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Mobile Application Development Trough ADDIE Model

Mat Redhuan Samsudin, Rushana Sulaiman
Faculty of Art & Design MARA University of Technology Malaysia
Email: redhuansamsudin@uitm.edu.my, rushana@uitm.edu.my

Tan Tse Guan, Anuar Mohd Yusof, Mohd Firdaus Che Yaacob
Faculty of Creative Technology and Heritage, Malaysia Kelantan University, Malaysia
Email: tan.tg@umk.edu.my, anuarmy@umk.edu.my, firdaus.cy@umk.edu.my

Abstract
The development of a mobile application must have a systematic system to ensure the development process of an application is more effective. The purpose of this study is to identify design model as guide to develop the module based on research has been done. The ADDIE model is a selected model for mobile application development. There are five phases in the ADDIE model which in the first phase is analysis which is to identify the problem of learning module design, purpose, learning environment and students' existing knowledge and skills. While in the second phase is the design, which is related to learning objectives, assessment instruments, training, content, subject analysis, lesson planning and media selection. The third phase is development, in this phase the programming process is done based on the design that has been made. Testing procedures were performed and reviewed according to the feedback provided. The fourth phase is implementation, in this phase the developed application is adopted by the user. The last phase is the assessment which consists of two parts namely formative and summative. Formative assessment is available at every stage of the ADDIE process. Summative evaluations consist of tests designed for reference items related to specific domain criteria and provide opportunities for feedback from users.
Keywork: Instructional Design, Mobile Application, Teaching & Learning, Mute-Deaf Students', ADDIE Model

Introduction

The process of developing a mobile application is a complex process and needs to follow appropriate methods (Flora et al., 2014). Therefore, there are several models of multimedia application development such as Addie model, waterfall, dick and carey, hanaffin and peck and so on. Researchers in this study identified an appropriate model as a guide to designers to develop a prototype. It aims to ensure that there is no recurrent development due to the use of inappropriate methods. The use of inappropriate methods causes the development process to slow down this will affect the increase in production costs.

In this paper the researcher focuses on the ADDIE development model because this model is more appropriate and systematic. The ADDIE model is one of the most used models in instructional technology design to develop more effective learning applications. This model helps designers as well as teachers to develop more efficient learning modules and the process is easier. The elements involved in the ADDIE model can also be used in a variety of learning environments either online or offline.

The ADDIE model chosen in developing mobile applications is also based on constructivist learning theory. According to Yasin (2010) constructivist learning theory existed during the second world war where the theory was used in the war. Several psychologists have made a study on the theory, and it is suitable to be practiced in the field of education and this theory is also used by the American institute (McLeod et al., 2003).

According to Aris et al (2002) constructivist theory was introduced by Jerome Brunner in 1966 and the main theme of this theory is that learning is an active teaching and learning process where students build new knowledge or concepts based on experience. Therefore, the implementation of the ADDIE model in the development of teaching and learning aids is suitable for its development.

Objective

i. Identify mobile application development model
ii. Evaluate development process involved to develop the sign language mobile application
iii. Implementation ADDIE model to develop the sign language mobile application

Methodology

There are five phases involved in the ADDIE model namely analysis, design, development, implementation, and evaluation. Each phase has a different activity and will be explained in the next topic. Based on the selection of the development model, it is in line with the objectives of teaching and learning (Nasohah et al., 2015). This is because in teaching and learning, a learning aid should cover the needs in learning and educators also need to know the appropriate teaching strategies (Peterson, 2003), (Samsudin et al., 2017).

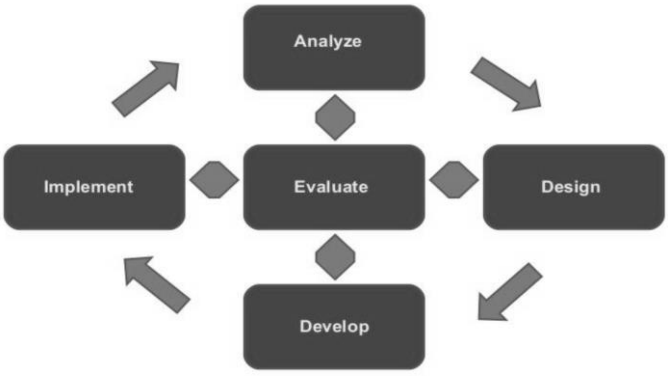

Figure 1. ADDIE Model
(Consulta, 2008)

Analysis Phase

Analysis is an important phase in the process of developing a technology-based teaching and learning aid. In this process, the designer performs a needs analysis in a teaching aid before planning, development, and implementation. This aims to speed up and simplify the process as well as assist members in each phase. According to Muruganantham (2015) there are four main things that are done at this stage among students, it includes their location, needs and skills. In addition, teaching and learning methods such as steps to use the material. In this phase, the designer must also think about the goals to be achieved, namely the results of learning using the material and the learning objectives where it is identified whether this learning method achieves the objectives of students. Whereas according to Wang and Hsu (2009) analysis of students 'knowledge content should also be done to find out the level of existing students' knowledge, what they want and why they need it.

Design Phase

The design phase uses the results from the analysis phase to plan a strategy to develop a product design. In this phase the designer outlines how the design can achieve the learning goals and it is determined based on the results of the analysis conducted in the analysis phase. Among the things that are emphasized are such as target users, learning methods, learning, and testing objectives. In addition, the instruction of the learning material processing system (Wang & Hsu, 2009).

Just as the sign language mobile application is a smartphone -based learning method, it is a learning application that is still new among students with disabilities, and it is given less exposure. Designers in designing these applications help students with simpler designs to help students become proficient in using the application system. The designer also considers the skill level of the students as well as the extent to which the level of ability of the students can use it based on their skill level and the operating system also promotes an active learning style as well as optimizing online learning.

Based on the designed activities i.e., five main topics were selected based on the needs of lower secondary students. Among the topics selected were letters and numbers, days, verbs, pronouns, and speech. Designers also create exercises to identify student achievement levels based on selected topics. Each topic selected using the operating system shows a hand signal system using two -dimensional animation method and it is also supported by audio as well as text so that students can understand the concept of learning more clearly.

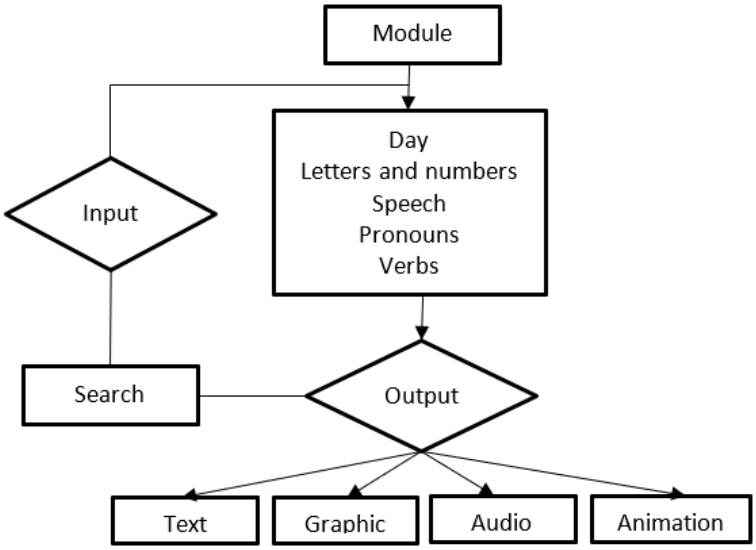

Figure2. Module design

Based on the module design framework four multimedia elements are involved namely text, graphics, animation, and audio. Text is a word that can be understood by the user. It encompasses key elements that are often used in mobile applications to convey a concept or message to users (Hashim et al., 2003). In terms, text is also known as typography which is an important element in developing a mobile application, most of a mobile application uses text as the main element and support to other elements in conveying information. It is also intended to give instructions or statements for a topic, object or other.

Graphics are also used in this mobile application as a true representation of a movement or action. Graphics are pictures or illustrations to produce multimedia products that are easy to use and attractive. Designers need to emphasize the appearance, shape and presentation aspects of each graphic element used in an application (Hashim et al., 2003; Siong et al., 2021). It is also defined as a static image that serves as a support in conveying information so that it becomes easier and more effective. Graphics can give a variety of meanings based on one's understanding and feelings. In the context of mobile applications, it acts to prevent the users of a mobile application from becoming bored, because the inner nature of human beings likes to be visually oriented especially students with disabilities.

There are three categories of graphics namely representation, analogy, and logic. Representation is a graphic that represents something such as a scene, a background and so on. While an analogy graphic is a graphic that describes a concept that is symbolic and has an implicit meaning. A logical graph is a graph that shows a decision or evaluation. In the context of learning sign language, the graphics used are a type of analogy where hand signals give different meanings.

Apart from that, animation elements are also involved in this application, and it is a key element in conveying information. Animation is a process of animating or giving a moving image to a static object so that it looks alive and dynamic (Hashim et al., 2003), Or a picture that is played sequentially and alternately, it is played in a fast period until it appears. move and live. In the development of this application, the designer uses a two -dimensional

animation delivery method because animation is more interesting and easier to understand than just a picture because it is more communicative in conveying a purpose. Audio elements are also included in the development of this application. Audio is sound that can be heard but cannot be seen with the naked human eye. It is used to improve user understanding and audio can also engage users. Audio is also an element of communication between users and applications.

Interface Design

User interface refers to the design and equipment used to house the interaction between a mobile application and the humans who use it (Tahir & Mydin, 2003; Feng et al., 2015). The learning approach using mobile applications tends to student -based learning where it uses the concept of self -learning and teacher as a reference for the information obtained. There are several processes involved in interface design as shown in the following figure

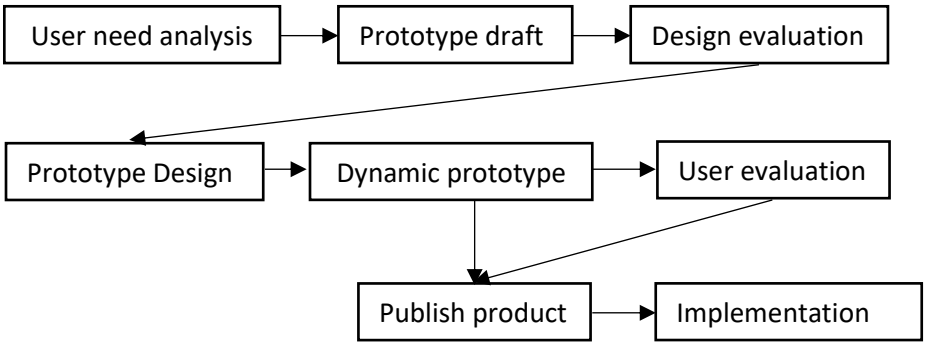

Figure 3. Design process

Development Process

The development phase is a complex phase and requires experts in developing a software or application. Development of learning modules based on the outputs for each phase of analysis and design. The purpose of this phase is to develop a mobile application and this phase involves the process of operating the module using various software, hardware and supporting documents.

Storyboard is a series of screens on the application flow arranged by section (Tahir & Mydin, 2003). Storyboard displays real pictures in 2-dimensional format on published applications. The purpose of the storyboard is used to develop the document more clearly. In addition, the storyboard is also used to show links between various screens. Here are the characters and storyboard according to the link.

Scene 1
Text: Malaysia sign language
Graphic: character
Audio: -
Video: -
Animation: text movement from left to right

Figure 4. Storyboard

Authoring and Programming

Mobile application development uses a variety of software for authoring and programming. The designer is not limited to the use of the specified software as the process may also use any suitable software. The development of this mobile application is based on basic sketches done to trigger ideas and from those sketches it is developed as a real application. The initial sketch is done on paper, and it is scanned and done a digital sketching process.

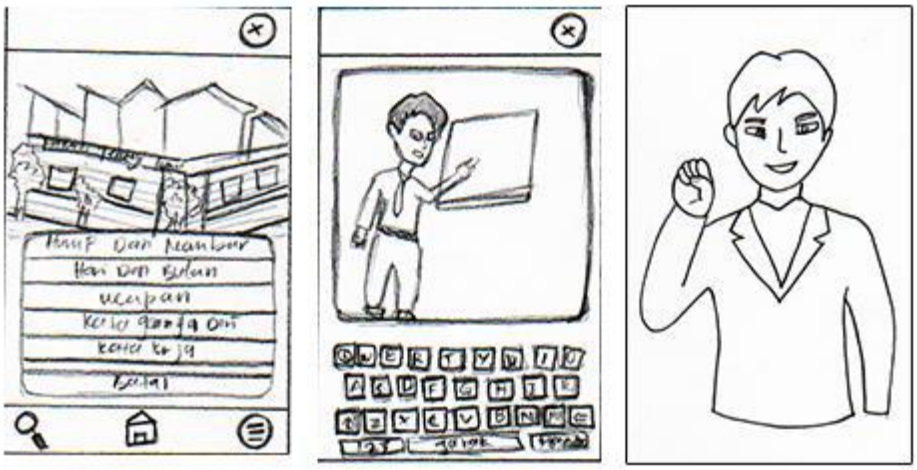

Figure 5. Sketches

Once the digital sketch process is ready to be developed, then the programming process is done for the navigation process. The designer develops a different interface based on the selected module, it aims to simplify the designer for the navigation process so that each button or link can work properly. Each application interface has consistent main links such as back buttons, menus, homepage, and search as per the figure. Among the important things that are in the process of development is the Gantt chart. It aims to ensure that the process runs according to a set schedule.

No	Activity	Duration/month					
		1	2	3	4	5	6
1	Develop characters and draw each hand gesture						
2	Each character is redrawn using Adobe Flash software						
3	Storyboard design and animation for each hand movement according to the cues for each word letters and numbers						
4	Record and edit audio according to the words, letters and numbers created						
5	Graphic design and user interface included - Buttons involved - Create a link for each hyperlink						
6	Prototypes are ready to be developed and a testing process is done for improvement.						

Table 1. Gantt chart

Implementation Phase

The implementation phase is the phase where the prototype is ready to be developed based on the selected module. The completed prototype was given to the students for experimentation. Students are given a period to use the application before the test is done. According to Muruganantham (2015) this phase aims to see the extent to which mobile applications can affect students as well as whether students can understand a learning topic. In addition, it supports students' mastery of objectives, and ensures the transfer of knowledge to students.

Evaluation Phase

At this phase, the designer ensures whether the selected function responds according to a predetermined specification which is known as testing. An error will be identified so that it does not affect the application and interfere with the operating system. This process will also identify how users can communicate with the system in controlling animation as well as audio. The content will also be reviewed based on the needs and suitability with the level of user needs. Based on the content, the designer also ensures the extent to which the content can help students understand the concept of learning.

In addition, this phase will also go through an evaluation process where two tests are performed, namely formative test and summative test. Formative assessment is an assessment done during the process of mobile application development is done. While the summative evaluation is an evaluation done after the application has been developed.

Evaluation is done by the designer to measure the level of effectiveness and efficiency of the mobile application. Evaluation is made based on the design process in each phase and between the phases involved as well as the entire module in the application. Assessors are done after module development to determine module development in accordance with the needs of the students. Assessment is done formatively and summative where formative assessment is done continuously during the development process. It aims to identify errors in the development process earlier. At the end of the process the designer will also make a summative assessment. This evaluation is done to evaluate the application as a whole and

the results of the evaluation will be a guide for improvement of the application before it is used.

Prototypes that have been developed through a testing process to see the quality and usability of the application. Usability Testing is a general thing that is done after an application is ready to be developed, it aims to see how well an application works according to the user's needs. Based on feedback from users the developer makes an analysis to improve the quality of the application.

Evaluation Method

A survey was conducted on six respondents who were classified as consumers. Using the evaluation form, a survey was conducted on six respondents to complete the evaluation form. The designer conducted a summative evaluation of the prototype. Summative evaluation is more suitable for the evaluation of a prototype it aims to obtain actual results based on user response (Rahim et al., 2016). Before respondents completed the evaluation form, they were given a prototype to use, and subsequently they completed the evaluation form. The analysis was performed based on the evaluation forms received. Figure 6 shows the framework of the prototype testing process performed to identify the level of usability and functionality of the mobile application.

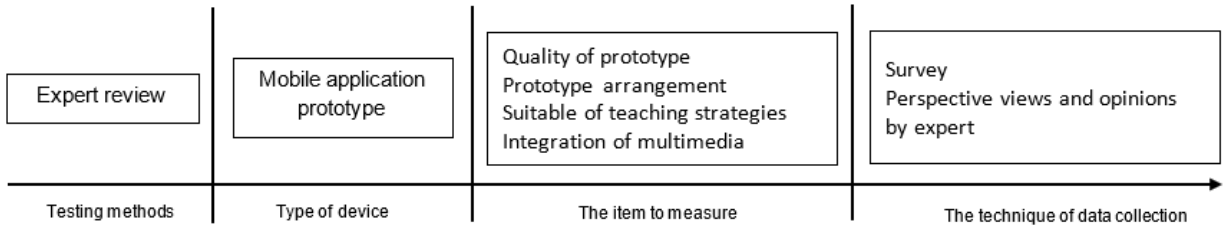

Figure 6. Expert testing

Result

Based on the results that have been made shows the prototype of this mobile application can be used and applied in learning because it works well like a real application. However, from the perspective of teachers and lecturers it is suggested that the background of each word reflects its meaning so that it is clearer. In addition, users also suggest that this application integrates augmented reality (AR) technology to provide a more effective learning experience. From the designer's perspective, he suggested that the animation should be streamlined so that it looks neater.

Conclusion

The development of an application requires skilled manpower and large costs, therefore careful planning and guidance is needed to ensure that it can be completed according to the original plan. Based on the results of the study it shows that consumer acceptance of technology in education is very good. However, it should be based on the characteristics and needs of the students to meet the needs and complete a learning process. This clearly shows that the ADDIE model is a suitable model to be used for the development of an application among others, development based on the ADDIE model will also be more consistent to

achieve the objectives. This clearly shows the relevance for each phase of the analysis to the assessment.

The final evaluation results show that the suitability of the design affects the frequency of use of mobile applications, therefore the design aspect should include user features to meet the needs of users so that the technology is more user-friendly. Good design can improve academic achievement and the ability of students to think more critically. The ability to think can make students more visionary and make students more innovative. Among others, developers based on the ADDIE model also affect the development time of the application where it can speed up the period to complete the application.

The need for technology in education makes the design aspect need to be the focus of prototype development because learning depends on the modules provided. Self -directed learning, the presentation of information needs to be more creative so that it has more impact on users. The application management aspect is also an important issue in the development of mobile applications so that users can communicate better.

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