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Learning Mathematics using Fun-Math Mobile Application for Pre-School

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***Abstract*- The use and development of game application nowadays is in very fast pace and most kids like to play games rather than studying especially in mathematics. Mathematics syllabus is usually formal and theoretical, and it is not interesting for kids is the attitude of kids in pre-school is more to playing and learning. Therefore, the aim of this paper is to propose a Fun-Math mobile application to help pre-school in learning and understanding basic mathematics. The method used is ADDIE model consists of analysis, design, development, implementation, and evaluation. The proposed mobile application is evaluated to verify its capabilities in helping kids. The results showed that the proposed Fun-Math mobile application can improve kids' understanding of mathematics.**

Keywords—Learning Mathematics, E-learning, M-learning, ADDIE model

I. INTRODUCTION

Mobile application and technology have seen increase and growth rapidly since the early year 2012. Mobile application is essential to the mobile user, especially students. There are many things that can be done using a mobile device such as education, games streaming, serve the internet and etc. Mobile applications consist of software or a set of programs that runs on a mobile device and perform certain tasks for the user. The main goal of a mobile application is to have an interactive engagement with the user. Mobile applications are available via distribution platforms such as App Store and Google Play Store, there are many free applications, as well as paid apps [1]. Nowadays, the development of game applications is increasing rapidly. Kids tend not to study and just want to play games. Most of them like to play games compared to reading books. Kids are not attracted to traditional studies (books) and easy to lose their focus. Mathematics at the pre-school is formally, theoretically, and book-based learning, and it is not interesting as playing games. One of the difficult subjects in basic education is mathematic because it has more logical and needs high problem-solving skills.

A survey conducted in America showed that mobile devices have become a part of children as it is of the children development process, especially in education. As a result, mobile learning (M-Learning) has come into modern's life and become the best way of learning mechanism that can improve children learning process by using mobile learning applications [2]. Games applications help the teachers to conduct activities during the break. Besides, the aid of instructional technology, digital devices, and the advancement of educational mathematics games can help the teachers to use in the learning process. Since the educational mathematics game has gained considerable interest in education circles due to its capability of enhancing the learning process among students, the teachers need to have their criteria and set goals in order to achieve the desired learning outcomes. It is good when a mobile application adds a game element that includes entertainment, challenges, and competitive spirit like video games. These elements could encourage them in their study. By providing some recreational activity they could escape from everyday routine for a bit. By adding the fun element into a casual application, it helps to reduce some stress and relax for a moment. Therefore, the aim of this paper is to propose Fun-Math mobile application to help pre-school to learn

mathematics. This paper is organized as the following: Section II discusses the materials, Section III explains the methods, Section IV shows the results and findings. Lastly, Section V explains the conclusion and future work.

II. MATERIALS

A. Mathematic

The mathematics syllabus at the primary school is book-based learning, and it is known as a formal and very theoretical subject. Mathematic is a boring and complex subject [3]. It would easily give one headache if the students are unable to understand the basic number and operations such as addition, subtraction, multiplication, subtraction, and division. Besides that, Mathematic is one of the most challenging subjects for students [4]. This is due to kids that are not focused and always lose interest quickly.

B. E-Learning

Electronic learning (E-Learning) is a platform in the form of electronic media that focuses on education. E-Learning is online learning that includes various types of media such as videos, audio, text, images, animation, and many more [4]. The Internet is playing a big role in children's s life nowadays as they prefer to use and interact with the content and images on the screen rather than books and papers. There are many advantages of online learning. Students can access the content at anytime and anywhere [5]. There are days when students could not attend school; they must learn the topic on their own. Students do not have to worry about the lesson they have missed. Students could access updated content with more creative material unlike a book with online learning.

C. Mobile Game-Based Learning

Mobile game-based learning has grown rapidly and gaining popularity among teachers and students. Mobile games in education provide an interesting learning method that is acceptable and workable for pre-school students of different levels and gender to improve their basic skills in Mathematics. Mobile learning can be defined as the ability to obtain and provide educational content on personal pocket devices such as PDAs, smartphones, and mobile phones [6]. According to [7], mobile learning is learning that is using small portable devices small/ portable computing devices. These include smartphones, PDAs, and handheld devices. It also will take the education process away from any fixed points [7]. Learning in the 21st century does not have to be chained with the way it was before, which is the traditional method in delivering information to the students. Mobile game-based learning will make the way to learn in fun and entertaining ways [4]. At the end of the day, it will improve the student's mathematic knowledge. Besides that, mobile game-based learning is much engaging the students' attentions more than book-based learning of teaching system as it is unique and fun [3]. It is also embedded with interactive, immersive content to the students and provided an exciting experience to them, which is better than memorizing the facts. Games provide parent-child interaction as well as opportunities for exploring ideas and more opportunities for communication and discussion that are normally available in the classroom [8].

III. METHODS

Fun-Math mobile application is developed using ADDIE model. According to [9], ADDIE model is one of the systematic learning design models. ADDIE model is structured with sequences of systematic activities in an effort to solve learning problems. ADDIE model is simple, linear, and easy to understand, and it is suitable to use in mobile development applications [10]. This study developed a prototype for Android mobile platform to learn Mathematics Operations. This model consists of five stages namely analysis, design, development, implementation, and evaluation as shown in Fig. 1. Fig. 1 depicts the phases of developing the Fun-Math App. The explanation of each stage is described below.

Fig. 1. ADDIE Model

A. Analysis

During this initial stage, the potential requirements of the application are methodically analyzed and written down in a specification document that serves as the basis for all future development. The result is typically a requirements document that defines what the application should do, but not how it should do it. The system will be analyzed in order to properly generate

the models and business logic that will be used in the application. At this stage, the objective, problem statement and environment are being clarified in order to understand the project goal.

B. Design

Design is the second stage in ADDIE model which is at this stage covers technical design requirements such as sketches storyboard for Fun-Math App, the programming language that can be used, data layers, services, etc. A design specification will typically be created that outlines how exactly the business logic covered in the analysis will be technically implemented. In this stage, the structure and flow of the project must be clearly stated which is include framework, object, icon, and interface layout.

C. Development

In the development stage, the Build Box framework is a medium that is used to develop Fun-Math App. Build Box is a drag and drops game engine and one of the no-code game development platforms. It is focused on game creation without programming. Android Studio will be used to convert the app to the Android platform so that it can be installed in a smartphone that using an android operating system.

D. Implementation

Fun-Math App will be testing at this stage. Implementation is a stage in which Fun-Math App is installed into smartphones. At this stage, Fun-Math App has been tested and working smoothly. On the start-up and main page of Fun-Math App, the organization logo and "Quiz Matematik" will be displayed and introduce the application in the form cartoon character.

E. Evaluation

During this stage, Fun-Math App is installed on different smartphones with different android versions. The evaluation stage entails not just the evaluation and deployment of the application, but also subsequent support and maintenance that may be required to keep it functional and up to date.

IV. RESULTS AND FINDINGS

The usability test is conducted on 19 kids as a respondent to evaluate the Fun-Math App. Each respondent has to play the Fun Math App and after that, the test administrator explained about the test session and asked the respondent to answer the questionnaire. Since the respondents were kids below 12 years old, so the test administrator helps them by reading the question and fill the answer from the respondent. The result of the evaluation is shown in Fig. 2.

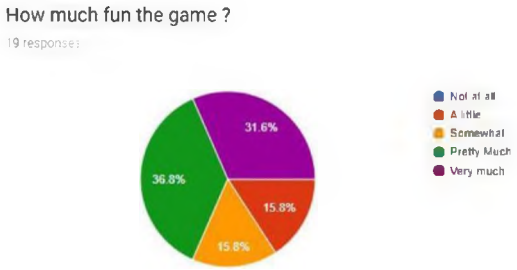

Fig.2. How much fun the game?

Fig. 2 shows the question of how much fun the Fun-Math App is. Based on the survey conducted; the highest percentage is 36.8% which is seven respondents who are voting for pretty much. Six respondents indicate 31.6% votes for very much. 15.% (three respondents) votes for a little and somewhat. This shows that users pretty much enjoy using this app. The next question is shown in Fig.3. Fig. 3 shows the question for how much would you like to play the game again for the Fun-Math App. The result shows that 31.6 % are pretty much like to play Fun Math again, while 26.3 % of the users feel a little like playing the game again and 21.1 % of the users feel very much and somewhat. The next question is shown in Fig. 4.

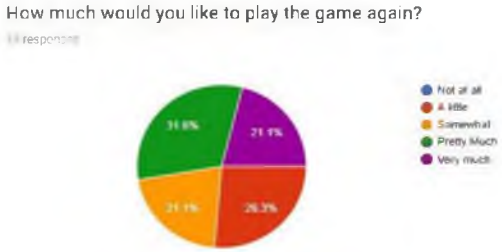

Fig.3. How much would you like to play the game again?

Fig. 4. Does this Fun-Math App help to improve understanding in mathematics?

Fig. 4 shows the result of respondents towards the ability of this application in improving their understanding of mathematics operation. The highest percentage which is 31.6% show that respondent vote for a little and somewhat. 21.1% of the respondent, which is four people, are voting for pretty much and 15.8% (thereof the respondent) votes for very much.

V. CONCLUSIONS

Fun-Math App provides a mobile application that enables users to immerse themselves in a learning environment anywhere and anytime. On top of that, it helps the user to understand the basic operation and counting by following thirty different questions that have been integrated into the application. During the testing, this application can perform the activity as expected without any bug and error. Moreover, users can handle the application without any problem as the interfaces are easy to use and learn. As the result of users' evaluation, Fun-Math App can inspire and motivate users to learn the basic operation and counting via smartphone as long it has Android Operating System. For future work, more operations or categories should be added to the application so that it can be used by different ages of users.

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