Educational mobile game for learning English words

IOP Conf. Series: Materials Science and Engineering **979** (2020) 012007 doi:10.1088/1757-899X/979/1/012007

Educational mobile game for learning English words

B K Ng[1]*, N M Suaib[1,2], A J Sihes[3], A Ali[2] and Z A Shah[2]

[1]School of Computing, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia.
[2]UTM Big Data Center, Ibnu Sina Institute of Scientific and Industrial Research, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia.
[3]School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia.

*nebk96@gmail.com

Abstract. English is a second language in Malaysia and English language skills are vital for Malaysians. Mobile technologies such as mobile phone can be a great tool for educational purposes since it can increase students' engagement and is a popular tool for interactive digital media. This paper discusses the development of an educational mobile game called EWORD for learning English words, for primary school kids. There were four phases involved; preliminary analysis, game design, game development and game evaluation. In the first phase, the fundamental knowledge of English words and vocabulary, English language learning methods in Malaysia, traditional learning methods, and educational mobile game were studied to acquire adequate information about the requirements for educational mobile game. User Interface (UI), gameplay, and game mechanics were designed in the second phase, while the mobile game prototype was developed in the third phase. In the fourth phase, the evaluation was conducted to evaluate the usability of the educational mobile game prototype. Based on the results, the educational mobile game helps in boosting the learnability of English words among students and is capable to increase student engagement.

1. Introduction

English is the most-spoken language in the world and it is important for younger generation in Malaysia to learn and have a good grasp of the English language. The limitations of traditional classroom learning methods such as limited time and place for learning English, as well as the passive learning environment lead to the lack of motivation and interest of primary school kids to acquire the English language. A mobile game is a digitally based game that plays on a mobile device such as smartphone, tablet, Personal Digital Assistant (PDA), and so on [1]. Mobile technology such as mobile phone can become a great tool for learning English words through the mobile game as it can reduce the problems of traditional classroom learning methods such as boring and passive learning environment. By combining mobile technology with the educational aspect, it can form an educational mobile game that can be introduced as a new learning method and make the learning process interactive and fun but also focus on the educational elements.

Game-based learning can provide motivation for learners through interactive content and competitive presented from game compare to traditional learning methods [2]. An educational mobile game can be a new learning method for students to learn independently and acquire knowledge by playing this mobile game. Students can focus more on playing a game rather than reading books. This is due to the fact that

students are free to explore and figure out the game strategies to accomplish the game mission that enhances the students' engagement. Players can learn and gain knowledge from the subject through the educational mobile game. In an indirect way, players are trained to improve critical thinking and problem-solving skills as players need to accomplish the mission to get scores.

2. Literature Review

2.1 English Words

A word means a single distinct meaningful element of speech or writing that can be combined to form a sentence [3]. English word can be defined as a word that can be spoken and written in the English language. A list of words known of a language can be defined as vocabulary. Vocabulary learning is essential for learners to gain vocabulary knowledge by understanding the meaning of new English words. Knowledge of vocabulary plays important roles to master language skills such as listening, speaking, writing, and reading.

2.2 English Language Education in Primary Schools Malaysia

English is important as a second language in Malaysia. Malaysia provides an English education curriculum for Malaysians since at preschool. Based on the Malaysia Educational System, the English language is a compulsory subject for students that studies at primary (6-12 years old), secondary school (13-17 years old) and post-secondary and tertiary levels of education (above 17 years old) but not compulsory for students to pass the standard national examinations [4]. Malaysia implements new Malaysia Education Blueprint (2013-2025) launched in 2012 and had introduced Primary School Standards-Based Curriculum (KSSR) for primary education as a new initiative by the Ministry of Education of Malaysia start from 2013 to enhance the English language skills of students to minimum proficiency levels through educational contents compared to New Primary School Curriculum (KBSR).

Standard-Based English Language Curriculum (SBELC) is introduced as a new English curriculum that implements in primary schools along with KSSR [5]. The implementation of SBELC aims to improve the English language proficiency of students from urban and rural areas. The SBELC emphasizes student-centered teaching as an approach for formal English language teaching and learning in classrooms. Student-centered teaching and learning approach more concentrate on students to foster critical thinking skills and problem-solving skills through a variety of activities [4].

2.3 Traditional Classroom Learning Methods

Traditional classroom instruction is a learning method with space restrictions such as classrooms, schools, and other locations [6]. There are two approaches of traditional classroom learning methods that are teacher-centered and student-centered. The teacher-centered approach is one of the traditional learning methods that emphasizes the role of the teacher to deliver the educational content by using textbooks as resources for the curriculum to teach students in a classroom [6]. In the teaching process, the teacher as the center and teach the students based on the teaching content in particular English textbooks with a fixed syllabus. However, students are passive in the classroom as students become listeners in the teaching process [7]. Therefore, students may lose interest in learning if unable to follow up on the topics taught by teachers as each student has different learning progress.

Whereas, student-centered approach is another learning method that focuses on students and allows students to work in a small group to complete activities to enhance communication skills and provide thinking space for students [6]. For example, students communicate in English, discuss English exercises together, give suggestions, and learn from each other. This approach is more flexible as it encourages the students to become active participants in the learning process compared to the teacher-centered approach.

However, traditional classroom learning methods provide limited opportunities as students learn and speak English in the classroom only with a maximum of an hour [8]. Besides, students need to attend the class in school on time. In the passive environment, students have to pay attention in class to follow up and absorb the content delivered by the teacher in a short time. Moreover, the teacher has limitation to focus on every student in class, while each student has different learning progress and proficiency

level in English. In view of that, students may lose confidence as unable to follow up on the topics and incapable perform well in class like other students. Furthermore, there is a lack of motivation in learning English from textbooks as students feel boring to memorize the textbook.

2.4 Educational Mobile Game

A mobile game is a game that can be played via mobile phones and developed in diverse mobile handsets such as the Android operating system and Microsoft Operating System [9]. Education is the process of receiving or giving systematic instruction, especially at a school or university [3]. Therefore, an educational mobile game can be defined as a mobile game used for educational purposes.

Mobile phones are suitable to be utilized for educational purposes such as learning tools due to its extreme portability and convenience. Mobile game-based learning can be offered as a new learning method with the use of educational mobile games or apps. This learning method takes advantage of the mobility of mobile phones and time flexibility as the learner can access educational resources anytime and anyplace [10]. An educational mobile game is also known as instructional games designed to meet educational objectives through rules and constraints contained in the mobile game to achieve the goal of the mission [11]. Additionally, educational mobile games can be employed as mobile learning tools that enable users to learn educational content interactively and engagingly. The mobility and information accessibility of mobile technology play significant roles to enhance English language teaching and learning [10]. Hence, an educational mobile game can be a great learning tool for children to learn a second language such as English.

Based on the research done by [12], the result stated that students able to learn English words indirectly through playing education mobile games. It creates the learning environment for students to learn English words without particular intention as students need to identify the meanings of the words. The result of the research also shows that mobile games able to enhance the English vocabulary acquisition of learners. Moreover, there are several requirements of educational mobile game are determined as shown in Table 1 based on papers and research reviewed to enhance user experience in learning English.

Table 1. Requirements of Educational Mobile Game.

Requirement	Description
Characters and Storyline	The storyline of a mobile game that represents the scenarios of the game that applied for players to understand the core of the game. The characters in the mobile game should be well-designed and attractive as it is one of the major elements to enhance the learning experience of learners [1].
Rule	A rule-based mobile game that utilizes for learning purposes able to boost the motivation of learners [2]. This is due to the players have been motivated in thinking and using an appropriate strategy in the game to get a higher score by reading the rules of the game.
Immediate feedback	Immediate feedback displays in the game to the players that reflect the performance of the players in the game mission whether players have done it correctly or incorrectly [13].
Goal	Each educational mobile game should set a clear goal for the player to achieve [14]. It can increase the motivation of players and being concentrate on accomplishing tasks at each game level to score a success in the mobile game.
Reward	A reward is also one of the requirements of educational mobile games that enable the player to earn things after accomplishing tasks. This enables players to gain a sense of accomplishment after obtaining the rewards from game missions such as points, money, and trophies [13].

2.4.1Current Related Educational Mobile Games or Applications

There are three existing educational mobile applications or games used for learning English that are Super Word King, Duolingo, and Memrise are reviewed in this paper. Based on the Table 2, it shows that three educational mobile game applications use different methods to teach language and focus on vocabulary learning Besides, these mobile games have several similarities in integrating game elements such as goals, levels, and rank with educational content that offer an interactive and engaging learning method for language learners. It also provides motivation for learners to achieve goals such as lessons in each level. In addition, most of these educational mobile games provide several useful features such as words review that can help to reinforce the language skills of learners. In short, an educational mobile game can be a great tool for language learners to learn a language in a fun and interesting way.

However, there are some limitations of these educational mobile games and applications. For example, all educational mobile games and applications mentioned above provide language learning in a bilingual setting that using one language to teach another language. In view of that, the user should know another language if wants to learn English. For instance, Super Word King more benefits to Mandarin speakers as it teaches English words by providing the instruction and meaning of English words in Mandarin. But it is limited to Mandarin speakers only for learning English words. On the other hand, Duolingo also using the bilingual mode to teach users to acquire a language. However, Duolingo doesn't provide many options for Asian speakers such as Malay speakers to learn English. Whereas, users of Memrise need to pay an extra fee for upgrading the application to Memrise pro as it provides additional features such as unlimited access to all game modes. In view of that, the user may unable to enjoy all the features during learning languages. In view of that, these mobile applications and games may not suitable for all primary school kids in Malaysia as different races and languages are spoken in Malaysia.

Table 2. Comparison between three educational mobile games that are Super Word King, Duolingo, and Memrise.

	Super Word King	**Duolingo**	**Memrise**
Mobile Operating Systems	Android, iOS	Android, iOS	Android, iOS
Learning Contents	Vocabulary	Vocabulary, Grammar	Vocabulary, Grammar
Learning Modes	-Provide vocabulary learning through listening, spelling, and meaning matching methods -Learning through levels of accomplishment -Provide the pronunciation guide of a native speaker	-Learn to pronounce the words correctly -Word meaning matching -Translate the sentence provided - Learning through levels of accomplishment -Provide the pronunciation guide of a native speaker	-Provide the pronunciation guide of a native speaker - Provide vocabulary learning through listening and words meaning matching methods
Features	-Words Review -Quick Challenges with different categories of English words -Performance Ranking	-Words Review -Daily Goal setting -Daily Practice Reminders -Variety of Languages Courses provided	-Speed Review -Daily Goal setting -Performance Ranking -Variety of Languages Courses provided
Limitations	-Limited to Mandarin speakers only for learning English words	-Malay speaker is not included as the options for learning English.	-Extra fee for additional features

3. Usability Testing

Usability Testing is a useful testing methodology to test and evaluate the usability aspects of an application. It is vital in improving the quality of user experience as usability testing emphasizes aspects such as ease of use, efficiency, and satisfaction. Based on the research done by [15], it revealed that usability testing contained 5 quality components that are learnability, efficiency, memorability, errors, and satisfaction. Table 3 shows the five quality components with the corresponding description.

Table 3. Five Quality Components.

Quality Component	Description
Learnability	To determine the ease of use of the game for the user to accomplish the task or mission while the user first attempts to the game.
Efficiency	A factor that focuses on the time for the user to complete the task given after the user had the experience with the game
Memorability	Concerns on the skills of a user to play the game during reattempting the game after a long time not using it.
Errors	Criteria to measure the errors made by the user and the ease for the user to fix it
Satisfaction.	To measure the level of satisfaction by a user after using the game.

4. Methodology

This section explains the methodology used in this paper. Figure 1 shows the flowchart of methodology that represents the procedures required to guide the educational mobile game development.

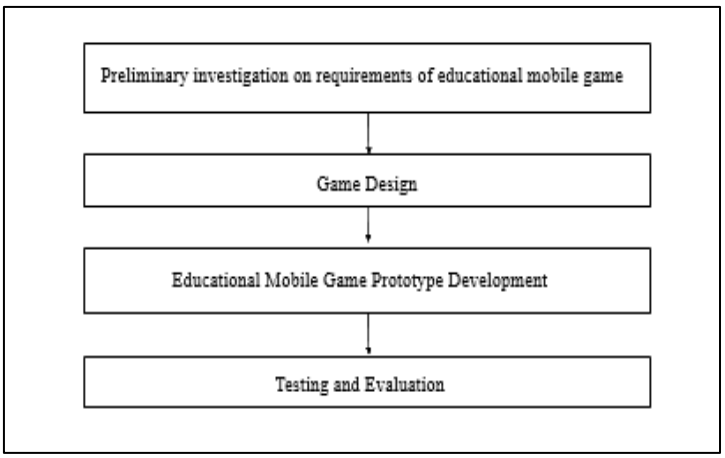


Figure 1. Flowchart of Methodology.

In Phase 1, the studies on English language education in primary schools of Malaysia and the traditional learning methods are conducted to collect the related information about the current learning method for the English language applied in primary schools. Besides, the research is conducted to investigate the existing educational mobile game and the technology that can be used to develop the game prototype to determine the requirements for educational mobile game development. Based on the research and interview, the requirements of educational mobile game such as goals, feedback, and reward can be applied in the educational mobile game to enhance the learning experience. After the

information collected in the previous phase, the game concept and gameplay of the educational mobile game are designed as well as game interfaces in Phase 2.

After the design phase is completed, the educational mobile game prototype is developed by using a suitable game engine and tools such as Unity and the Android Software Development Kit (SDK) to build the prototype in the Android platform in Phase 3. In Phase 4, the educational mobile game prototype developed is tested through user acceptance testing and evaluated by using usability testing to test the functionality and usability of an educational mobile game for primary school kids to learn English words.

5. Implementation

This section explains the implementation of this paper based on the methodology of this paper.

5.1 Educational Mobile Game Prototype Development

After the information collected in the previous phase, the game concept and gameplay of the educational mobile game are designed as well as game interfaces for game prototype development. For example, the number of levels and the total missions in each level. Each level is designed with three missions. Each English word is classified based on the categories and used in a suitable game level.

5.1.1 Curriculum Design

The educational content is a collection of English words according to the KSSR curriculum from Year 1 to Year 6 that utilized for the mission at each level. The mobile game is designed with three levels for the player to achieve. Each level has 3 missions. Each mission is packed with 10 English words under the same category. For example, level 1 is using English words that less than 5 letters, whereas level 2 and level 3 are using English words with 5 and above letters. Level 1 and level 2 provide each hint in the form of an image, while level 3 uses images and sentences as the hints for the player to complete the spelling of English words. The difficulty of the game is increasing in aspects of English words and hints provided if the player goes to a higher level. Players can learn and gain a list of English words with a different category in each mission by progressing through the levels.

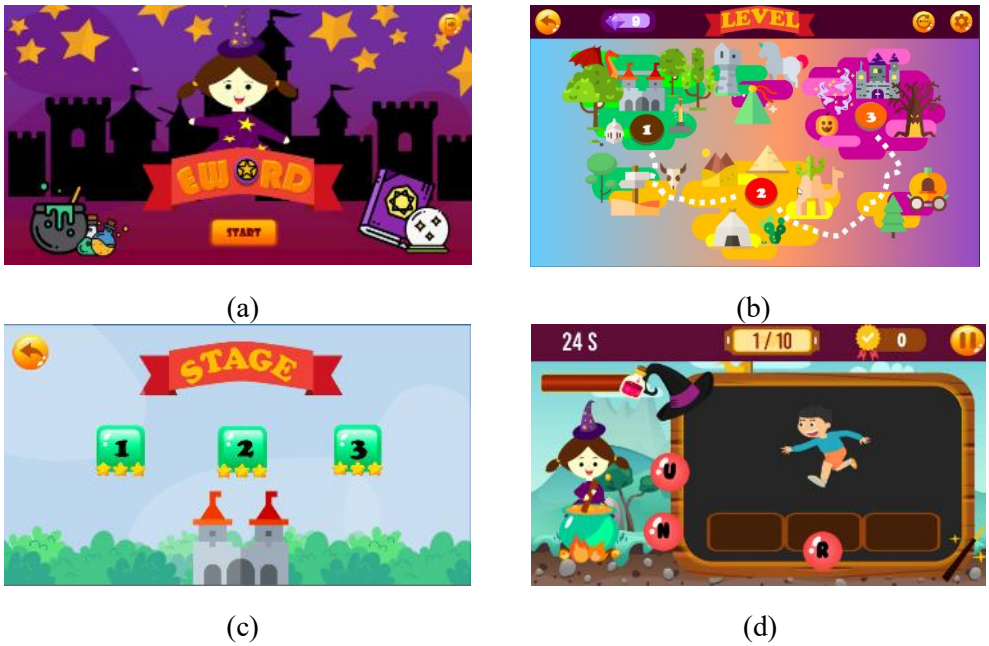
5.1.2 Character and Rewards Design

The main character named Kiki in the mobile game is designed. The appearance of Kiki is designed as a beginner of magician and possessed magical objects such as a broom and magic wand. The rewards are the list of magical gems that give to a player after accomplished each mission. The player needs to collect all the magical gems to achieve the goal of the mobile game. Figure 2 shows the design of character and reward.

Figure 2. Character and Reward Design.

5.1.3 Interfaces Design

In this section, the interfaces of this paper are designed. A properly designed Graphical User Interface (GUI) of the game enable the player to start the game easily without knowing details before and provide the information. Figure 3 shows the interfaces of the game prototype.



(a) (b)

(c) (d)

Figure 3. Interfaces Design of Game Prototype that are (a) Start Page (b) Level Page (c) Mission Stage Page (d) Gameplay Page.

5.1.4Gameplay and Mechanics

EWORD starts with a story presented to the player with the theme of 'Magical' that describes the magical trial for the main character named Kiki to be a powerful magician by accomplishing the missions in each island to collect 9 magical gems. There are 3 levels in this game with the difficulty increasing while going to a higher level. Each level has 3 game missions and each game mission contains 10 questions for players. The mission starts with a question that providing an image or sentence as a reference for the player to complete the spelling of the English word. The question is picked randomly from the list of questions each time at all levels. The bubble objects are appeared and move randomly in the range of screen view. The player can tap on the desired position in the screen view to pop the bubble that is labeled with a letter. The player needs to find and tap on the targeted bubble to get the letter for completing the spelling of the English word. The target bubble pops and disappears after tapped by the player and the corresponding letter is filled in the English word. Moreover, the player requires to fill in the letters orderly according to the spelling of the English word. Players can get immediate feedback from the game such as pop the bubble that is labeled with the wrong letter through the role of sound effects and retry to answer the question in the given time.

There is a timer of 25 seconds shown in the game start to countdown for each question. The score in each mission is given based on the performance of the player in completing a list of English words correctly within the time given. For example, the player can earn 100 points if the player filled in all the letters of the English word within 5 seconds. If the timer runs out of time, the player is getting zero points and the game moves to the next question. The image of a new English word is given for the next question after the player completed the spelling of the previous English word. The player needs to answer 10 English words to complete the mission. The player needs to obtain a targeted score of 650 and above to get the magical gem as a reward. The game records and updates the highest score obtained by the player. Each game mission at each level are rated with stars based on the highest score obtained by the player. The list of English words used as 10 questions in the previous game mission is listed on the Review Page for the player to learn and practice the English words. The next mission is unlocked only if the player completed the previous mission. Whereas, a new level is unlocked after the player accomplished the previous level. The player can replay the mission to achieve the targeted goal if failed to obtain the targeted score in the mission. It provides the chance for the player to replay and review the

English words. The player can click the gem button on the level page to view the current gems collected. The goal of this game is to collect all nine magical gems for the game character to become a powerful magician by accomplishing all the levels.

5.2 Game Engines and Android SDK

Unity has provided a variety of important tools and functions to develop the educational mobile game prototype. First, unity allows users to build the project to the target platform such as Android. In order to develop a mobile game with the Android platform, it needs to add the Android SDK path to Unity that aims to allow Unity to create the Android Package Kit (APK) file and install it into a targeted mobile phone based on its Android version and its Application Programming Interface (API) level. Then, the unity project builds and runs as a mobile game on a targeted mobile phone. The educational mobile game prototype needs the function such as *Input.getMouseButtonDown* that can use to detect the position of the screen that tapped by the player to pop the target object on the tap position. The components such as collider 2D also need to add for the Two-Dimensional (2D) objects such as bubbles with the purpose of collisions detection. Due to the educational mobile game prototype is a 2D game, therefore, it can use the canvas that represents the screen view of the mobile game. All the User Interface (UI) elements are added as the child of the canvas such as text, images, button, and so on. It is useful for designing and building the interfaces of the mobile game.

6. Results

The result of this paper is an educational mobile game prototype, EWORD for primary school kids to learn English words. A user can interact with the content of the educational mobile game through the 2D touch screen input of the mobile device. The user can start the game with the first level. There are three levels in this game and each level contains 3 mission stages. The user needs to go through all the stages one by one and get target scores to unlock all the stages and levels. In each stage of a level, there are 10 English word questions prepared in the mission for the user to spell each English word in the correct order by popping the bubble labeled with the correct letter. The timer starts to countdown the time in 25 seconds for each English word question. After user completed all the questions, it shows the results with stars, scores obtained, and the highest score of the stage. The user can receive a magical gem as a reward if achieve the target score in the mission. Next, the review page is displayed with the list of English words used in the previous game mission for the user to learn the correct spelling of the English words and review it. If the user clicks on the Next button from the review page, it back to the current level page for the user to select the next stage to play. Once the user collects nine magical gems, it shows the final game win page to the user to indicate the user had finished and won the mission of all game stages of each level. The user can select the reset button to clear all the game data and record to replay all the game stages.

6.1 Evaluation

User acceptance testing and usability testing are conducted to test the functionality and user experience of the educational mobile game prototype developed in this paper. There are 3 target users aged between 10-12 years old and 10 non-target users aged between 23-30 years old are involved in user acceptance testing and usability testing.

6.1.1 User Acceptance Testing

Twelve actions that are the main tasks of the educational mobile game prototype are suggested for target users and non-target users to perform. All the results are recorded and tabulated as Table 4 shown below. Based on the results of user acceptance testing obtained, there are six out of twelve actions performed by all target users. Whereas, there are seven out of twelve actions that are performed by all non-target users. This is because these actions are the main tasks that needed to carry out by both groups of users to play and proceed with the game. Besides, the actions such as view the game tutorial, view the gem collection, and reset the game are not done by all target users and non-target users are due to the buttons are less noticeable and eye-catching for the users to select and able to continue the game although

without doing these actions. Figure 4 shows the target user and non-target user tested the educational mobile game prototype.

Table 4. Results of User Acceptance Testing.

Action	Expected Result	Results of target users	Results of non-target users
Start Game	The game will start.	✓	✓
View story of game	User can understand the instruction given through story.	×	✓
View game tutorial	User can understand how to play the game.	×	×
View gem collection	User can view the collection of gem collected.	×	×
Sound Setting	User can on or off the background music of game.	×	×
Reset Game	User can reset game data.	×	×
Select game level	User select the game level wanted.	✓	✓
Select game stage in game level	User can select the game stage in a level.	✓	✓
Tap on the letter bubble	User can tap the letter bubble to complete the spelling of English words.	✓	✓
Pause menu	User can select options such as back home, resume and restart the game.	×	×
Press OK to receive reward	User will collect a gem as reward	✓	✓
Review list of English words	User can view the list of English words in the game.	✓	✓

(a) (b)

Figure 4. The respondents that tested the educational mobile game prototype are (a) target user (b) non-target user.

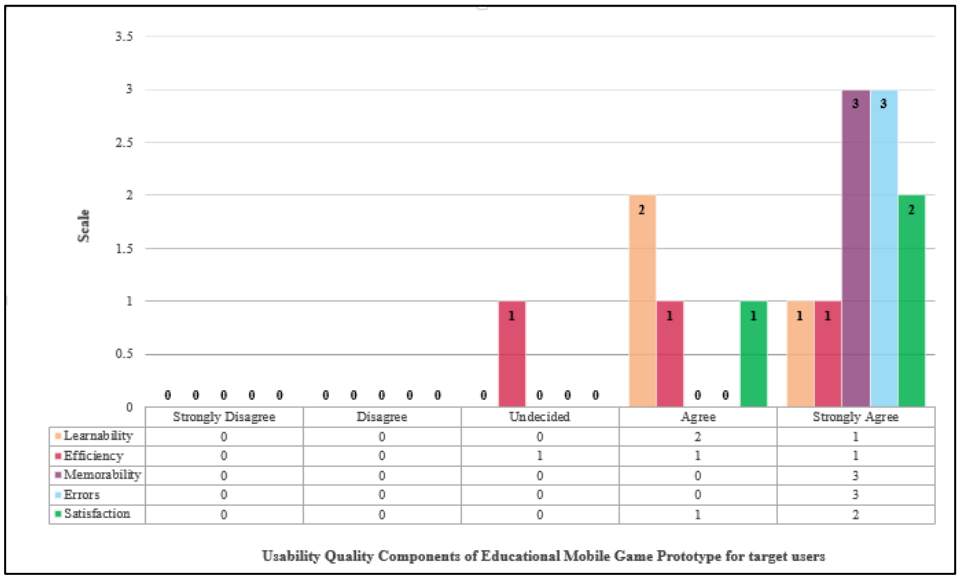
6.1.2Usability Testing

The questionnaire is given for the respondent to fill after the respondent completed the time of 15 minutes in interacting with the educational mobile game prototype. The questionnaire contains two sections that are pre-test and post-test questionnaire. Based on data collected from the pre-test questionnaire, all the target users have no experience in using any educational mobile game to learn the English language. Whereas, only 3 out of 10 non-target users have the experience to use an educational mobile game to learn English.

Based on the results of target users as shown in Figure 5, it showed that educational mobile game is easy to use, memorable, efficient, and fulfilled with the other usability quality components. For example,

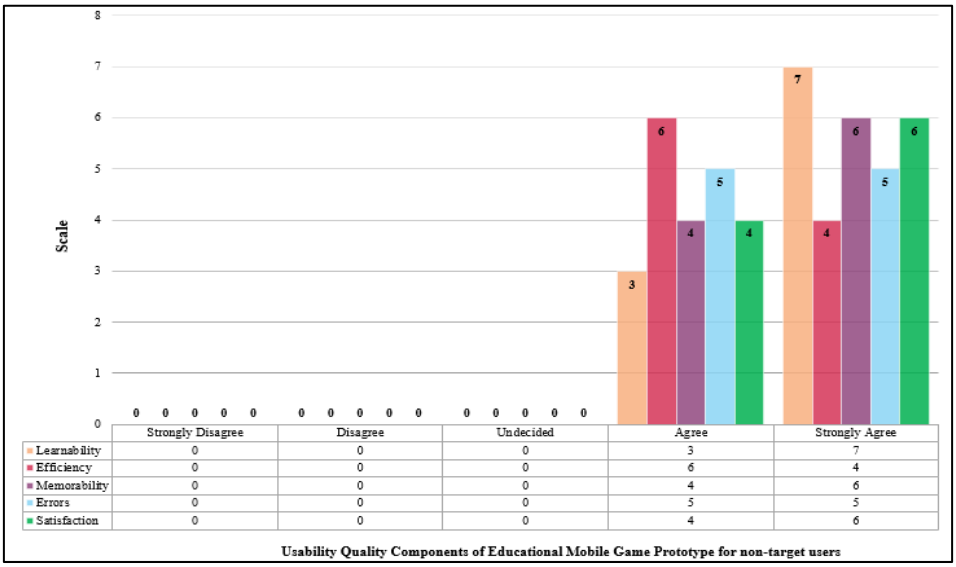
the target users have been asked about the learnability of the educational mobile game prototype. There are 2 out of 3 target users choose "Agree" and 1 respondent chooses "Strongly Agree". Therefore, the result shows that most of the target users agreed that this game prototype was easy to use and learn English words. Moreover, most of the target users able to know the method to play with the gameplay of the game prototype and use the function of interfaces. The target users also agreed that the game prototype able to proceed smoothly on the mobile device and fewer errors occur during interacting with the game prototype.

From the results of non-target users as shown in Figure 6, most of the non-target strongly agreed that this game prototype was satisfying to use as 60% of non-target users choose "Strongly Agree" and 40% of non-target users choose "Agree" for the question related to the satisfaction. The non-target users felt satisfied to use the game prototype to learn English words. For the memorability of the game prototype, most of the non-target users able to understand the function of interface elements such as buttons and input controls as well as gameplay of mission at each level of the educational mobile game prototype.



	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Learnability	0	0	0	2	1
Efficiency	0	0	1	1	1
Memorability	0	0	0	0	3
Errors	0	0	0	0	3
Satisfaction	0	0	0	1	2

Figure 5. Feedbacks of target users to the questions related to usability quality components.



	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Learnability	0	0	0	3	7
Efficiency	0	0	0	6	4
Memorability	0	0	0	4	6
Errors	0	0	0	5	5
Satisfaction	0	0	0	4	6

Figure 6. Feedbacks of non-target users to the questions related to the requirements of educational mobile game.

6.2 Evaluation Results

The results of usability testing were gathered and analyzed for the evaluation phase. The results obtained from the testing phase are important to further improve the functionality of the educational mobile game prototype for users to use and enhance user satisfaction. Both target users and non-target users agreed that this game prototype is targeted for primary school students to use as its learning content suitable and relevant to primary school standards of English subject. Besides, most of the respondents felt that the educational mobile game prototype is easy to use and can use it to learn English words. Most of the respondents also satisfied with the game prototype and found fewer errors during interacting with the interfaces of the game prototype. Moreover, the user experience of the educational mobile game prototype also is evaluated in the aspect of requirements of the educational mobile game applied such as rule, goal, immediate feedback, and rewards. Based on the results obtained of target users and non-target users, it show that the educational mobile game prototype is fulfilled with the requirements of educational mobile game.

7. Conclusion

EWORD is an educational mobile game prototype introduced as an option for a new learning method for primary school kids in learning English words. The requirements of educational mobile game were analyzed by collecting the knowledge and information from the research and studies that are important for the development of the educational mobile game prototype. The graphical user interface and game elements were designed based on the requirements as well as developing the educational mobile game prototype by using Unity3D. After the development phase, the testing and evaluation of this paper were conducted for improvements in the educational mobile game prototype. The usability of the educational mobile game prototype for primary school kids to learn English words was evaluated based on the results obtained. There are several limitations and improvements suggested for the future development of this paper. Due to the Movement Control Order (MCO) implemented in Malaysia from 18 March 2020, the situation prohibits any visit to schools or to invite primary school students as respondents for evaluation. Therefore, the testing process was carried out by involving two groups of respondents; 10 non-target users aged between 23-30 years old (for functionality test) and 3 target users aged between 10-12 years old (targeted users) as an alternative way to overcome current limitations. Therefore, we plan to do more testing such as involving more target users in testing, and to enhance this product by preparing more game levels for players to perform the more missions and learn a wider range of English vocabulary

from the game, providing more game instructions, and adding more effects in aspects of audio and animation to provide feedback and to increase the enjoyment of the game.

Acknowledgments
The authors would like to express sincere appreciation to all people involved in this project and contributed to the success of this project.

References

[1] Shiratuddin N and Zaibon S B 2010 Mobile game-based learning with local content and appealing characters International Journal of Mobile Learning and Organisation 4 55-82
[2] Boeker M, Andel P, Vach W and Frankenschmidt A 2013 Game-based e-learning is more effective than a conventional instructional method: a randomized controlled trial with third-year medical students *PloS one* **8** e82328
[3] Stevenson A 2010 Oxford dictionary of English: Oxford University Press, USA)
[4] Azman H 2016 Implementation and challenges of English language education reform in Malaysian primary schools 3L: Language, Linguistics, Literature® 22
[5] Sulaiman S, Sulaiman T and Rahim S S A 2017 Teachers' Perceptions of the Standard-Based English Language Curriculum in Malaysian Primary Schools *International Journal of Instruction* **10** 195-208
[6] Relan A and Gillani B B 1997 Web-based instruction and the traditional classroom: Similarities and differences Web-based instruction 62 41-6
[7] Liu C and Long F 2014 The discussion of traditional teaching and multimedia teaching approach in college English teaching. In: *2014 International Conference on Management, Education and Social Science (ICMESS 2014)*: Atlantis Press)
[8] Ali M S 2003 English language teaching in primary schools: Policy and implementation concerns IPBA E-Journal 1-14
[9] Prasetya F 2015 Mobile Game Effectivenessfor Game Enthusiasts Who Have Little Spare Time to Play Games *SISFORMA* **2** 10-2
[10] Gangaiamaran R and Pasupathi M 2017 Review on use of mobile apps for language learning *International Journal of Applied Engineering Research* **12** 11242-51
[11] Gunter G A, Campbell L O, Braga J, Racilan M and Souza V V S 2016 Language learning apps or games: an investigation utilizing the RETAIN model *Revista Brasileira de Linguística Aplicada* **16** 209-35
[12] Ali Z and Ghazali M A I M 2016 Learning technical vocabulary through a mobile app: English language teachers' perspectives *International Journal of Language Education and Applied Linguistics*
[13] Aslan S 2016 Digital Educational Games: Methodologies for Development and Software Quality. Virginia Tech)
[14] Trisnadoli A, Muslim I and Novayani W 2016 Software Quality Requirement Analysis on Educational Mobile Game with Tourism Theme JSW 11 1250-7
[15] Nielsen J 2012 Usability 101: Introduction to usability (2012) URL: http://www. nngroup. com/articles/usability-101-introduction-to-usability/[Accessed November 2016] 9 35