page the first time it is displayed.
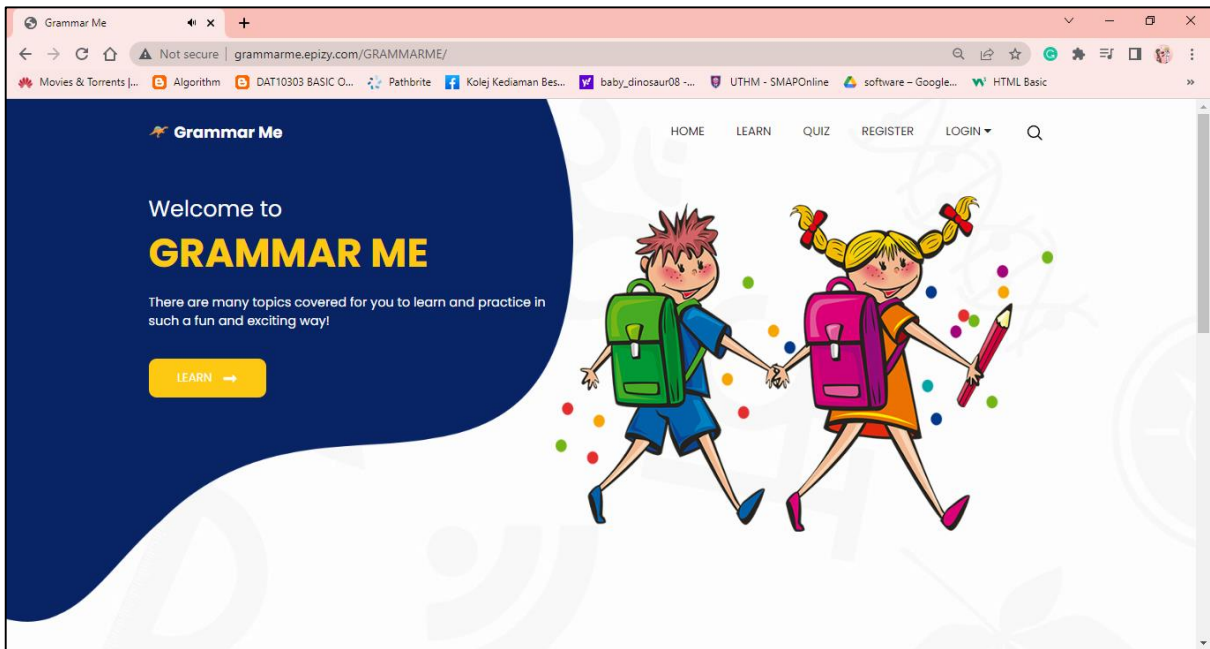
Figure 9: Grammar Me main page

Figure 10 shows the student's login page. Existing users need to insert the correct username and password. Otherwise, input validation indicates the user's account is not yet registered, or there is an incorrect username or password.
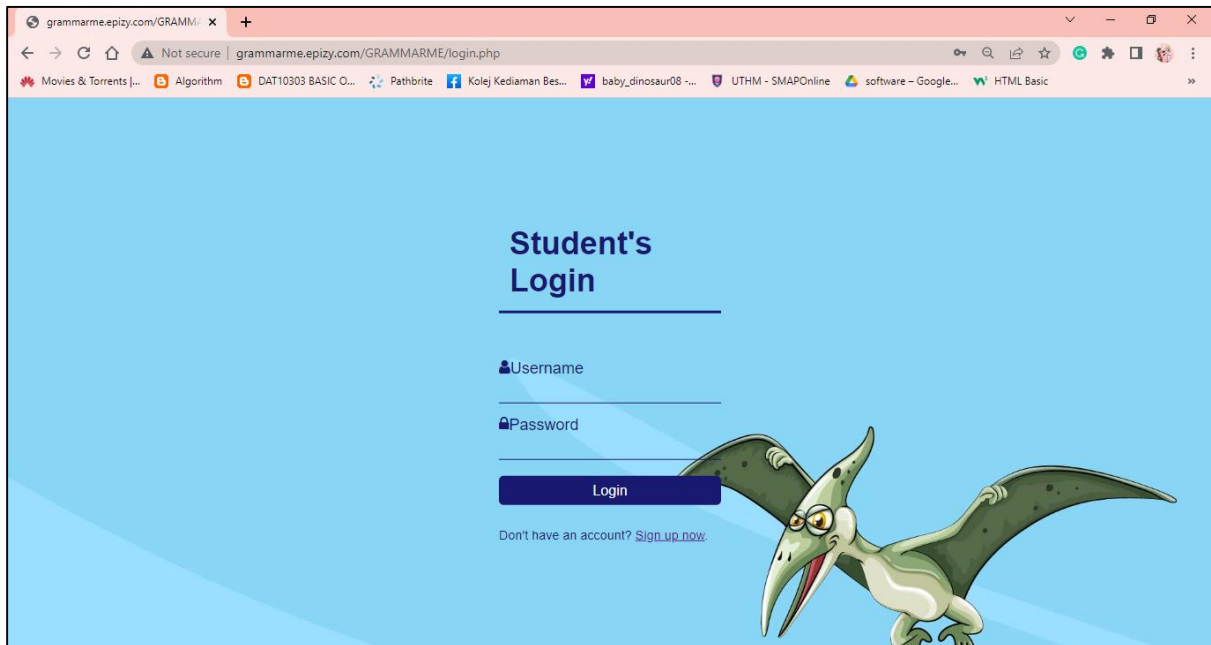

Figure 10: Student login page

After the user successfully logged into the website, the user can see quiz modules based on **Figure 11**. Myriad quiz topics are covered with total question numbers with full marks displayed. The user will

need to click on the Start button to start answering questions. If the quiz has already been answered, the Restart button will appear.
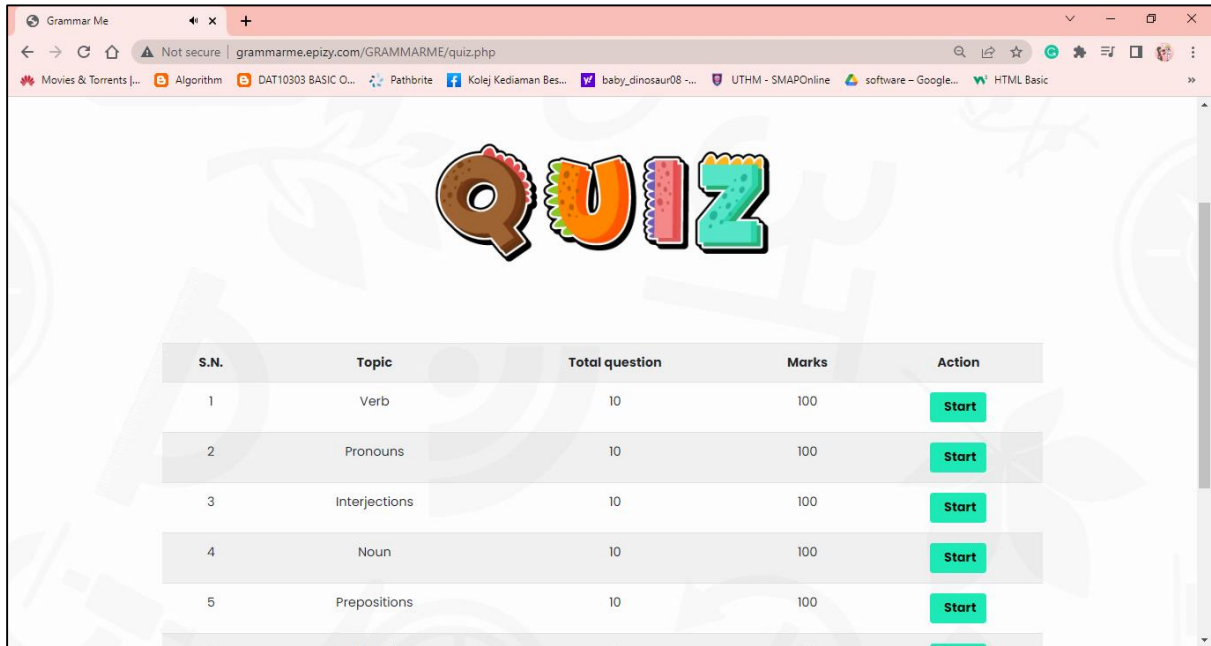

Figure 11: Quiz page

Figure 12 shows the Admin Dashboard page, where the admin can see new learning material topics and quiz titles as soon as the admin logs in. On the left sidebar are many functions for the admin to utilize. The admin can add, edit, delete, and view materials in the learning material function. Meanwhile, in the quizzes function, the admin can add, delete and view quizzes. Lastly, for the User function, the admin can see user history and achievements.
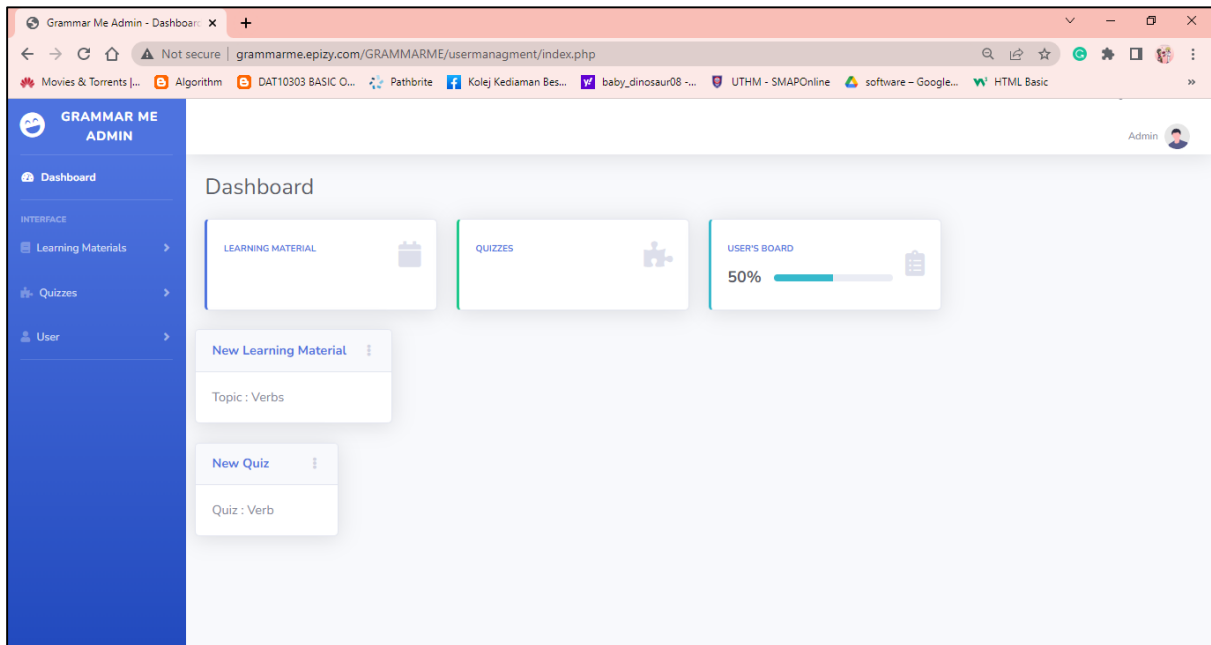

Figure 12: Admin dashboard

4.1 Test Case

To satisfies the system requirements test case is conducted to test every feature in the system to check if the feature is functioning based on the requirement. **Table 5** shows the test case for the login module, and the status for the login test case results is all passed.

Table 5: Test Case for Login module

Test Cases	Description	Excepted Output	Status
Test Case Login (TEST_01)			
TEST_01_01	The user inserts the correct username and password	The system will navigate the user to the main page	PASS
TEST_01_02	The user inserts an incorrect username and password	Received error message stating "Wrong Username or Password"	PASS
TEST_01_03	The system reset the username and password.	The login form will be clear	PASS
TEST_01_04	Admin inserts correct email and password	The system will navigate the user to the main page	PASS
TEST_01_05	Admin inserts incorrect email and password	Received error message stating "Wrong Username or Password"	PASS

User acceptance testing is performed by actual users. The main objective of this testing is to check whether the requirements are met. A questionnaire was created and distributed to the user so they could give an honest review based on the website. **Table 6** below shows the result obtained from users of the system.
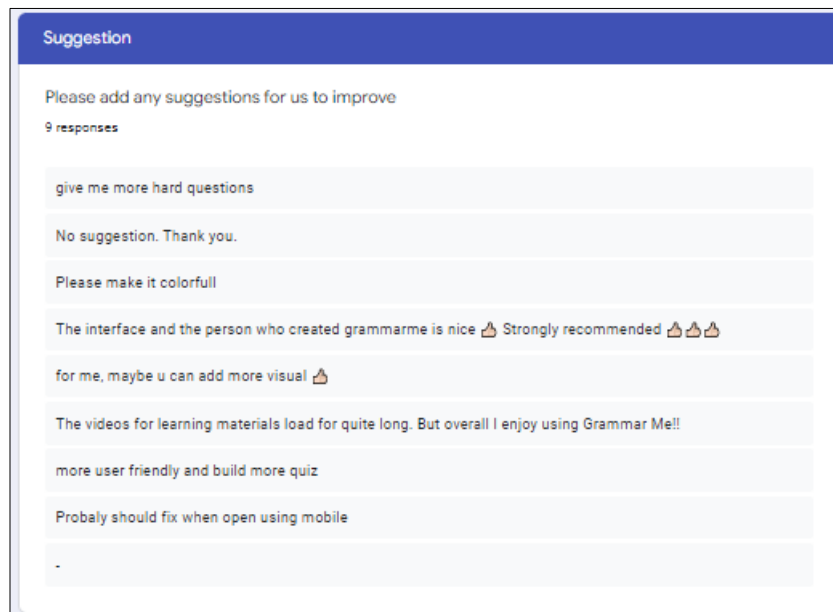
Table 6: User Acceptance Testing

No	Questions	Variables		%	N
1	How would you rate the system interface?	Very Satisfied		66.7	10
		Satisfied		33.3	5
			Total	100	15
2	How would you rate the readability of the font used?	Very Satisfied		73.3	11
		Satisfied		26.7	4
			Total	100	15
3	How would you rate the navigation of the website?	Very Satisfied		73.3	11
		Satisfied		26.7	4
			Total	100	15
4	How would you rate the features of the website?	Very Satisfied		80	12
		Satisfied		20	3
			Total	100	15
5	How would you rate your experience with using this website?	Very Satisfied		73.3	11
		Satisfied		26.7	4
			Total	100	15
6	Login function	Very Satisfied		80	12
		Satisfied		20	3
			Total	100	15

Table 6: (cont.)

7	Registration function	Very Satisfied		86.7	13
		Satisfied		13.3	2
			Total	100	15
8	Learning module	Very Satisfied		100	15
9	Quiz module	Very Satisfied		73.3	11
		Satisfied		26.7	4
			Total	100	15
10	Achievement module	Very Satisfied		85.7	12
		Satisfied		13.3	2
			Total	100	15
11	Grammar Me is a good platform for me to gain knowledge on grammar	Very Satisfied		80	12
		Satisfied		20	3
			Total	100	15
12	Grammar Me is a good platform for me to do some revision	Very Satisfied		93.3	14
		Satisfied		6.7	1
			Total	100	15
13	I would recommend Grammar Me to my friends and family	Very Satisfied		86.7	13
		Satisfied		13.3	2
			Total	100	15

It shows that the total number of respondents is 15 with the total number of questions needed to be answered being 13. Most of the respondents are very satisfied by the system indicating the system can be used by the user.

Figure 13: User suggestions

Overall, the user acceptance testing results indicate that most users are delighted with the system's functionality and overall experiences using the system. Based on **Figure 13**, the suggestion is to make the interface more colorful, update the user-friendliness, and add more quizzes.

5.   Conclusion

In conclusion, this system was developed to create an educational program that permits and promotes virtual teaching and self-learning, constructs a Visual, Auditory, and Kinesthetic learning application, and builds a more sustainable system than conventional learning techniques. Not only that, but this system is also a platform that allows the educator to share learning materials and assigns quiz for student as quick delivery of lessons everywhere and anywhere as long as there is a good internet connection around. Students, too, can learn and answer quick quizzes without worrying about bringing physical books around. With the achievement features, users' grammar knowledge levels can be easily identified without having to wait for exam results at school.

Thus, based on the user acceptance testing, it can finally be said that this system has reached its objectives. Although this system has been successfully developed, there is always room for improvement. The significant improvement is having multi-type quizzes such as wordplay and hangman with different difficulty levels and adding more quiz modules. Not only that,Grammar Me needs to improve the interface to make it suitable for targeted users. Then, the system needs to improvise on user-friendliness in terms of the smoothness of navigation and video load. Hopefully, this system can be widely used after a certain period of updates.

Acknowledgment

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