EFFECTIVENESS STUDY ON MULTIMEDIA MOBILE APPLICATION FOR CHILDREN: MFOLKTALES

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ABSTRACT

Mobile application has been used widely among children as a supplement for learning purposes. These handheld technologies such as smart phone and tablet have been chosen as they are easy to carry anywhere and anytime and easy to get as they are become cheaper nowadays. Following from that, a mobile application called MFolktales have been designed and developed for children to promote Malay folktales to the new generation as Malay folktales became extinct and almost forgotten. This paper discusses the effectiveness testing for MFolktales application to measure effectiveness level in students' comprehension performance after using the MFolktales mobile application. In the other hand, the study also conducted to evaluate the hypotheses to summarize the relationship between the samples that have been used in the testing. The testing was conducted among 90 students aged 5 and 6 years old which then divided into three groups which are control group (CG), experimental group 1 (EG_1) and experimental group 2 (EG_2). CG and EG_1 are control groups while EG_2 is experimental group. Result from the post-test show that, there is a significant difference between the post-test means scores of the students in CG, EG_1 and EG_2. Results also show that, there is a significant difference between the mean scores for the students in CG, EG_1 and EG_2. Thus, MFolktales application can be considered as effective.

Keywords: *Multimedia Mobile Application, Human Computer And Interaction, Quasi Experiment, Education, Malay Folktales*

1. INTRODUCTION

Multimedia courseware is a learning method that people can use as an alternative tool in the teaching and learning process. Nowadays, multimedia courseware is also available in mobile applications so users can use it through devices such as smart phone and tablet. There are 5 billion people around the world using mobile phones. It is staggering figure. A new category of mobile phone is rapidly growing like smart phones and tablets. The use of devices like iPad and tablets is popular among children. Researchers [1], [2] state that we are now entering a new era of technology-enhanced learning, characterized as mobile learning. Mobile technology is hand-held compared to PC and laptop. Handheld technologies like smart phones and tablets allow and support children's engagement in various activities and contexts [3]. Besides, studies from [3] and [4] show that the use of iPad and tablets can stimulate children's motivation and concentration.

This paper presents the effectiveness testing on Malay folktales mobile application for children in term of their performance before and after get the treatment. The testing was aimed to evaluate the usefulness and effectiveness of the application towards students. The prototype was tested on 90 students for effectiveness testing. The present paper contains seven sections which are: Section 2 discusses previous researches and studies on mobile application for children that have been studied, Section 3 presents the MFolktales mobile application, Section 4 elaborates the methodology used for this study, Section 5 indicates the results

and discussions, while Section 6 and Section 7 establish the conclusion and future work that can take guidance from this study.

2. BACKGROUND OF STUDY

This section discusses six multimedia mobile applications that have been studied. Table 1 presents some of the previous researches and studies that have been done by others. The table presents the mobile applications that have been designed and developed for children's education including storytelling, language learning, and learning basic alphabets. The studied applications are StoryRooms: Interactive Storytelling Spaces for Children, A Digital Storytelling Tool for Arab Children, A Mobile-based Multimedia System for Learning Japanese, StoryKit – A Mobile Storytelling, Belajar Bersama Dino, and I-MMAPS for Learning Iban Language.

Based on the six discussed application above, it summarizes the significances of the mobile application towards end users. Most of them give positive feedback and the applications meet the purpose of the development. The studies also prove that there are improvements in user's performance before and after using the applications. These facts support that the objectives of the developing the mobile application is to attract the users so that they can enjoy playing with the application and at the same time can motivate the users. There must have significant different between the control group and the experimental group in the testing to measure the effectiveness of the mobile application towards the end users. If there is significant different between both groups, the application can be considered as effective.

3. MFOLKTALES MOBILE APPLICATION

Malay folktale story like *Pak Pandir dan Mak Andeh, Bawang Putih dan Bawang Merah* and many more are become extinct and forgotten among young generation [5], [6]. Although Malaysia has a wide variety of folktales, children's knowledge about local folktales are less compared to foreign folktales. Until this moment, not much Malay folktales animation mobile application was developed and published in the market, as well as the application for tablet. In the research area, mostly researchers proposed the conceptual model as a guideline to develop the courseware or mobile application. They validated it through usability and effectiveness testing where the results from the testing proved that the courseware and application were ease of use and effective. Yet, they don't

validate the conceptual model itself [7]–[9]. However, for this research, the proposed conceptual model has been validated before proceed to the development process.

Before proceed to development phase, a study was done among 394 children aged from 9 to 11 years old to investigate the preferred operating system for MFolktales application. The investigation is based on Android (Google), iOS (Apple) and others (Microsoft Windows and BlackBerry). Summary from Table 2 shows that Android has become the preferred operating system of smartphone and tablet for children application. Thus, MFolktales application has been developed using Android operating system. Besides that, the survey also investigated the children's exposure to Malay folktales. The result shows a comparison between children who are exposed to local folktales and foreign folktales. The analysis also shows that the children would love to watch Malay folktales through smart phone and tablet [6].

Table 2: Results From The Survey On Preferred Mobile Operating System

Age	Android	iOS	Others
9	89	63	0
10	66	25	5
11	105	32	9
Total	260	120	14

MFolktales mobile application is an Android-based application that can be downloaded for free from Google Play. MFolktales application was developed based on the validated conceptual model called MobChild proposed by [10]. The validation was used to see the correlation between the elements included in the conceptual model. The conceptual model contains the elements that need to be fulfilled in the process of development of application. The elements include mobile apps technology, layout, content, navigation, touch gesture, learning theory, scaffolding and user. MFolktales contains an animation story module followed by four (4) games modules which are: (i) Recognize Character Module, (ii) Picture Rearrangement Module, (iii) Mind Test Module, and (iv) Moral Value Module. The screenshot for Animation modules is show in Figure 1 while screenshot of interface for the rest four modules is shown in Figure 2. All these activity modules are intended to test and strengthen the comprehension skills among users through the message delivered in the animation story [11]. A survey was done in analysis phase to determine the popular genre of

Malay folk stories among children. From several of popular stories, animal genre was chosen and as a result, "*Sang Arnab dan Sang Kura-Kura Berlumba Lari*" was selected. The content of the story was taken from a storybook and then the story was digitized and developed using 2D animation.

No.	Application	Platform	Significant of Study
1	StoryRooms [12]	Android	StoryRooms is a mobile application for children to share their experience through storytelling spaces with other children. There are positive feedbacks from the testing and the children enjoy playing with the application but the application was not-portable.
2	A Digital Storytelling Tool for Arab Children [13]	iOS	This application is designed to improve the communication skills among Arab children aged between 4 and 5 years old. The application is act as a storytelling tool to help the guidance of these children evaluate communication skills.
3	A Mobile based Multimedia System for Learning Japanese [14]	iOS	This application is designed to help children learn Japanese language through multimedia elements such as animation, simulation, audio and video. This application emphasis daily life conversation like speaking and listening. Results from the testing showed that this application can improve children's performance before and after the treatment.
4	StoryKit – A Mobile Storytelling [15]	iOS	A mobile application where the children can use their imagination to create or modify the stories using the elements of multimedia such as text, graphics and audio. The children seem excited to use the application and the testing results showed that this application can improve social skills among children.
5	Belajar Bersama Dino [16]	Android	This android based mobile application is designed for primary school children to help children understand basic alphabets and spelling. The outcome from the research showed that children become motivated and eager to use the application and the application can improve basic numbering knowledge among the children.
6	I-MMAPS for Learning Iban Language [17]	Android	Designed and developed for learning Iban language by implementing conversational method and constructivism learning theory. The users can learn the language in various environment and situations. The results from the testing showed that most of the respondents feel happy when using the application. The results also showed that user's performance is improved before and after using the application.

Several testing was conducted in the implementation stage. In order to make sure the courseware is free from interface and design problems, as well as suitable for the target users, a heuristic evaluation has been carried out, which comprises of a questionnaire distributed to five

animators and five Malay language primary school's teachers. There were 14 heuristics and 69 subheuristics included in the questionnaire, where eight heuristics were used for the animators and six heuristics were used for the teachers. The results of this study showed the acceptance is high for both groups of experts. The results also showed that there were several comments and feedback from the experts that would be considered. In addition, there are needs for some modification on the courseware, and the courseware suitability has been identified through this study [18].

Besides that, a usability testing was done among 10 teachers and 43 parents to evaluate the usability of MFolktales mobile application [19]. The outcome from usability testing gained positive feedback from the respondents. MFolktales is a mobile application prototype designed and developed for children. The main objective of this application is to promote Malay folktales to the new generation in order to preserve the Malay folktales for future generations. At the same time, MFolktales can also help in popularizing folk stories besides inculcating good reading habit among children.

Figure 1: Screenshot of Animation Module.

Figure 2: Several Screenshot Of Mfolktales Application.

4. METHODOLOGY

4.1 Objectives

In general, the objective of this paper is to evaluate the effectiveness of MFolktales mobile application for children's education. Pre-test was conducted to evaluate the level of existing knowledge that respondents acquired before getting any treatment while post-test was conducted to identify significant difference between two different groups of participants after undergoing a particular treatment. In the other hands, the objective of this paper also to evaluate the hypotheses to summarize the relationship between the samples that have been used in the testing.

4.2 Effectiveness Testing

The effectiveness testing was conducted to measure effectiveness level in students' comprehension performance after using the MFolktales mobile application. This testing used a quasi- experimental, pre-test/post-test control group design [20]. The pre-test and post-test testing was done to observe the children's performance before and after using MFolktales application as compared to conventional practices like storybooks. Effectiveness testing used Quasi Experimental Design involved three groups of respondents: (i) control group (CG), (ii) experimental group 1 (EG_1), and (ii) experimental group 2 (EG_2). Randomly 90 kindergarten students aged between 5 and 6 years old were selected from KEMAS (Community Development Department) Perak, Malaysia involved in the testing. Students in EG_1 and EG_1 have experience using smart phone and tablet. Table 3 shows the sample number involved in the effectiveness testing while Figure 3 shows the students involved during the testing.
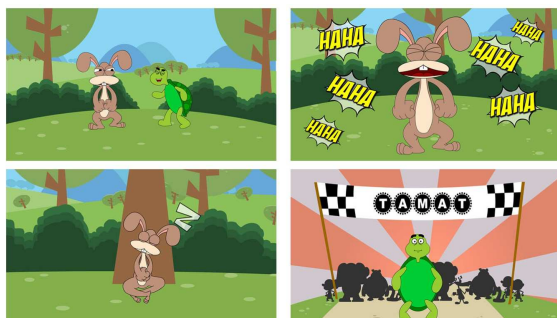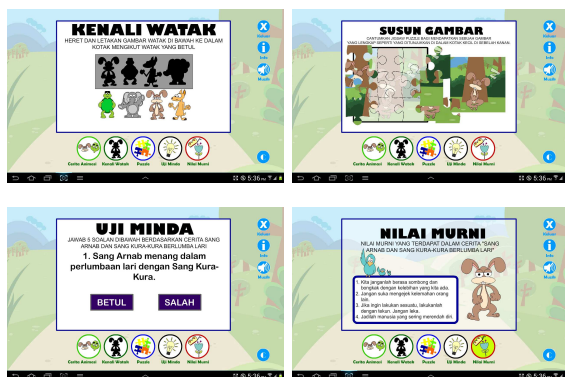
Table 3: Sample Number Of Effectiveness Testing.

Group	Number of students (N)
Control group (CG)	30
Experimental group 1 (EG_1)	30
Experimental group 2 (EG_2)	30

Figure 3: Students during effectiveness testing.

As mentioned, the students are divided into three groups, which are control group (CG), experimental group 1 (EG$_1$) and experimental group 2 (EG$_2$). The objective of conducting the pre-test of Quasi experiment is to evaluate the level of existing knowledge that respondents acquired before getting any treatment as the preparation for post-test. During pre-test evaluation, a story about "*Sang Arnab dan Sang Kura-Kura Berlumba Lari*" was delivered to all groups of students through conventional method using storybook. A teacher was assigned as a storyteller and the students listened to the teacher about the story. Then, all groups of students were asked to answer a set of comprehension questions with assistance from a

teacher. The marks from the questions were then recorded.

After conducting the pre-test, the preparation for post-test was made. The objective of conducting post-test Quasi experiment is to identify significant difference between two different groups of participants after undergoing a particular treatment. Again, students in CG went through the same activity as in the pre-test. Students in EG$_1$ were given a mobile application called MFolktales v1. In general, the application provides the same Malay folktale story which is presented in the mobile application. However, MFolktales v1 only displays the story as a digital storybook and the students need to read the story like a hardcopy storybook. There is only narration but no animation included in the application. Interactives games are also not included in that version of the application. The students are given the freedom to play with the application for 20 minutes. Students in this group have experience using smart phone and tablets. Last but not least, the students in EG$_2$ were given the freedom to play with the MFolktales mobile application for 20 minutes. Students in this group also have experience using smart phone and tablets. After that, the students in all groups were asked to answer the same questions as pre-test, but with different order. The teacher was given some cash reward and all the students were given compensation in the form of a goody bag containing sweets and handmade bookmark. The result of the effectiveness testing will also be discussed in the next section.

Hypotheses evaluation was applied to summarize the relationship between the samples that have been used in the testing. For evaluating the hypotheses, one-way analysis of variance (ANOVA) had been applied [21]. The calculation of one-way ANOVA produced α value. If the calculated α is higher than 0.05, the null hypothesis is accepted [22]. Meanwhile, if the calculated α value is lesser than 0.05, the null hypothesis is rejected [22]. Some previous studies [23], [24] also use ANOVA to evaluate the hypotheses in their study.

Three null hypotheses had been constructed:

1. *Hypothesis (H$_0$1) – There is no significant difference between the pre-test mean scores of the students in control group (CG), experimental group 1 (EG$_1$) and experimental group 2 (EG$_2$).*

2. *Hypothesis (H$_0$2) – There is no significant difference between the post-test mean scores of the students in control group*

(CG), experimental group 1 (EG$_1$) and experimental group 2 (EG$_2$).

3. *Hypothesis (H$_0$3) – There is no significant difference between the mean of increment marks of the students in control group (CG), experimental group 1 (EG$_1$) and experimental group 2 (EG$_2$).*

5. RESULTS AND DISCUSSIONS

5.1 Pre-test Results

As mentioned above, Quasi experiment had been designed to include pre-test and post-test on the selected samples. Table 4 shows the descriptive analysis of pre-test scores for CG, EG$_1$ and EG$_2$. Based on Table 4, students in EG$_2$ obtained slightly better mean score as compared to the students in CG and EG$_1$ with small difference. Apart from pre-test evaluation, hypothesis testing to evaluate the level of existing students' knowledge has been performed. The variables were tested to examine whether the relationship that had been stated is, in fact, true. The null hyopthesis is:

Hypothesis (H$_0$1) – There is no significant difference between the pre-test mean scores of the students in control group (CG), experimental group 1 (EG$_1$) and experimental group 2 (EG$_2$).

Table 4: Descriptive analysis of pre-test scores.

Group	CG		EG$_1$		EG$_2$	
Age	N=30	Mean score	N=30	Mean score	N=30	Mean score
5 years old	7	4.71	5	3.60	9	5.44
6 years old	23	4.57	25	5.16	21	5.05
Mean	4.64		4.38		5.25	

In evaluating the hyphotesis (H$_0$1), one-way ANOVA had been performed to analyse the significant difference of all groups. According to Sekaran & Bougie (2010) and Coakes & Ong (2011), the *p* value (Sig.) determine the acceptance or rejection of the hypothesis. In the case of the presented result in Table 5, the *p* value is 0.134, which is greater than α value 0.05.

Therefore, the null hypothesis (H$_0$1) is accepted. Thus, it could be concluded that there is no significant difference between the pre-test mean scores of the students in CG, EG$_1$ and EG$_2$. The findings of this evaluation indicated that the same

level of knowledge was acquired by the students in all three groups. This finding also fulfills the aim of conducting pre-test where students in all groups should have similar level of knowledge.

Table 5: One-way ANOVA result for pre-test.

	Sum of Squares	df	Mean Square	F	Sig. *p* value
Between Groups	4.822	2	2.411	2.055	.134
Within Groups	102.067	87	1.173		
Total	106.889	89			

5.2 Post-test Results

The purpose of conducting the post-test of Quasi experiment is to identify the significant difference between two different groups of students after undergoing a particular treatment. Table 6 shows the descriptive analysis of post-test scores for CG, EG$_1$ and EG$_2$. Based on Table 6, students in EG$_2$ obtained better mean scores as compared to the students in CG and EG$_1$. In making the conclusion on the difference between the effect of using MFolktales mobile application and traditional learning approach, hypothesis evaluation was considered.

Table 6: Descriptive analysis of post-test scores.

Group	CG		EG$_1$		EG$_2$	
Age	N=30	Mean score	N=30	Mean score	N=30	Mean score
5 years old	7	4.29	5	7.60	9	8.89
6 years old	23	5.30	25	7.32	21	9.43
Mean	4.80		7.46		9.16	

Similar to pre-test evaluation, hypothesis testing had been conducted to compare students' performance for all groups after getting the treatment. The null hypothesis is:

Hypothesis (H$_0$2) – There is no significant difference between the post-test mean scores of the students in control group (CG), experimental group 1 (EG$_1$) and experimental group 2 (EG$_2$).

In evaluating the hypothesis (H$_0$2), one-way ANOVA had been performed to analyse the

significant difference between the groups. In Table 7, the *p* value is 0.000, which is lesser than α value 0.05. Therefore, the null hypothesis ($H_0 2$) is rejected. Thus, it could be concluded that there is a significant difference between the post-test means scores of the students in CG, EG_1 and EG_2. The findings of this evaluation indicated that different levels of knowledge were acquired by the students from all three groups. One of the three groups obtained the highest mean scores as compared to other groups.

Table 7: One-way ANOVA result for post-test.

	Sum of Squares	df	Mean Square	F	Sig. *p* value
Between Groups	265.400	2	132.700		
Within Groups	52.700	87	.606	219.068	.000
Total	318.100	89			

5.1 Increment Evaluation

The purpose of conducting the increment analysis is to identify significant improvement that had been achieved by students in all groups from pre-test to post-test result. Table 8 shows the descriptive analysis of increment result for CG, EG_1 and EG_2. Based on Table 8, all groups obtained a positive improvement in mean scores. However, EG_2 group obtained positive improvement compared to other two groups CG and EG_1.

Table 8: Descriptive analysis of increment result.

Group	CG		EG_1		EG_2	
Age	N=30	Mean score	N=30	Mean score	N=30	Mean score
5 years old	7	-0.43	5	4.00	9	3.44
6 years old	23	0.74	25	2.16	21	4.38
Mean	0.16		3.08		3.91	

Similar to pre-test and post-test evaluation, hyphotesis evaluation had been conducted to compare significant improvement of all groups after getting the treatment. The null hyphotesis is:

Hypothesis ($H_0 3$) – There is no significant difference between the mean of increment marks of the students in control group (CG), experimental group 1 (EG_1) and experimental group 2 (EG_2).

Table 9 shows that the *p* value is 0.000, which is lesser than 0.05. Therefore, the null hyphotesis ($H_0 3$) is rejected. Thus, it could be concluded that there is a significant difference between the mean scores for the students in CG, EG_1 and EG_2. The findings of this evaluation indicated that different levels of mean were obtained by the students from all three groups. One of the three groups obtained the highest increment of mean scores as compared to other groups.

Table 9: One-way ANOVA result for increment evaluation.

	Sum of Squares	df	Mean Square	F	Sig. *p* value
Between Groups	238.467	2	119.233		
Within Groups	87.933	87	1.011	117.968	.000
Total	326.400	89			

6. CONCLUSION

In general, the MFolktales mobile application was developed based on the proposed conceptual model that has been validated to see the correlation between the elements included in the model. Based on the validated conceptual model, MFolktales mobile application has been successfully design and developed. MFolktales mobile application was developed to promote Malay folktales among young generation and at the same time can inculcate children a good reading habit.

As a conclusion, this paper presented the effectiveness testing for MFolktales mobile application. This testing is conducted to observe the application's performance among children before and after using the mobile application. 90 children were divided into three groups. Quasi experimental design was used to evaluate the pre-test and post-test results while ANOVA was used to evaluate the hypotheses. The results from the testing shows that: (i) there is no significant difference between the pre-test mean scores of the students in CG, EG_1 and EG_2, (ii) there is a significant difference between the mean scores for the students in CG, EG_1 and EG_2, and (iii) there is a significant difference between the mean scores for the students in CG, EG_1 and EG_2. The result for effectiveness testing

proves that MFolktales mobile application is an effective tool for students to improve their knowledge about Malay folktale story delivered through the application where the students who utilised the application obtained better marks as compared to the students who did not.

7. FUTURE WORK

As for future work, a user experience testing will be conducted to access the children's experience after using the mobile application. The prototype will be tested on 15 kindergarten male and female students from KEMAS (Community Development Department) Perak, Malaysia. The prototype will be shown to the students and the students' feeling and experience about the application will be observed during the test. A set of user experience questionnaire will be given to the teacher and she will fill in the questionnaire based on the students' perceptions and answers. The objectives of the testing are to measure the significance and impact of the MFolktales mobile application towards end users as well as to measure the Cronbach Alpha-Coefficient and benchmark quality relative to other products.

8. ACKNOWLEDGEMENTS

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