Multimedia Mobile Learning Application for Children's Education: The Development of MFolktales

Norshahila Ibrahim[1], Wan Fatimah Wan Ahmad[1] & A'fza Shafie[2]

[1] Department of Computer and Information Sciences, Universiti Teknologi PETRONAS, 32610 Bandar Seri Iskandar, Perak, Malaysia

[2] Department of Fundamental & Applied Sciences, Universiti Teknologi PETRONAS, 32610 Bandar Seri Iskandar, Perak, Malaysia

Correspondence: Norshahila Ibrahim, Department of Computer and Information Sciences, Universiti Teknologi PETRONAS, 32610 Bandar Seri Iskandar, Perak, Malaysia. E-mail: shahilaibrahim@gmail.com

Abstract

Children learn from what they see and hear. One of the attractive applications is animation story and these children are exposed to various types of animation story. However, not all animation stories presented are suitable for children's education in terms of exaggeration elements applied in animation. Furthermore, the existence of mobile application does not emphasize the touch gesture that is suitable for children's age. Hence, there is a lack of mobile learning applications with education-oriented environment for children's education. Therefore, there is a need for research to develop a well-designed mobile application with suitable exaggeration elements together with good story plots and socio-cultural values to educate as well entertain children. This paper discusses the design and development of Malay folktales mobile application called MFolktales based on a local Malay folktale story. MFolktales is an Android-based application and it was developed based on the validated conceptual model as well as analyzed and defined design principles and requirements. This paper presents the development process of MFolktales application. The development life cycle was adopted from ADDIE Instructional Design (ID) model, taking into consideration the animation development process of pre-production, production, and post-production. Overall, there are five phases involved in the development life cycle: analysis, design, development, implementation and evaluation. The application was tested to strengthen its functionality and usability. The result shows that MFolktales application is ready to be tested to real users and ready to be commercialized.

Keywords: Child-Computer Interaction, education, mobile application, folktales, Instructional Design

1. Introduction

Developing multimedia application for children's education has become popular today. There are many advantages offered by the application itself. The advantages include improving the children's learning performance (Bonsignore, Quinn, Druin, & Bederson, 2013; Chachil, Engkamat, Sarkawi, & Shuib, 2015; Yahaya & Salam, 2014), reducing the formality in learning process (Attewell, 2005), improving children's development of fundamental arithmetic skills (Barendregt, Lindström, Rietz-Leppänen, Holgersson, & Ottosson, 2012), developing the communication skills of disabled children (Tang, Jheng, Chien, Lin, & Chen, 2013) and many more. The assimilation of the multimedia application and the learning activities increases children's interest during the learning process due to its success in attracting children's attention with the multimedia elements included in the application. In addition, there are a lot of studies that proved that by adopting the right and suitable learning theories into multimedia application, children will be able to learn more effectively (Kittidachanupap, Singthongchai, Naenudorn, Khopolklang, & Niwattanakul, 2012; Muda, 2006; Nusir, Alsmadi, Al-Kabi, & Shardqah, 2011). As for multimedia mobile application, the learning theories that could be implemented include the cognitive, social, sensory stimulation theory, affective and psychomotor.

Using mobile device as a learning tool is a new way for learners to learn anywhere and anytime they like. Moreover, an application that contains multimedia elements such as animation, graphic and video encourages parents to attract the attention of their children with it. The use of devices like smartphones and tablets can facilitate the children to learn. There are many studies that proved that there are improvements in terms of

children performance before and after they used the multimedia mobile application as a learning tool. In designing the multimedia mobile application, children have their own behavioural characteristic and cognitive limitations which must be analysed in light of the fact that children are different from adults in terms of motor skills and holistic development. (Ni & Yu, 2015) did a comprehensive analysis of the existing domestic and foreign educational applications. The results show that early childhood educational goals can be categorized into three major areas: cognition, emotion, and action skills. These three areas can be seen to cover the following: language information, intellectual skills, cognitive strategy, attitude, emotion, and action skills.

Children are exposed to handheld technology or devices like smartphones and tablets and their interaction with these devices are increasing since the devices are becoming cheaper and easily obtained. Children are starting to use touch screen devices at a very young age and they have become comfortable with touch screen technology. Although they do not have their own smartphone or tablet, they can easily use their parents' smartphone or tablet. The ways children interact with touch screen devices are also different from adults. Most touch screen devices are not designed to be user-specific and they are often too difficult for children to handle. Studies from (Aziz, 2013) and (Aziz, Batmaz, Stonde, & Chung, 2013) showed that there are seven common gestures that are used for touch screen and interactive surfaces that are always used by children in applications, which are tap, drag-and-drop, slide, pinch, spread and rotate. The studies also showed that children aged 6 years old are able to use all the gestures and have no problem in using a lot of gestures on one interface. (Ibharim, Borhan, & Maizatul H.M. Yatim, 2013) investigated the knowledge and skills that children have with touch screen. The study showed that children enjoy using touch screen technology. The study also clarifies what gestures were hard for children that should be left out, like rotating. (Anthony, Brown, Nias, Tate, & Mohan, 2012) described and investigated the challenges in interpreting gestures on touch screen devices. Children need larger 'touch target' than adults do and children need a target group-specific gesture recognizer in order to recognize their input better. By identifying the limitation, a multimedia application for children's education must be developed according to the requirements that can fit the children's cognitive limitation and touch gestures that are suitable with children with integration with learning theories. Thus, for the purpose of this study, which is to develop a multimedia application for children's education, some examples of the existing multimedia applications are studied in terms of their strengths and weaknesses.

Hence, the aim of this paper is to design and develop a Malay folktale multimedia mobile application (MFolktales) based on a local Malay folktale story for children's education. The application was developed based on the proposed conceptual model by (Ibrahim, Ahmad, & Shafie, 2013), and the development methodology process is described in this paper. The remainder of this paper is organized as follows: Section 2 discusses the development of MFolktales application while Section 3 presents the conclusion of the study and future work.

2. Development of MFolktales Application

Development of mobile application is not easy, where even a detailed and systematic planning is needed so that the application is developed in line with the target users and meets the goals to be achieved. Therefore, the development life cycle model has been developed for MFolktales application prototype as a guideline for the development of the content for mobile application for children's education. The development life cycle was adopted from ADDIE Instructional Design (ID) model, taking into consideration the animation development process of pre-production, production, and post-production. Overall, there are five phases involved in the development life cycle: analysis, design, development, implementation and evaluation. Figure 1 presents the MFolktales development life cycle.

2.1 Analysis

Analysis is the most crucial phase in this process. Basically, there are two stages of preliminary study that have been done in the analysis phase. Firstly, in preliminary study, problems regarding multimedia mobile application and Malay folktales were identified in literature review and surveyed to list down all the choices of solutions for the problems. Learning theories, guidelines and animation principle were analysed in this phase. All the elements identified were implemented in the design of the prototype application (Ibrahim, Ahmad, & Shafie, 2015). As presented in Table 1 and Table 2, the learning theories and user interface principles that are implemented in the MFolktales are described.

In the second preliminary study, in order to determine the level of exposure among children on folktales, a survey was conducted on 394 children, aged from 9 to 11 years old. The results of the survey proved that children are more familiar with foreign folktales compared to local folktales. The results also showed that children are interested in animal, humor and exemplary stories (Ibrahim, Ahmad, & Shafie, 2014). The survey

also investigates the preferred operating system for MFolktales application and the result showed that Android is the preferred operating system of smartphones and tablets for children in learning applications. Thus, MFolktales application has been developed using Android operating system. Based on the results in this phase, the proposed conceptual model for multimedia mobile application was developed (Ibrahim et al., 2013).

2.2 Design

The animal genre story, which is the most favoured among children, was selected to be the main content in the application. As displayed in Figure 2, MFolktales Instructional Design (ID) was produced during this phase. This ID model symbolizes the overall developed prototype. Several elements identified was included in the model, which are objectives, perpetual navigation, interactivity, learning approach, methodology, medium, and pedagogical approach. The initial view of the animation story that was developed had been created with consideration of identified learning theories and the guidelines. The prototype design has been developed based on the ID model. Prototype design include the animation design, art design (characters and props), navigation structure and sketching.

Table 1. Theories implemented in MFolktales

| No.	Learning Theory	Implementation in MFolktales
1.	Cognitive	Contribution of cognitive learning theory towards a learning process is the ability of a method to train and improve consistency (Shariffudin, 2007). While from the point of multimedia design, cognitive learning theory affects some points such as perception and attention, encoding, comprehensive, memory, active learning, motivation, locus of control, mental model, metacognition, learning transfer, and individual differences (Alessi & Trollip, 2001).
2.	Social	Social learning theory was pioneered by Albert Bandura, a professor of psychology at Stanford University. According to Bandura, people learn by observing and imitating the actions of others (Seng, Parsons, Hinson, & Sardo-Brown, 2003) and (Jarvis, 2006). Humans constantly change their attitudes and behaviors as reinforcers that influence behaviour. Bandura has submitted "Reciprocal Determinism Model" and "Imitation Learning Theory".
3.	Sensory stimulation	Sensory stimulation theory is a traditional method where the learning process takes place through learning by doing and listening. Through sensory stimulation, learning can be enhanced. This research will apply this theory since reading is the most fundamental way of learning. When we read, we use our sense of sight to receive written symbol and gain information or knowledge.
4.	Afective	Affective refers to the skills and processes involved in learning a compilation of suitable behaviours (Bloom, Krathwohl, & Masia, 1984) and (Anderson, Krathwohl, & Bloom, 2001). Learners will receive, respond, evaluate, organize, and characterize the information they get. For this research, affective taxonomy will be applied to all modules in the application.
5.	Psychomotor	Psychomotor encompasses all physical aspects based on what user have learnt (Anderson et al., 2001; Bloom et al., 1984). Users will replicate the physical activity that they see, such as running, jumping, drawing, dancing, and so on. The learning effects can be measured during or after the learning process. For this research, psychomotor taxonomy will be applied in Animation Module.
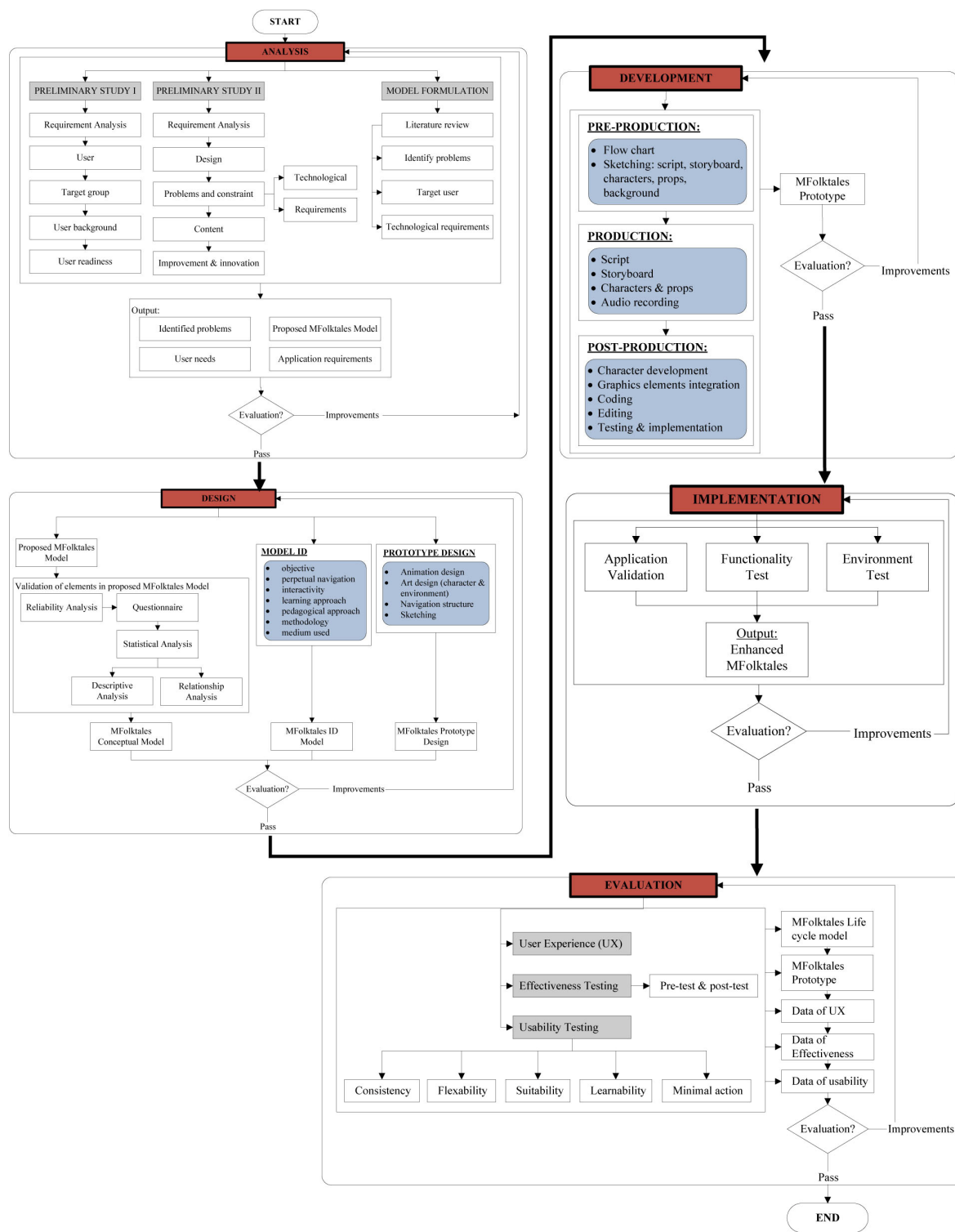
Figure 1. MFolktales development life cycle

Table 2. Guidelines implemented in MFolktales

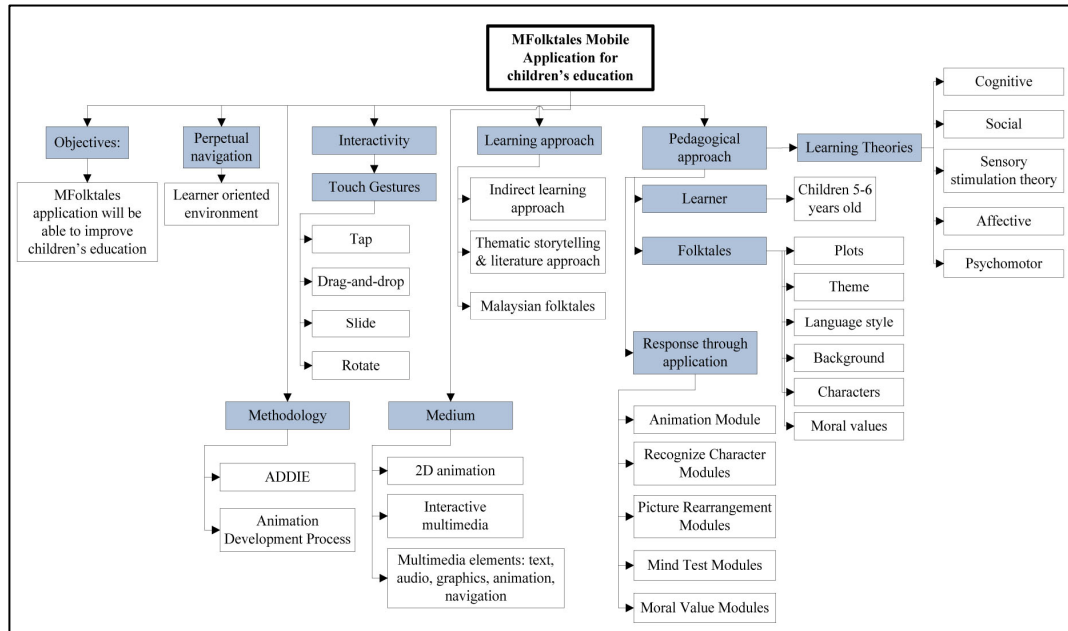| No.	User Interface Principles	Implementation in MFolktales
1.	Content	Avoid unnecessary information (Parsons, Ryu, & Cranshaw, 2007). Unnecessary information in the application can decrease children's focus and attention (Inkpen, 1997) and also confuse them.
2.	Design	Multimedia design
		- Use sound and music to attract children's attention (Jakob Nielsen, 2010), use simple and relatively large fonts (Large & Beheshti, 2005), use images and interesting characters with special effects that should not be distracting and are also child-friendly (Jakob Nielsen, 2010), using narration in a friendly human voice with age-appropriate language (Borse, Robles, & Schwartz, 2006).
		Interface design
		- The interaction between users and the application in terms of one-click interface (Segers & Verhoeven, 2002), touch screen (Chiasson & Gutwin, 2005), controlling the multimedia, and intermediate feedback (Blackwell, Lauricella, & Wartella, 2014).
		Learning design
		- Scaffolding and guidance help children remember how to accomplish a task (Chiasson & Gutwin, 2005), children should be actively participating (Fluckiger, 2010), designing activities that support imagination (Liebermana, Batesa, & Soa, 2009), mental development, and enhancing self-confidence of children (Chiasson & Gutwin, 2005), design activities that encourage social interaction and collaborative and hearing words more than once can help vocabulary learning (Fluckiger, 2010).
		Cultural Design
		- Use multimedia elements and interface designs that children are familiar with, such as ethnic costumes, community values, and beliefs (Fluckiger, 2010; Korat, 2001).
		- Use contents related to children's identity that have meaning for them and their lives on a personal, family, community or national level (Dubosarsky et al., 2011; Korat, 2001).
		- Incorporating cultural themes to promote critical thinking such as concept and vocabulary skills (Dubosarsky et al., 2011; Korat, 2001).
3.	Visual Elements	Visual elements include still frame and motion video, images, text, graphics, and animation (Orr, Golas, & Yao, 1994).
4.	Natural Usage	The application must be user-friendly. User-friendliness can be measured when the users just need a few minutes to understand how the application works (Grasso & Roselli, 2005).
5.	Navigation	- Avoid using complex navigation (Inkpen, 1997).
		- Minimize scrolling frequently (Inkpen, 1997).
6.	Consistency	- Consistency is the most important aspects in measuring user interface design principles (Jacob Nielsen, 1993).
		- Similar information and action need to be inserted in the similar position (Jacob Nielsen, 1993).
7.	Flexibility	Alternative display can be added to perform the same function. The display can act as a shortcut key (Grasso & Roselli, 2005).

Figure 2. MFolktales Instructional Design (ID) model

2.3 Development

The next phase is development phase. Development phase is further divided into three phases: (i) pre-production, (ii) production, and (iii) post-production. Figure 3 shows the development activity involved in MFolktales application. Pre-production stage is divided into two phases, which are analysis and design. During the pre-production stage, the problems and solution have been identified and analyzed. The prototype development methodology was also produced during this stage. This stage produced the initial view of the animation story which is: storyline, flow chart, character and props, script and screenplay, storyboard and animatic. The 2D animation story and the modules in the MFolktales application were fully developed based on the storyboard. The sketching and digitizing process was done during production stage. Other processes executed in this stage are cleaning up the sketching, editing process and adding sound effects. Post-production stage is divided into two phases, which are implementation and evaluation. The tools for developing the application were: (i) Adobe Flash CS5 for 2D modelling with ActionScript 3.0 for programming, (ii) Adobe Photoshop CS5 for graphic editing, and (iii) Audacity audio software for audio editing.

2.3.1 Story Development

Based on the survey done in the analysis phase, a popular genre of Malay folktales among children was determined. A few interesting stories were compared, and *"Sang Arnab dan Sang Kura-Kura Berlumba Lari"* was selected. The content was taken from a storybook. The application used Malay language as its medium of language. The story lasted for about 3 minutes and was developed using 2D animation. The story was about an arrogant rabbit that lost to a tortoise in a race. The story started when *Sang Arnab* (the rabbit) challenged *Sang Kura-Kura* (the tortoise) to race with him. As *Sang Arnab* ran, he looked behind and he saw *Sang Kura-Kura* was running at a slow pace. *Sang Arnab* thought that if he took a short break, *Sang Kura-Kura* would still fail to defeat him. So, *Sang Arnab* stopped by a tree and slept soundly. *Sang Kura-Kura* continued running and he saw *Sang Arnab* was fast asleep under a tree. *Sang Kura-Kura* continued running at a slow pace. Suddenly, *Sang Arnab* awoke and he thought that *Sang Kura-Kura* was still left behind. *Sang Arnab* ran as fast as he could to the finish line. Upon reaching the finish line, *Sang Arnab* realized that *Sang Kura-Kura* had already reached the finish line and was relaxing while waiting for *Sang Arnab*. *Sang Arnab* felt ashamed of his defeat and his arrogance towards *Sang Kura-Kura*. The moral of the story is not to be arrogant and boastful. Besides, one should never insult others due to their deprivation, and they would probably be more successful because of their hard work.

2.3.2 Storyboard Development

The storyboard was used as a visual guide to researchers in developing the animated folktale story. The storyboard was made in fractions of scene and displayed guides like dialogues and actions shown in a scene.

Dialogue and camera angles for each scene shot were mentioned briefly in the storyboard for ease of reference to the script. For this prototype, two storyboards were developed, which were storyboard for animation story, and storyboard for interactive modules. Figure 4 shows an example of storyboard for the Animation Module, while Figure 5 shows the storyboard for interactive modules in MFolktales application prototype.
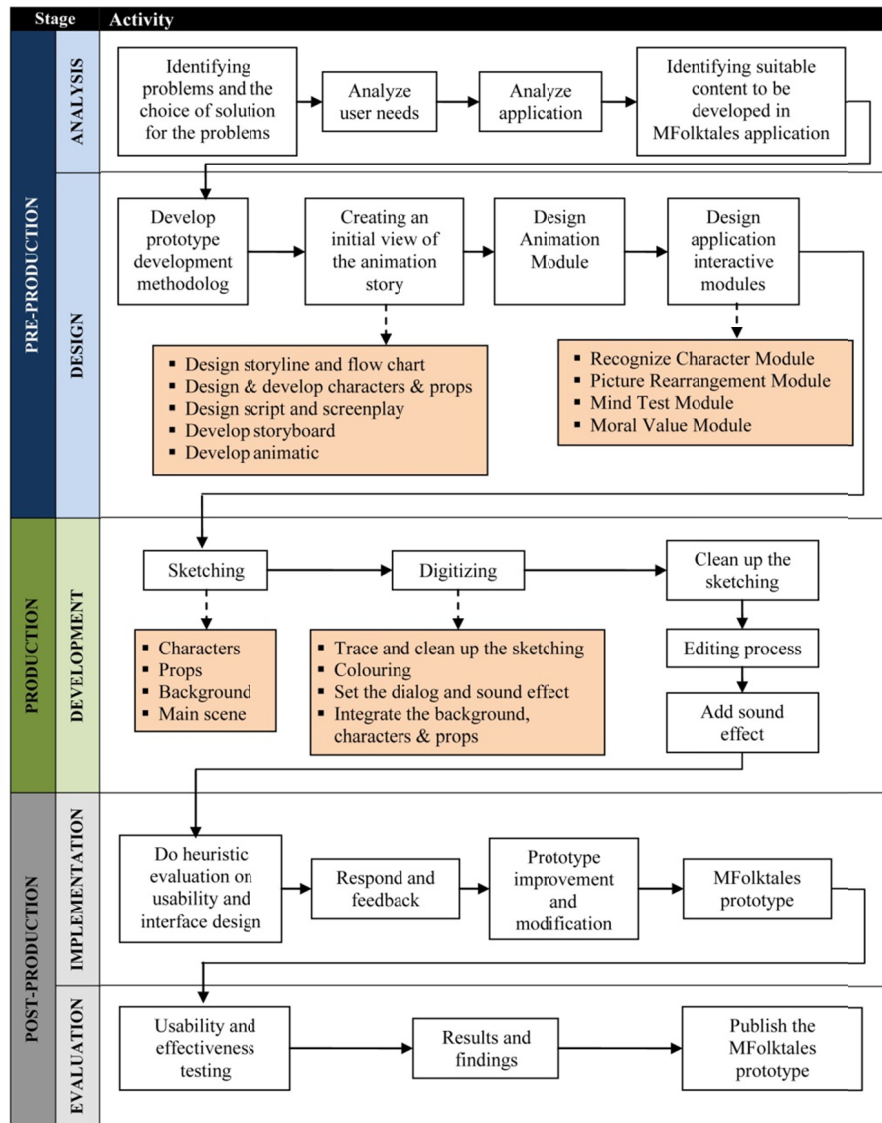
2.3.3 Research Design Characters and Background Development

Figure 3. Development activity for MFolktales

Based on the final sketches and design, each character and background was developed using Adobe Flash. The graphics that were produced with Adobe Flash were vector graphics, where the quality of the image would not be affected if the size of the graphic was changed. Characters and background were developed based on the suitability of Malay folktale and the target users, who are children, by using a bright color scheme. The story *"Sang Arnab dan Sang Kura-Kura Berlumba Lari"* has two main characters, *Sang Arnab* and *Sang Kura-Kura*. Besides these two characters, there are a few supporting characters towards the end of the story, who are friends of *Sang Arnab* and *Sang Kura-Kura*. Figure 6 shows the characters designed in the Animation Module.

MFolktales application consists of five modules, where one is an animation story module, and the remaining four are activity game modules. MFolktales application used the dynamic navigation approach so that the users get full control accessing the content of the prototype. Figure 7-11 shows the interface of each module in MFolktales

application respectively. Figure 8 shows several screenshots for the Animation Module. The animated folktale entitled *"Sang Arnab dan Sang Kura-Kura Berlumba Lari"* was adapted to suit the age of the target users. Bright colour schemes are used to attract users and simple graphic designs were applied to each graphic element to obtain neat graphics and animations. Social learning theory was applied in this module. Learning occurs through observation and understanding of the animated story *"Sang Arnab dan Sang Kura-Kura Berlumba Lari"*, which acts as a source for lesson delivery.
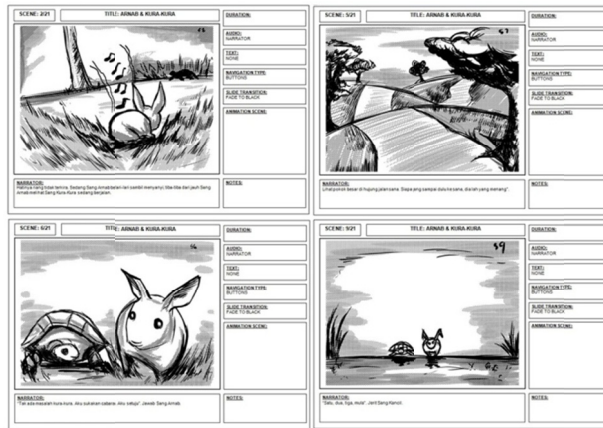

Figure 4. Storyboard for Animation Module "Sang Arnab dan Sang Kura-Kura Berlumba Lari"
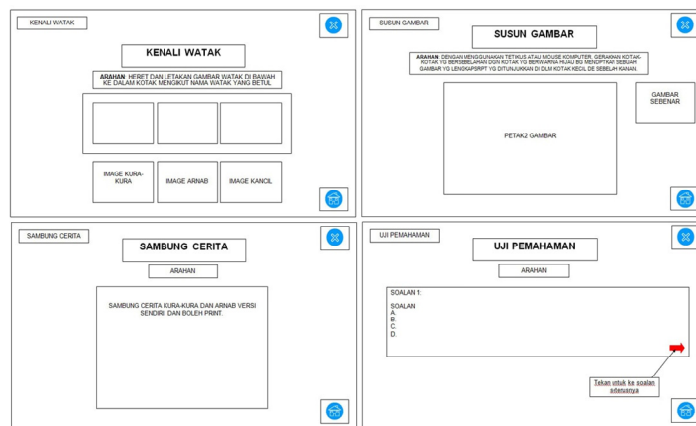

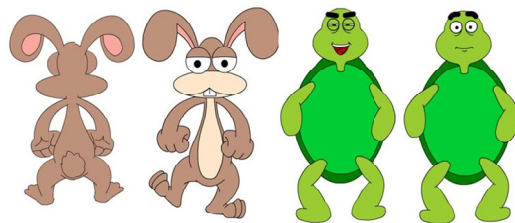Figure 5. Storyboard for interactive modules

Figure 6. Main characters in Animation Module

Meanwhile, Figure 9 illustrates a screenshot of Recognize Character Module. This module is aimed to test the level of recognition among the four main characters in the Animation Module. The module is a simple game activity, where the user can drag and drop the characters using their finger and place them in the correct position. If the character is placed in the correct position, the audio effect "Right" is played automatically, and an animated blinking star appears. Meanwhile, if incorrect, the audio effect "Wrong" is played and the character returns to its original position. This module applies effective learning theory, whereby users are praised as a

reward when they successfully complete the activity in this module. This learning theory is appropriate with this module as this module is very easy and suitable for children with a fundamental learning level.

Figure 10 shows the screenshot for Picture Rearrangement Module. This module is a puzzle activity. The user needs to use their creativity to solve the challenges by placing the puzzle in the right position. Each puzzle represents a small part of the picture to be completed. A cognitive learning theory was applied in this module because the users need to use their creativity to solve the puzzle and the users also must have good short-term memory. Through this module, the users can encourage their spatial skills and concentration.
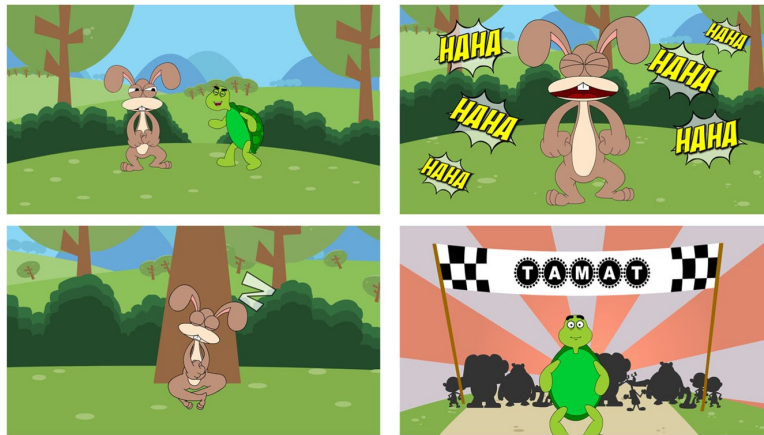

Figure 7. Animation Module

Figure 8. Recognize Character Modules

Figure 9. Picture Rearrangement Modules

Meanwhile, the screenshot for Mind Test Module is shown in Figure 11. This module is a true and false game, and it is the most challenging module in the application. This module consists of five questions. The user needs to answer all the questions, and there is no time limit. The questions are based on the story in the Animation Module. Cognitive learning theory was applied in the Mind Test Module. According to this theory, knowledge stored in the memory space is restored to make decisions based on experience. This concept was taken to test the users with comprehension questions that require them to answer questions based on their understandings and memories associated with the Animation Module.

Figure 10. Mind Test Modules

Lastly, all morals of the story from the Animation Module will be displayed in point form in the Moral Value Module. Sensory stimulation theory was applied in this module. Vision of sensory is stimulated for reading when users see the text. In order to get the point from the animation story and Moral Value Module, users need to read the text displayed. Figure 12 shows the screenshot for Moral Value Module.

Figure 11. Moral Value Modules

2.4 Implementation

After the development phase, in order to make sure that the application was free from interface and design problems, as well as to look into the suitability of the application to the target users, several tests have to be performed, as shown in Figure 1. The tests include application validation, functionality test and environment test. Application validation involved the tasks of cross-checking overall application with MFolktales conceptual model that has been developed. All functions that have been illustrated in Figure 7 should appear in the application. All the buttons and navigation have been tested so that the application achieves the objective of the development. Functionality test was conducted to check if the produced output of each function works the same as expected while environment test that had been conducted once the full application had been uploaded and installed in the smartphone and tablet. The environment test was conducted to ensure the application works

properly in the real environment.

2.5 Evaluation

The final phase in this development process was evaluation. As shown in Figure 1, the ready prototype will be evaluated in terms of its usability, effectiveness, and to obtain perceptions from children on its quality, as well as to identify their user experience towards this application.

3. Conclusion and Future Work

As a conclusion, from the analyzed and defined theories and guidelines, the proposed conceptual model has been developed. Based on the validated proposed conceptual model, MFolktales mobile application has been successfully designed and developed. In general, this paper has presented the activity involved in the development of a multimedia mobile application for children's education, called MFolktales. Through this application, there is an alternative medium in changing the traditional teaching and learning method that only uses storybooks as reference and leads towards a better form of learning environment. It is hoped that the development of the mobile application could attract children towards socio-cultural awareness, besides helping them to revive and sustain the existence and the popularity of local Malay folktales among the future generation. As for future work, the application will be evaluated for its usability and effectiveness to obtain perceptions from children on its quality, as well as to identify their acceptance towards this application.

Acknowledgments

References

Alessi, S. M., & Trollip, S. R. (2001). *Multimedia for learning: Method and development* (3rd ed.). Boston: Allyn and Bacon.

Anderson, L. W., Krathwohl, D. R., & Bloom, B. S. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Allyn & Bacon. Boston, MA (Pearson Education Group).

Anthony, L., Brown, Q., Nias, J., Tate, B., & Mohan, S. (2012). Interaction and Recognition Challenges in Interpreting Children's Touch and Gesture Input on Mobile Devices. In *Proceedings of the 2012 ACM international conference on Interactive tabletops and surfaces* (pp. 225-234). http://dx.doi.org/10.1145/2396636.2396671

Attewell, J. (2005). *Mobile Technologies and Learning. A Technology Update and M-learning Project Summary*. London: Learning and Skills Development Agency. doi:Retrived 13th March, 2014.

Aziz, N. A. A. (2013). Children's Interaction with Tablet Applications: Gestures and Interface Design. *International Journal of Computer and Information Technology*, *2*(3), 447-450. http://dx.doi.org/10.1.1.404.1245

Aziz, N. A. A., Batmaz, F., Stonde, R., & Chung, P. W. H. (2013). Selection of Touch Gestures for Children's Applications. In *Science and Information Conference* (pp. 721-726). Retrieved from http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6661821

Barendregt, W., Lindström, B., Rietz-Leppänen, E., Holgersson, I., & Ottosson, T. (2012). Development and Evaluation of Fingu: A Mathematics iPad Game Using Multi-touch Interaction. In *The 11th International Conference on Interaction Design and Children* (pp. 204-207). http://dx.doi.org/10.1145/2307096.2307126

Blackwell, C. K., Lauricella, A. R., & Wartella, E. (2014). Factors Influencing Digital Technology Use in Early Childhood Education. *Computers & Education*, *77*, 82-90. http://dx.doi.org/10.1016/j.compedu.2014.04.013

Bloom, B. S., Krathwohl, D. R., & Masia, B. B. (1984). *Taxonomy of Educational Objectives, the Classification of Educational Goals. Handbook II: Affective Domain* (2nd ed.). New York: Addison Wesley Publishing Company.

Bonsignore, E., Quinn, A. J., Druin, A., & Bederson, B. B. (2013). Sharing Stories "in the Wild": A Mobile Storytelling Case Study Using StoryKit. *ACM Transactions on Computer-Human Interaction*, *20*(3). http://dx.doi.org/10.1145/2491500.2491506

Borse, J., Robles, E., & Schwartz, N. (2006). Designing for Kids in the Digital Age: Summary of Research and Recommendations for Designers. In *The 1st interaction Design & Children Conference*. http://dx.doi.org/10.1.1.85.5603

Chachil, K., Engkamat, A., Sarkawi, A., & Shuib, A. R. A. (2015). Interactive Multimedia-based Mobile Application for Learning Iban Language (I-MMAPS for Learning Iban Language). *Procedia - Social and Behavioral Sciences*, *167*, 267-273. http://dx.doi.org/10.1016/j.sbspro.2014.12.673

Chiasson, S., & Gutwin, C. (2005). Design Principles for Children's Technology. In *Proceeding of HCI-TR*. http://dx.doi.org/10.1.1.83.5281

Dubosarsky, M., Murphy, B., Roehrig, G., Frost, L. C., Jones, J., Carlson, S. P., … Bement, J. (2011). Incorporating Cultural Themes to Promote Preschoolers' Critical Thinking in American Indian Head Start Classroom. *Young Children*, *66*(September), 20-29. Retrieved from http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/cultural-linguistic/DualLanguageLearners/ecd/culture_and_diversity/Incorportaing-cultural-themes.pdf

Fluckiger, B. (2010). Culture-Switching in Different Worlds: Young Children's Transition Experiences. *Australasian Journal of Early Childhood*, *35*(4), 101-108. Retrieved from http://www98.griffith.edu.au/dspace/bitstream/handle/10072/36926/67450_1.pdf;jsessionid=AE5EDF06C5A6E85494016ED7E5178360?sequence=1

Grasso, A., & Roselli, T. (2005). Guidelines for Designing and Developing Contents for Mobile Learning. In *IEEE International Workshop on Wireless and Mobile Technologies in Education* (pp. 123-127). http://dx.doi.org/10.1109/WMTE.2005.27

Ibharim, L. F. M., Borhan, N., & Maizatul H.M. Yatim. (2013). A Field Study of Understanding Child's Knowledge, Skills and Interaction Towards Capacitive Touch Technology (iPad). In *The 8th International Conference on Information Technology in Asia (CITA)* (pp. 6-10). http://dx.doi.org/10.1109/CITA.2013.6637571

Ibrahim, N., Ahmad, W. F. W., & Shafie, A. (2013). A Proposed Model for Animation of Malay Folktales for Children. In *Information Systems International Conference (ISICO)* (pp. 243-248). Retrieved from http://is.its.ac.id/pubs/oajis/index.php/file/download_file/1222

Ibrahim, N., Ahmad, W. F. W., & Shafie, A. (2014). A Preliminary Study on Local Folktales Exposures to Support the Development of Animated Courseware. In *The 2nd International Conference on Computer and Information Sciences (ICCOINS)*. http://dx.doi.org/10.1109/ICCOINS.2014.6868420

Ibrahim, N., Ahmad, W. F. W., & Shafie, A. (2015). A Study on Design Principles and Requirements for Multimedia Application Development: MFolktales Application for Children Education. In *International Symposium on Mathematical Sciences and Computing (iSMSC)*.

Inkpen, K. (1997). Three Important Research Agendas for Educational Multimedia: Learning, Children, and Gender. In *AACE World Conference on Educational Multimedia and Hypermedia*. doi:10.1.1.54.4439

Jarvis, P. (2006). *Towards a Comprehensive Theory of Human Learning (Lifelong Learning and the Learning Society)*. New York: Routledge. Taylor & Francis Group.

Kittidachanupap, N., Singthongchai, J., Naenudorn, E., Khopolklang, N., & Niwattanakul, S. (2012). Development of Animation Media for Learning English Vocabulary for Children. In *International Conference on Computer Science and Automation Engineering (CSAE)* (pp. 341-345). http://dx.doi.org/10.1109/CSAE.2012.6272788

Korat, O. (2001). Cultural Pedagogy and Bridges to Literacy: Home and Kindergarten. *Early Childhood Education Journal*, *28*(4), 225-230. http://dx.doi.org/10.1023/A:1009542809057

Large, J. a., & Beheshti, J. (2005). Interface Design, Web Portals, and Children. *Library Trends*, *54*(2), 318–342. http://dx.doi.org/10.1353/lib.2006.0017

Liebermana, D. A., Batesa, C. H., & Soa, J. (2009). Young Children's Learning With Digital Media. *Computer in the Schools*, *26*(4), 271-283. http://dx.doi.org/10.1080/07380560903360194

Muda, Z. (2006). Storytelling Approach In Multimedia Courseware: An Introduction To Science For Preschool Education. In *The 2nd International Conference on Information & Communication Technologies* (pp. 2991-2993). http://dx.doi.org/10.1109/ICTTA.2006.1684891

Ni, Q., & Yu, Y. (2015). Research on Educational Mobile Games and the Effect it Has on the Cognitive

Development of Preschool Children. In *Third International Conference on Digital Information, Networking, and Wireless Communications (DINWC), 2015* (pp. 165-169). http://dx.doi.org/10.1109/DINWC.2015.7054236

Nielsen, J. (1993). *Usability Engineering*. (Morgan Kaufman, Ed.). Academic Press.

Nielsen, J. (2010). *Children's Websites: Usability Issues in Designing for Kids*. Retrieved February 23, 2015, from http://www.nngroup.com/articles/childrens-websites-usability-issues/

Nusir, S., Alsmadi, I., Al-Kabi, M., & Shardqah, F. (2011). Designing an Interactive Multimedia Learning System for the Children of Primary Schools in Jordan. In *IEEE Global Engineering Education Conference (EDUCON)* (pp. 45-51). http://dx.doi.org/10.1109/EDUCON.2011.5773111

Orr, K. L., Golas, K. C., & Yao, K. (1994). Storyboard Development for Interactive Multimedia Training. *Journal of Interactive Instruction Development*, *94*, 2004-2018. http://dx.doi.org/10.1.1.118.2147

Parsons, D., Ryu, H., & Cranshaw, M. (2007). A Design Requirements Framework for Mobile Learning Environments. *Journal of Computers*, *2*(4), 1-8. http://dx.doi.org/10.4304/jcp.2.4.1-8

Segers, E., & Verhoeven, L. (2002). Multimedia Support of Early Literacy Learning. *Computers & Education*, *39*, 207-221. http://dx.doi.org/10.1016/S0360-1315(02)00034-9

Seng, T. O., Parsons, R. D., Hinson, S. L., & Sardo-Brown, D. (2003). *Educational Psychology: A Practitioner – Researcher Approach (An Asian Edition)*. Singapore: Thompson Learning, Inc.

Shariffudin, R. S. (2007). Innovative Design of Instructional Materials for Teaching and Learning Purpose Using Technology. In *Simposium Pengajaran dan Pembelajaran UTM 2007 (SPPUTM 07)*.

Tang, H. H., Jheng, C. M., Chien, M. E., Lin, N. M., & Chen, M. Y. (2013). ICAN: A Tablet-Based Pedagogical System for Improving the User Experience of Children with Autism in the Learning Process. *ICOT 2013 - 1st International Conference on Orange Technologies*, 177-180. http://dx.doi.org/10.1109/ICOT.2013.6521186

Yahaya, N. S., & Salam, S. N. A. (2014). Mobile Learning Application for Children: Belajar Bersama Dino. *Procedia - Social and Behavioral Sciences*, *155*(October), 398-404. http://dx.doi.org/10.1016/j.sbspro.2014.10.312

Copyrights