Mobile Learning: Fonik Application (FA) Using Spaced Repetition Algorithm (SRA) in The Covid-19 Era

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Abstract: Phonics is one of the techniques to teach kids to learn alphabet. This technique used the sound of alphabet to teach kids. This project is to improve word reading skills by learn how to spell. The user's mood of study can increase by the time. The memorizing technique which is Spaced Repetition Algorithm that implemented in the application can help the slow learner that have problem to memorize. The spaced repetition approach will strengthen memory, although at another efficiency using intervals. The Fonik Application (FA) target user is slow learner. This project provides the video of lips motion of how to sound the alphabet using phonics technique. It also provides two tests to view the user understanding of the learner. The tests are test of pronunciation and test of hearing. In pronunciation test, user needs to input the voice of the word that display in the screen. Speech recognition will recognize whether the speech that user input is correct or wrong. In the hearing test, user need to recognize the sound of the phonics that have given and answer the right alphabet by choosing the correct alphabet.

Keywords: phonics; spaced repetition; slow learner; m-learning; learning.

Introduction

Fonik Application (FA) is a mobile application for kids to learn alphabet using phonetic which is letter sounds. Phonics is a technique for instructing individuals to read and pronounce words by learns the sounds of letters, group of letters, and syllables. Phonics is the relationship of composed letters with sounds and the mixing of sound together to structure words [1]. His research indicates children in literacy are train phonics skills to assist them to sound out words when studying and spelling. The study notes phonics education is one of the many methods young kids are taught to read. The studies about phonics shows that students who learn phonics improve in all parts of reading which are identifying words correctly, the precision of oral reading, and silent reading comprehension and fluency that the individuals who do not learn it.

Incorporating technology into the kindergartners program might also be an advantageous way to address a range of gaining knowledge of consequences and capture the interest of the current student [1]. It is in many instances recognised as mobile learning (M-learning) and has been considered as the future of studying or as an integral section of any different from of academic process [2]. The major benefit arising from mobile gaining knowledge of traits is that the study can be completed through anyone, in any place, at any time when the user willing to study [2]. Due to their interaction with video games, computer, and Smart Phones, young children shortly become accustomed to swiftly altering stimuli from which they can obtain immediately and customized feedback [1]. This application provides lip motion video to teach how to pronounce the letters. This can help children to be able to identify the letter and know how to pronounce it. Kids age from 3-to-5-year-old consumed more education apps compare to video content toward smartphone [3].

FA applied Leitner System which is a simple implementation of Spaced Repetition Algorithm (SRA). SRA is used to help user to memorize what they have studies. This project also provides user two test which are "Ujian Sebutan" and "Ujian Mendengar". "Ujian Sebutan" is to test user's knowledge about how to pronounce a simple word individually. In this test, user need to pronounce word that displayed on the screen to check whether the user can pronounce it or not. The Google Speech Recognition API is used to evaluate the pronunciation. If correct, the user can move the next alphabet. However, if wrong the user need learn how to pronounce the letter more frequently. For "Ujian Mendengar", user need to recognize and choose the correct alphabet based on what they hear from a speaker button.

Literature Review

Mobile Learning (M-learning)

Mobile learning or M-learning is a learning technology that uses a device that is small and portable to use for learning. The computing devices that use for m-learning include smartphones, Personal Digital Assistants (PDAs) and similar handheld devices [5]. M-learning is a teaching method that allows students to obtain learning materials wherever and whenever they want to learn using mobile device [2]. Multiple types of research confirm that contextualizing Mobile-Assisted Language Learning (MALL) practice can improve idiomatic skills and support a

foreign language class, and there is a positive sense in the learners' perceptions towards mobile- based learning, for developing listening skills for instance [6]. Mobile learning or M-learning is an innovation of learning by mobile technology [7]. The learning process can be done without the constraints of time or place via m-learning using mobile learning [7].

Spaced Repetition Algorithm

The concept behind spaced repetition is to discover a perfect interval between the repetitions for one learning item [9]. To gain the great learning results, the intervals between repetitions need to make bigger the better the learner achieves the respective intention [9].

The best intervals are the longest feasible intervals that do no longer lead to forgetting. Spaced repetitions provide the concept of that guaranteed the way to improve the long-term memory sustainably [9]. The spaced repetition approach will strengthen memory, although at another efficiency using intervals. A certain spacing between the learning periods and therewith a certain difficulty in retrieving the content from long term memory is crucial for this [1]. Therefore, it is an important goal to make the learners stick to the intervals calculated by using the spaced repetition algorithm [10]. Integrating the spaced repetition method in mobile learning, therefore, promises a large potential for optimizing the learners' performance [11]. "Memory +" labelled for spaced repetition system in line with the objective of increasing the memorization process [12].

The forgetting curve describes the inverse exponential nature of forgetting [13]. In the presence of repeated, spaced repetitions as described above, the strength of a memory is increased, resulting in a more gradual process of forgetting. The forgetting occurs because of the automatic decay of the memory trace, which happens in short term memory as early as 15 to 30 seconds after learning the information unless it is rehearsed [10]. Once a learner successfully recalls an object using cued recall, any further testing of the same object in the same session is described as overlearning [13]. Overlearning is needed for short-term retention to enhance memorizing skills. Overlearning can flatten the forgetting curve over time with each repetition, strengthening the provided information inside the long-term memory [10].

The Leitner system is the flashcard method that implemented the principle of spaced repetition. The flashcards are reviews at increasing interval. Figure 1.0 shown that in the Leitner system, accurately answered cards are leading to the following less frequent box, while wrong answered cards return to the first field for more advance review and redundancy. Leitner proceed his own idea to progress his individual learning and retention capability. He found that memory redundancy is ideally supported through the investigation of data over a separated period, rather than at the same time. The function of Leitner system are giving the learner a series of flashcard-based data that they have as a main priority to have the capacity to hold and review as educated information. The Leitner system approach that the facts in box one are inspected every day and if recalled effectively are then continue into the following box. By repeated this procedure, the fact is easy to recall with more frequently until all facts reside in the higher-most box [12].
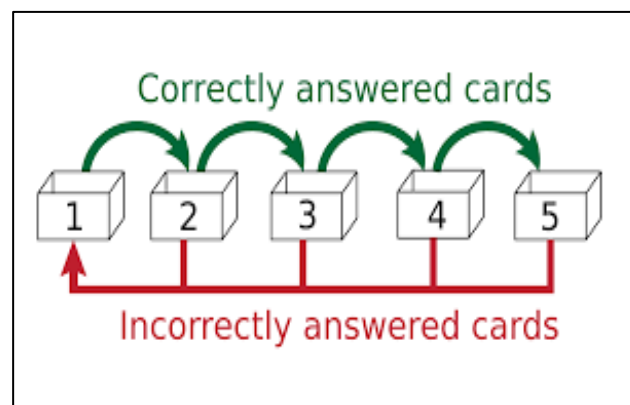

Figure 1

COVID 19 Among Children

Considering the best accessible information, COVID-19 seems to have a restricted direct weight on kids' wellbeing, representing about 8.5% of revealed cases internationally, and not many passing [16]. In contrast, school terminations have clear negative effects on kid wellbeing, instruction and improvement, family pay and the generally economy.

National and local governments now consider prioritizing continuity of education by investing in comprehensive, multilayered measures to prevent introduction and further spread of SARS-CoV-2 in educational settings, while also limiting transmission in the wider community [17].

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Methodology

ADDIE model is one of the most common models used in the instructional design field a guide to producing an effective design. This model is an approach that assists instructional designers, any content's developer, or even teachers to create an efficient, effective teaching design by applying the procedures of the ADDIE model on any instructional item. In addition, this systematic process is represented in the acronym ADDIE, which stands for the important components in the process of creating the instructional design, which are Analysis, Design, Development, Implementation, and Evaluation [15].

Analysis

To get all the requirement needed, requirement analysis have made. Requirement analysis includes the research that has been done such as find related information on the internet. Besides that, information was found by doing a personal research using a few sources such as journals, articles, books and many more.

Use Case

Use case is one of the techniques that are used to analyse the structure for documenting the functional requirements for the system. For this project, use cases are used to analyse the structure for documenting the requirement needed by the FA application.
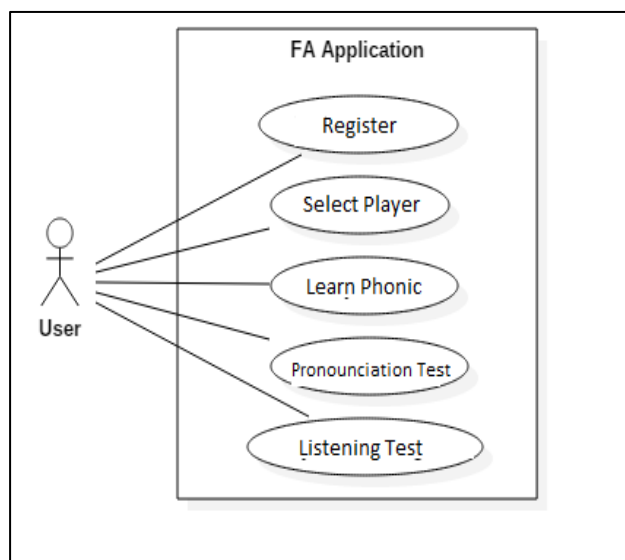

Figure 2

Figure 2 shows the overall use case for the FA application. The use cases explain about the overall process in the system. Firstly, user needs to create username at <<Register>> before login into the application. If user already registers their username, they just need to choose their username from list view of username by <<Select Player>> to login the application. Next, after user successful login the application, user can use the application to learn phonics and test their knowledge after study the phonics.

The user can learn phonics when they click the button of <<Learn Phonic>>. Then for test their knowledge about phonics, they can choose to test their pronunciation at <<Pronunciation Test>> or their hearing of the phonics at <<Listening Test>>. After that, they can logout.

Design

Design phase is process of designing the application. It includes the design the architecture and interface of the application. Figure 3 shows the flow chart of the application.
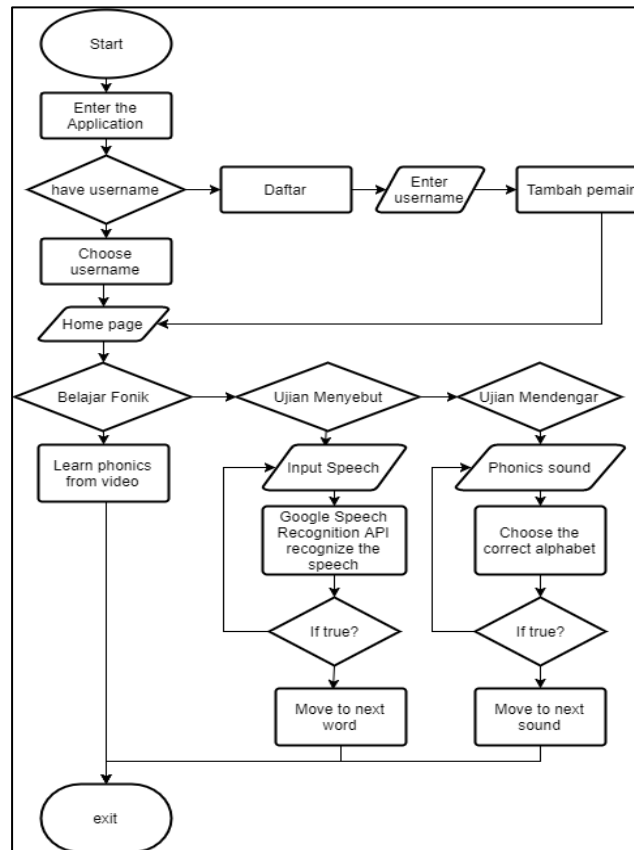
Figure 3

Development
Development phase is about the code that used to build the application. The coding is based on the use cases. It included the code to call Google Speech Recognization for recognizing the speech that use input. It is the important part in the system because it uses to make the SRA work. If the Google Speech Recognition does not work properly it will affect the technique of the application.

Implementations
Implementation phase is the phase that technique has been implemented in the application. The Leitner System has been used as a technique to improve the slow learner to memorizing the phonics and the alphabet. The looping code is used to implement the Leitner System. If the speech match with the word that are coded, then user can jump to the next word. But if the speech does not match, then user will back to the beginning of the test. The implementation of technique is implemented in the Pronunciation Test.

Evaluation
The evaluation phase is known as testing phase. It tests the full of the application to the end user. This phase is tested in Sekolah Kebangsaan Seri Mendapat, Merlimau, Melaka. The students that used to been tested are from LINUS program. The students that. joined the LINUS program are student that can be categories as slow learner. To measure learning received during the test as a result comparing the student's knowledge before pre-test and after the post-test. The pre-test data were used to obtain the baseline performance of the students before using the M-learning, while post-test was used to indicate which methods is more effective for the students. The details of the project evaluation are explained in result and finding part.

Results and findings
Testing
Test is conducted to gather the result of user effectiveness using the application. Two type of test are tested which are pre-test and post-test.

Pre-test conducted two type of test. The first test is Pronunciation Test, and the second test is Listening Test. Both tests are from the application. For the first test, the student need to speech the word that shows at the screen and the Google speech recognition will recognize their speech. They need to speech as much as they can within

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5 minutes. And the highest level of the word they can speech become the result of this pre-test. The level is based on the first letter of the word. For the second test, the students need to answer the right alphabet based on the sound of phonics that produced from speaker. They need to guess the answer from first 10 sounds that produced. The sound that produced by speaker are random. The number of right and wrong of the answer become the result for Listening Test.

The post-test similar with the test that conducted in the pre-test but in order to measure the effectiveness of the M-learning and the SRA that implemented in the application, the result need to compared with the before and after the student learn phonics by the application.

Pre-Test Result

The pre-test for Pronunciation test, 3 of 5 students that have been tested got 5 wrong pronunciations within 5 minutes. It means they need to start from the beginning 5 times. Another 2 students got 4 and 3 wrong pronunciation. The pre-test result for Pronunciation Test shown in Figure 4.
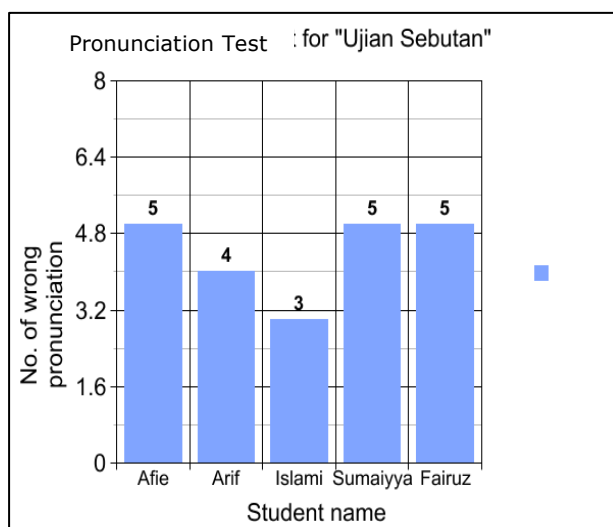

Figure 4

Figure 5 shows the pre-test result for Listening Test. The highest number of wrong answers for Listening Test is 7 out of 10 and the 3 of student got 6 out of 10. Another student answers the questions, 5 wrong and 5 right.
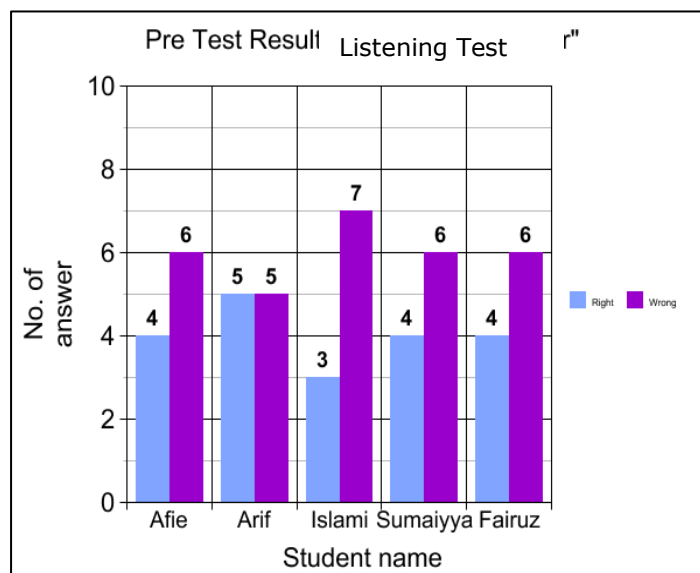

Figure 5

Post-Test Result

The post-test result for "Ujian Sebutan". shows that all of students just need to repeat to pronounce from the beginning just 2 times. The graph of the pre-test result for "Ujian Sebutan" shown in the Figure 6.
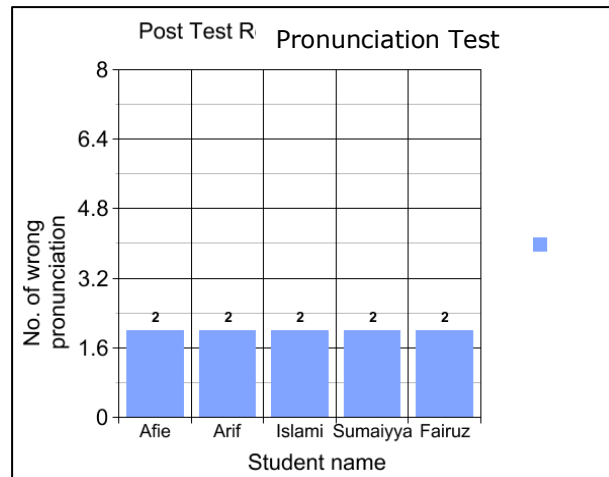
Figure 6

Figure 7 shows the post-test result for "Ujian Mendengar". From the result, all of students got 8 right and 2 wrong answers for this test.
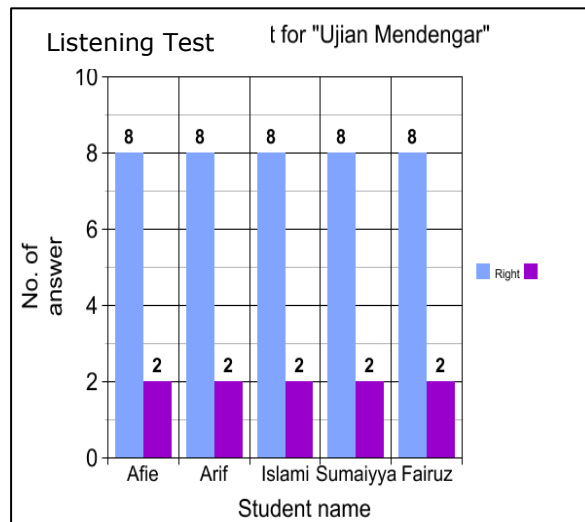

Figure 7

Conclusion

The M-learning technology that used teaches slow learner is an effective way to motivate them to learn in exciting experience. Based on the evaluation phase of the project, the testing found the effective of learning using mobile phone. The slow learner can learn phonics by itself without instructor to teach them. They also can test their knowledge after they finish learning phonics by itself.In the conclusion, all the objectives and significant for this project are achieved. For future improvement for this application, all of recommendation need to implement to solve the limitations of the application.

Acknowledgement

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