

ANDROID-BASED LINUS NUMERACY MODULE FOR PRIMARY SCHOOL

H. M. Ekhsan*, J. N. Hamid and A. H. M. Raffi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Arau, Perlis,
Malaysia

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ABSTRACT

LINUS is an abbreviation for Literacy and Numeracy Screening with the objective to ensure that all Year 1 students master the basic of reading, writing and calculating at the end of their Year 3 in primary school. In this study, a mobile application has been developed to serve primary school students as a place to do revision, learn strategies to answer questions, and answer sample questions for each topic in numeracy module of LINUS. The purpose of this study is to provide a better approach to learning numeracy module since it includes interactive and attractive interfaces to engage students to the module. It also evaluates the effectiveness of the application in preparing students for LINUS. The results from user acceptance testing show that this application gives a lot of benefits to students who are weak in numeracy and can increase the students' interest in learning numeracy module for LINUS.

Keywords: Android, LINUS, numeracy, primary school.

Author Correspondence, e-mail: hawame@perlis.uitm.edu.my

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1. INTRODUCTION

LINUS is carried out twice a year for students in Year 1 until Year 3 in Malaysia. The aim of this screening is to ensure that students master the literacy and numeracy skills at the end of their Year 3. Numeracy is the basic mathematical operations that are formulated specifically to



address the problems faced by students in mastering the skills of counting as well as to understand the basic of mathematics and to apply the knowledge and skills in daily life.

Generally, most children with mathematics difficulties show weaknesses in memory and application of arithmetic facts. Weak cognitive skills and lack of motivation have become the factors of disability in numeracy among students[1]. Most of the students would easily forget what they had learnt. They are desperately in need of a more effective tutoring from their teachers. On the other hand, the challenges that faced by the teachers are time constraint, students' disciplinary problem and lack of developmentally appropriate instructional strategies [2]. Moreover, solely depending on the learning materials is not sufficient as a child will easily get bored and have low interest to continue with the learning process.

Teachers in schools are aware of the limited teaching time [3] and the challenges faced by them related to teaching and learning strategies to convey knowledge and information to students. Teachers need to be more effective in acquiring new knowledge or skills in their work, developing ideas and increasing their understanding on the suitable teaching and learning approach[1].

Competency in mathematics is an important skill to every individual today. Failure to master the basic mathematical concepts will affect the ability to obtain mathematical skills at a higher level [4]. In addition, the inability to understand and learn mathematical concepts at early level also affects the interest and confidence in learning new mathematical knowledge.

Students who have difficulties in basic mathematics skills and concepts will have problems in the fluency of a combination of basic arithmetic. Generally, most children who experience mathematical problems demonstrate weakness in memorization and application of arithmetic facts [5]. This demonstrates that remembering numbers is the most common difficulty in arithmetic.

Thus, this study focuses on the development of Android-based mobile application to assist students in learning numeracy module as preparation for LINUS. The content of this application follows the guidelines that have been set by the Ministry of Education (MOE) to provide enough experience for students to build a strong foundation in computation and to enable them to participate in the learning in a more meaningful and effective way.

Nowadays, mobile applications are widely used in many fields such as education[6-8],

medical [9-10], entertainment [11] and many more. The use of mobile application in education changes the learning practices[12]while its usage in medical healthcare focuses on the availability of e-health application and medical information that can be accessed anywhere and anytime.

Android technology allows users to communicate with anyone at any time and place almost instantly across many obstacles. One of the main reasons for the widespread adoption of Android mobile market is that the mobile applications developed through the development of Android technology is more efficient and effective than other technologies that are producing fast, user-friendly and attractive applications. The distribution is also more flexible in the application of Android development.

2. MOBILE APPLICATION DESIGN AND CONSTRUCTION

The designing process of this application includes storyboarding and creating the interface of the application. Designing is very important before the development of a new mobile application can start.

A storyboard is illustrations or images displayed in sequence to present and explain in writing, the interactive events as well as the audio and motion, especially on user interfaces. One advantage of using storyboards is to allow users to make any changes in the storyline. For this project, the storyboard has been sketched on a paper that has a wire frame for mobile template. The development involves software such as Balsamiq Mockup and Android Studio. Balsamiq Mockup is a wireframing tool that can help designers to do their work quickly and easily. Balsamiq Mockup is a user interface builder application graphics that reproduces the experience of sketches on the board. Designers only need to use the editor's existing drag-and-drop function to design the mobile app.

Android Studio is an IDE official from Google that covers all the requirements to build applications, including code editor, emulator and supports all the latest and greatest APIs. It also provides a standard built virtual machine for the application to run between the code and the operating system. Figure 1 shows the outcome for each stage in the application development.

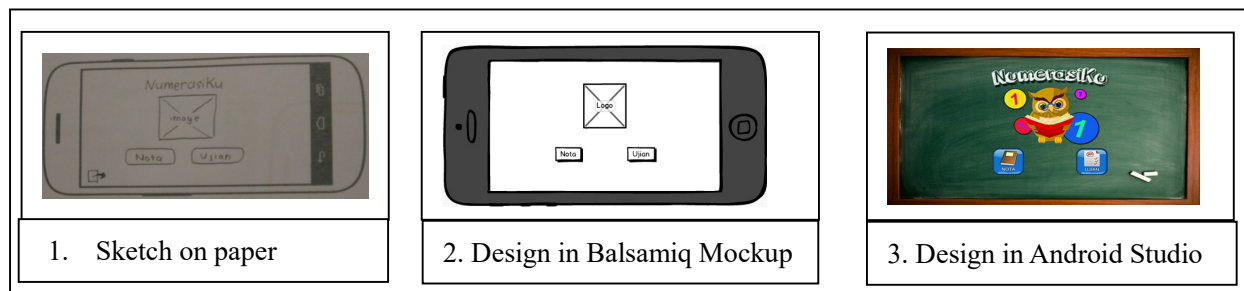


Fig.1. The outcome of each stage of development

Since this application is aimed to provide more attractive interfaces, the use of multimedia elements is taken into consideration. Multimedia elements can increase the attractiveness of information conveyed to the audience [13]. The use of multimedia elements in mobile application helps in enhancing the performance of the children during the learning process. In addition, in [14] stated that multimedia eases a learning process and makes users especially children achieve the learning goals in a short time as compared to the use of traditional learning methods.

This application includes multimedia elements such as audio, images, texts and animations. The use of child-friendly images and interesting characters with special effects that do not distract the children’s attention are also used in this application. The use of suitable fonts is also important so that the children can easily read the text in the application.

Figure 2 presents some of the interfaces that have been developed for this application. The use of suitable and attractive fonts, colours, audios and animations are included in the interfaces.



Fig.2. Some of the application interfaces

The application consists of 2 submodules; Learning and Exercise. Students can choose either Learning submodule or Exercise submodule as shown in Figure 3. In Learning submodule,

students learn the numeracy basics with guided audio instructions. After completing the Learning submodule, they can answer the exercises provided and each correct answer is given 1 point. The total marks will be displayed at the end of the exercise.

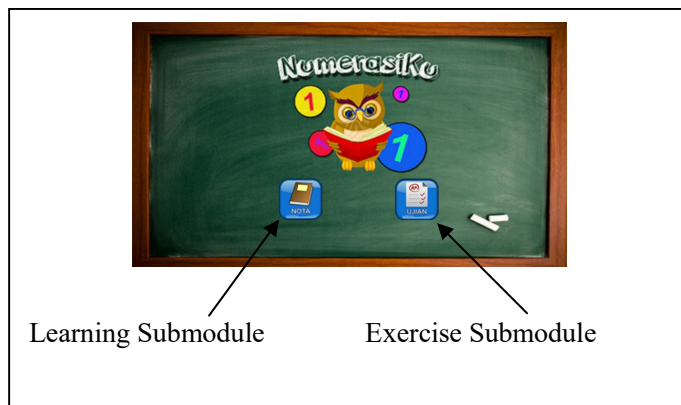


Fig.3. Main submodule of the application

In Learning Submodule, students can choose the desired unit as indicated in Figure 4(a). There are 13 units available in the application and each unit has its own learning goals as represented by Figure 4(b). Students will learn that particular unit until they complete all the lessons. They may proceed with the next unit of lesson or answer the Exercise Submodule.

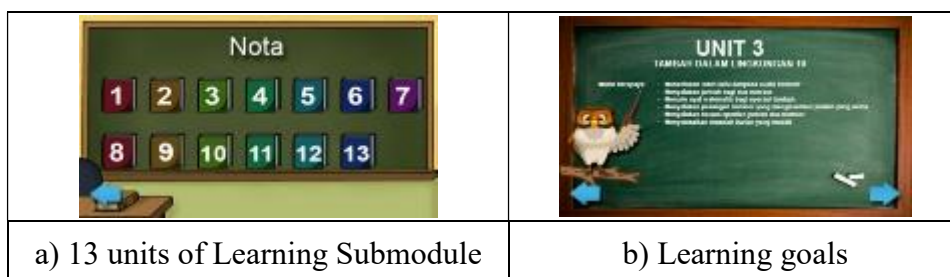


Fig.4. The lesson units and its learning goals

Figure 5 shows some of the lessons with variety of interface designs and learning approaches. Each lesson is provided with voice instructions to help the students to understand the lessons and guide them to explore the whole application.



Fig.5. Some the contents in Learning Submodule

In Exercise Submodule, there are two types of user input either fill in the blank or checkbox. Students can easily answer all the questions with the help of voice instructions and simple interface designs. Figure 6 illustrates the contents of Exercise Submodule.

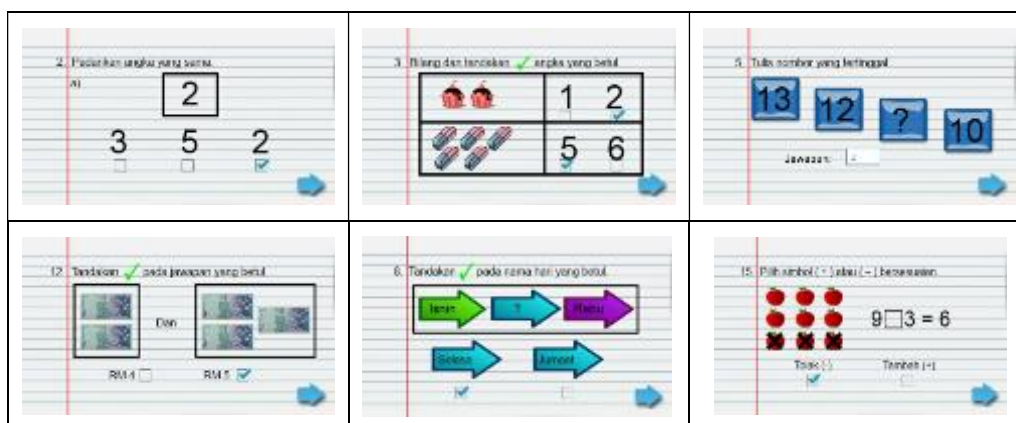


Fig.6. Some the contents in Exercise Submodule

3. RESULTS AND DISCUSSION

User Acceptance Test is a simple way to see how the proposed mobile application meets the actual user requirements and needs. This testing has been carried out with 20 students, and 10 teachers at three primary schools in Arau, Perlis. The testing was also conducted with five lecturers of Universiti Teknologi MARA, Perlis Branch as the experts in order to get their feedbacks on the application. A questionnaire was prepared and needs to be answered by the users after they use the application. In this questionnaire, a Likert scale is used as measurement criteria as stated in Table 1.

Table 1. Measurement criteria scale

Scale	Description
1	Strongly Disagree
2	Disagree
3	Moderate
4	Agree
5	Strongly Agree

User Acceptance Test is performed to identify problems faced by users on the interface, contents, functions, and elements included in the application. The questionnaire consists of four criteria of mobile application to be tested namely Content, Functionality, Interface and Multimedia Element. Table 2 shows the mean score for each criterion tested in the questionnaire.

Table 2. Mean score for each criterion

Criteria	Mean Score
Content	4.5
Functionality	4.2
Interface	4.8
Multimedia Element	4.8

According to the results as indicated in Table 2, the respondents agreed that the content of this application is very useful and can assist the students to learn numeracy module. They also agreed that they can use the application without written instructions and the language used is easy to understand. In terms of the functionality, a majority of them (80%) agreed that they can understand the function of each button and menu available in each interface.

The respondents hold strong views either in 'agreed' or 'strongly agreed' that the interfaces are attractive, well organized and the buttons are easy to find. Furthermore, 80% of the respondents approved that the multimedia elements in the application are sufficient and suitable with the students' level.

Besides that, respondents were also asked about their overall feedbacks of the application in terms of overall impression and whether they enjoy using the application. As depicted in

Figure 4, more than 80% of the respondents agreed that the application is easy to use, enjoyable and their overall impression suggest that this mobile application can be useful to attract and engage students in learning numeracy module as their preparation for LINUS.

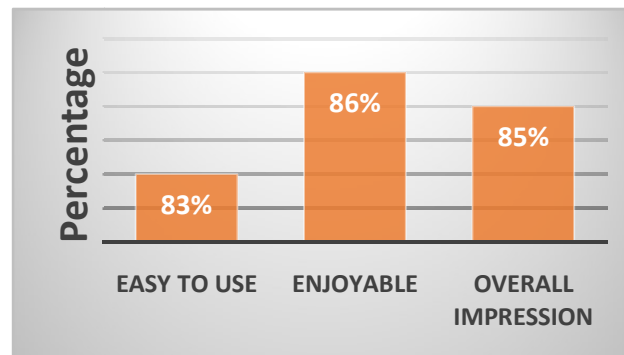


Fig.4. The overall feedback

Unexpectedly, all respondents (100%) strongly agreed that the reward system used in this application can increase students' engagement with the module. The reward system in this application can be seen when students answer the "Exercise" submodule. Students are more inclined to complete the exercises and this situation can motivate students to spend more time to the application.

4. CONCLUSION

The application that has been developed can be used as an assistive tool for primary school students to do revision and learn basic mathematics as a preparation for LINUS. The interfaces that applied multimedia elements with suitable interactivity can encourage and engage students to learn mathematics in an effective way. Uniquely, this application can be used at anytime and the students can study as per their convenience. Therefore, this mobile application has great potential to be a more innovative educational approach for students to learn numeracy module.

For future works, this application can be integrated with elements of gamification technique in order to enhance its effectiveness. It is hoped by applying the gamification technique, students will experience the sense of achievement, encourage and engage them to progress through the lessons that lead to a successful learning outcome.

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