

## Assisting Adult Literacy Skills Mastery Through Mobile Technology

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**Abstract:** This paper presents an android educational application to assist low literacy adults in Malaysia to enhance their reading skills. The language is Bahasa Melayu. Literacy is the foundation for learning and acquiring skills. Without it, adults would have difficulty in participating in their community and getting better job opportunities for the betterment of their lives. Recent 2017 data found that Malaysia's percentage of adult literacy rate is at 95.43% and ranks 70 out of 158 countries worldwide. To help increase this percentage, an application utilizing mobile technology and andragogy learning theory was developed. The application focuses on beginner level and the content was adapted from the Kelas Dewasa Asli Pribumi (KEDAP) module. Ten (10) respondents who are illiterate, participated in the usability testing process. Overall, all the respondents agree that the application is helpful and the content suits their need. As a conclusion, the application allows adults to increase their literacy skills, without having to enroll in a formal literacy class, and incurs minimal cost.

**Key words:** *Adult literacy, low literacy, mobile learning, usability testing, waterfall*

### INTRODUCTION

The aim of this study is to propose the use of smartphones to assist low literacy adult learners to enhance their reading skills by applying learning theories and andragogy (adult theory) model. Low literacy usually equates to poor skills and individuals with poor skills are associated with low earnings and limited employment opportunities [1].

In recognizing the importance of literacy skills, World Literacy Day organized by UNESCO held on every 8<sup>th</sup> September celebrates how reading skills can change lives and pay attention to millions of people who do not have access to basic education. Therefore, the needs to analyse and understand the development of adult literacy has increased over the years, with the objective to overcome the low literacy skills of adults. Therefore, mobile application for Assisting Adult Literacy Skill is proposed to increase adult literacy/reading skills. Mobile application as a learning tools enables people to access digital content that is easily accessible anywhere and anytime for everyday use.

This section leads to further discussion of the problem of low literacy skills for adults in Malaysia, motivation and the objective of this research in the next section.

### Problem Statement

Workers with low literacy skills are often linked to limited job opportunities which results in low earnings. This is because, in order to fulfill the complex demands of everyday life, adults need to have sufficient literacy skills. This is supported by results from the International Adult Literacy Survey from 1994 – 1998 which found that people with low literacy skills have very few chances of successfully solving problems [2]. Based on data from National Assessment of Adult Literacy (NAAL) in 2010, adult earnings in the US, for low-skilled jobs are under \$300 per week even for fulltime work [3].

Having low literacy skills not only impacts salaries and job opportunities. The percentage of low skilled workers in Malaysia recorded an increase from 12.4% in 2012 to 13.8% in 2015 [4]. Low literacy skill worker in

Malaysia earn less than RM1450 per month [1]. Without the right competency, especially literacy skills, low-skilled workers would find it difficult to get better job opportunities in the middle-skilled category. This indirectly make it difficult for them to improve their financial wellbeing and their living conditions, in the long run.

**Objectives**

The objectives of this study are:

1. o develop a mobile learning application for adults literacy in learning the alphabets.
2. o implement principles of andragogy learning theory in the mobile learning application.

**LITERATURE REVIEWS**

Literacy is hard to measure. The estimation of literacy rates requires census or controlled survey measurements. Literacy statistics for most countries cover the 15 years old population and above. Data on adult literacy was addressed in Malaysia by the UNESCO Institute of Statistics on the basis of national censuses and household surveys.

Statistics of adult literacy in 1970 derived from UNESCO Institute [5] showed that Malaysia’s adult literacy rate stood at only 58.1 percent with an illiterate population of adult is 2,521, as compared to other Asia-Pacific countries such as Mongolia which recorded the highest adult literacy percentage of 95.2 percent.

The same survey conducted in 2000 to 2006 showed an increase in Malaysia’s adult literacy rates to 91.5 percent with the number of illiterate populations at 1,527 as shown in table 1 [6].

**Table 1** Statistics of adult literacy in 1970 and 2000 to 2006 among asia-pacific countries [5]

	COUNTRY	Total adult literacy rate (15 and over)		Total adult illiterate population (15 and over)	
		1970 (%)	2000-2006 (%)	1970 (in thousands)	2000-2006 (in thousands)
1	MNG/Mongolia	95.2	97.4	34	49
2	MDV/Maldives	87.5	97.0	9	6
3	THA/Thailand	80.2	93.9	3,984	3,022
4	PHL/Philippines	81.8	93.3	3,632	3,711
5	CHN/China	52.9	93.0	235,964	73,232
6	LKA/Sri Lanka	80.8	90.8	1,443	1,339
7	IDN/Indonesia	56.1	91.0	30,548	14,772
8	VNM/Viet Nam	83.0	90.3	4,069	5,892
9	MMR/Myanmar	69.8	89.9	4,798	3,529
10	MYS/Malaysia	58.1	91.5	2,521	1,527
11	IRN/Iran	34.3	84.0	10,460	8,133
12	KHM/Cambodia	48.9	75.6	2,014	2,188
13	LAO/Lao PDR	39.4	72.5	948	967
14	IND/India	33.1	65.2	221,144	270,058
15	PNG/Papua New Guinea	39.8	57.3	786	1,579
16	PAK/Pakistan	20.9	54.2	28,442	47,060
17	NPL/Nepal	16.4	55.2	5,943	7,620
18	BGD/Bangladesh	24.6	52.5	27,295	48,392

Source: [5]

Another report by Asia Pacific Cultural Centre (ACCU) in 2007 (Table 2) based on statistics by UNESCO Institute showed that Malaysia literacy rate is at 91.9 percent. This puts Malaysia in the top four countries behind Maldives (97.0%), Thailand (94.1%) and China (93.3%) and ahead of Indonesia (91.4%) [7].

Recent 2017 data [8] states that Malaysia’s percentage of adult literacy rate is 95.43 percent. Malaysia ranks at 70 out of 158 countries worldwide. However, Malaysia now ranked lower than Indonesia (54).

Based on statistics from year 1970 to 2017, adult literacy rates in Malaysia showed a positive trend. However, adult education in Malaysia needs to be further improved to further reduce the illiterate population and increase the percentage of literacy rate as well as increase income and job opportunities among Malaysians as discussed in the next section.

**Negative Impact of Low Literacy on Income and Job Opportunities**

Low skills in literacy often lead to minimal payrolls and limited employment opportunities, leading to higher unemployment rate [9]. There is a relationship between education level and salary rate [10]. This is because salaries for employees with low literacy skills were \$ 14.60 per hour. Furthermore, the study by the Department of Labor [11] also shows that 30 to 70 percent of workers rarely do jobs that involve literacy skills of reading. In Brazil, Monthly Employment Survey (PME) [12] conducted in January 2002 to December 2006 by the Brazilian Geography and Information Institute shows that the average salary of illiterate people is 30 percent of the literate salary in 2002

and this shows a minimal increase to 32 percent in 2005.

**Table 2** Adult literacy rates 2007 of asia-pacific countries [7]

COUNTRY	Country Data: Adult Literacy Rate
	Adult literacy rate (15 and over) (%)
Afghanistan *	28.1
Bangladesh	53.5
Bhutan	55.6
Cambodia	76.3
China	93.3
India	66.0
Indonesia	91.4
Iran	84.7
Lao PDR	73.2
Malaysia	91.9
Maldives	97.0
Mongolia	97.3
Myanmar *	89.9
Nepal	56.5
Pakistan	54.9
Papua New Guinea	57.8
Philippines	93.4
Sri Lanka	91.5
Thailand	94.1
Vietnam *	90.3

Source: [7]

### Level of Literacy

The level of literacy defined by International Adult Literacy Skill (IALS) scale are grouped into five skills level. Level 1 represents the lowest ability range and level 5 the highest [11].

This study is focused on adult literacy level 1. Level 1 refers to people with very poor skills where, for example, the individual may not be able to determine the right amount of medicine to give a child from information printed on the package. This could occur due to several factors that will be discussed in the next section.

### Factors of Low Literacy

There have been several studies on the topic of adult literacy which explored the reasons for low literacy levels. There is not one single cause for why adults have difficulty with literacy. The reasons are as varied as the individuals themselves, and depend upon past experiences, life situations, and personal strengths, challenges, and interests. The following are the most frequent causes of illiteracy in adults [13]:

1. Parents with little schooling.
2. Lack of books at home and lack of stimulation as to the importance of reading.

3. Doing badly at or dropping out of school. Many have not completed high school.
4. Difficult living conditions, including poverty.

### Andragogy

The Andragogy term was introduced by Alexander Kapp in 1833. Andragogy is defined as a requirement for lifelong learning [14]. Andragogy (the theory of adult learning) defines that adults are attracted to learn if their needs and interests can be met [15]. In addition, those who are involved with adult education have defined andragogy over time with additional theories [16].

Andragogy has the following assumptions about adult learning [15]:

1. Adults need reason to study.
2. Adults need to be responsible for themselves in order to learn.
3. The experience that adults gain will be the source of learning.
4. Adults will only learn when they need to do something that affects themselves.
5. Adult will learn if they need to find a solution to the problem.
6. Adults will learn if they are exposed to internal motivation.

Among the varying theories of andragogy, it is the principle of self-directed learning that is the most significant [16]. Adults learn because they want to, not because they have to, and it is this internal motivation that is key to this research study.

There are several techniques and teaching strategies based on theory of adult learning such as lecture, computer-based training, problem solving, and demonstration. This research finds that adults with low literacy do engage with smartphones and are positive about using such technology. Therefore, using mobile phones as a learning tool (m-learning) is promising

M-learning is an extension of computer-based instruction technology. This technology enables adult learners to learn by offering comprehensive tutorials and active learning according to their own ability [17]. Besides that, this technique also offers

distinct methods of learning through the implementation of application using listening, images and many more.

The next section discusses the KEDAP module. The content for the application was adapted from this module.

### **KEDAP Module**

The KEDAP module was developed by Kementerian Pelajaran Malaysia (KPM) [18] to help teachers to teach literacy skills. Various activities are suggested in the KEDAP module, but teachers can modify the activity or suggest other activities that are considered more appropriate to the background of the adult learners. This model coincides with andragogy.

The KEDAP module was prepared according to the functional literacy theme which are family, health, civic and environment, economy and safety. For each theme, the various activities are proposed which include the subtheme also the learning outcomes. Each subtheme is applied with various activities to achieve the learning outcomes.

This study, adapted the family theme to teach the alphabets. The learning outcome is that adult learners can identify and mention alphabets.

This application also adopts the phonics components in reading. This is discussed in the next section.

### **Phonics Components in Reading**

Phonics is a system of teaching reading that builds on the alphabetic principle, a system of which a central component is the teaching of correspondences between letters or groups of letters and their pronunciations [19]. Readers use phonics skills, beginning with letter or sound correspondences, to pronounce words and then attach meaning to. The phonics component is appropriate for level 1 of adult learners as they can start learn reading by learning the letters and pronunciations.

In addition, this application is also based on language experience as a learning strategy to reading and will be discussed in the next section.

### **Language Experience Approach to Teaching Reading**

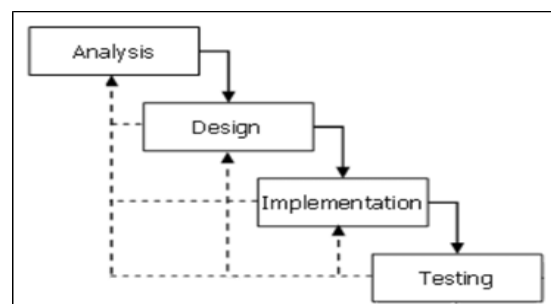
This section describes Language Experience that is part of the Socio-Psycholinguistic approach to help readers understand what they read [20].

This approach is defined as the use of students' knowledge and experience as reading material. The language experience approach is a very effective method for getting students in the beginning grades to read meaningfully. In this approach, learner's speech determines the language patterns of what they will read, and the learner's experiences determine the content. The emphasis is not on decoding from the printed page but rather on speaking to express a thought, followed by the writing of that thought. Since the written material is made up of the learner's experiences, the learners will have more of an incentive to learn to read. Not only that, language experiential approach also regarded to be anything associated to life such as work, home and soon. This is what is applied in the application. This will ease learners to remember what they are learning and are interested in learning reading.

### **METHODOLOGY**

This study underwent 4 phases; requirement analysis, design, implementation and testing.

The first phase is to determine what the system will do, the second phase is how the system will be designed, the third phase is implementation which involves the process of writing the code, and the fourth phase is testing the system.



**Figure 1** Methodology

### Requirement Analysis Phase

This phase involves activities such as defining problem statement, objectives, scope and significance about adult literacy. Besides that, the study of mobile application and related existing system is also done. The activities were carried out by reading related article, journal, thesis and conference paper to be delivered into the proposal and literature review as summarized in figure 2.

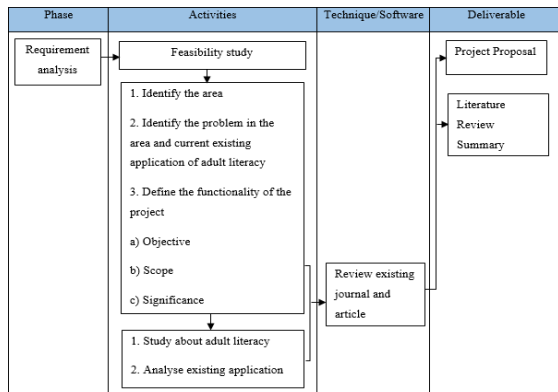


Figure 2 Requirement analysis phase

### Design Phase

The design phase is a process where the planning of solution for a software problem is done [21]. Bassil [21] further stated that in this phase, software developers and designers would create the plan for the solution, which includes the design of the algorithm, the architecture of the software, the design of the storyboard and graphical user interface design. Figure 3 shows the design phase diagram.

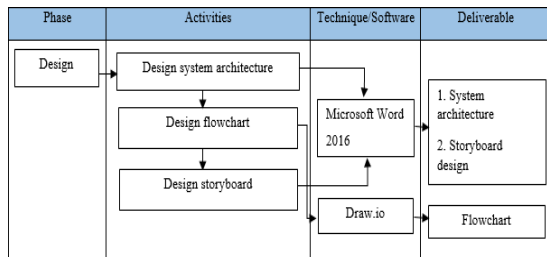


Figure 3 Design phase

### System Architecture

System Architecture is the diagram that shows the overview of overall components that were involved

in the development in order to create the project. These components have their own purposes. The major components involved are the User, Mobile Application and SQLite Database. All these components are interconnected and communicate with each other.

Figure 4 shows the architecture of the project. For saving the data, the project used the SQLite Database in Android Studio itself. SQLite is a opensource SQL database that stores data to a text file on a device. Android comes in with built in SQLite database implementation. These SQLite Database allow users interaction through the user interface and retrieving the learning activities. The SQLite Database stores all data for the application to execute and function.

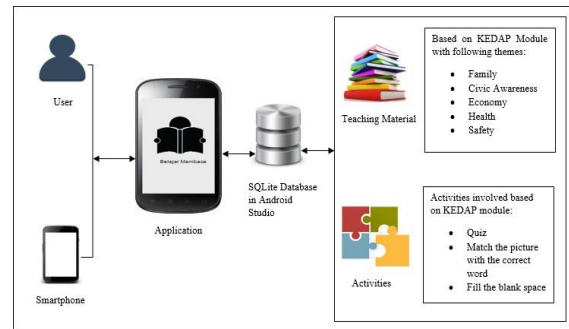
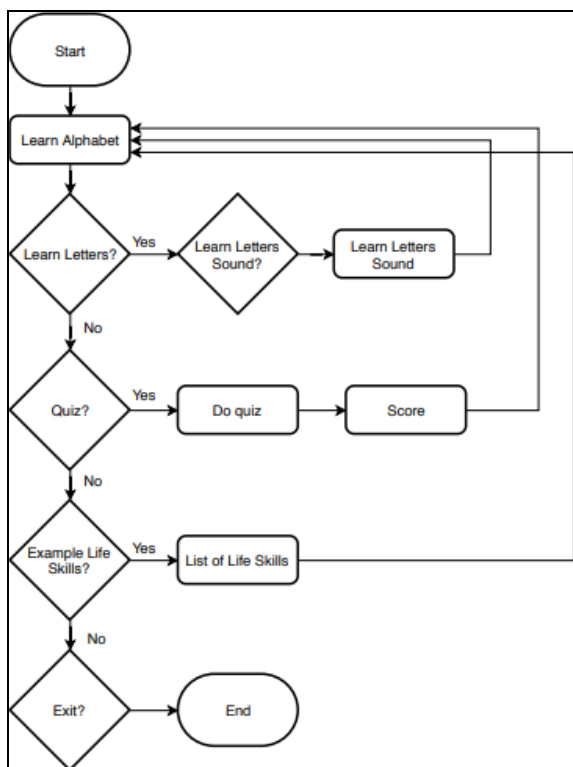


Figure 4 System Architecture

Information of teaching material and activities are stored in the SQLite database. Besides supplying data about literacy, it also stores all user feedback data when user use the application. It will response to the user's action to send an appropriate data.

Figure 5 shows the flowchart for the application.



**Figure 5** Flowchart Diagram

The application starts with learn alphabet. In the alphabet menu, users can choose whether to learn letters, answer quiz and look for example of life skills. If user clicks on learn letters, they will be directed to learn letters page. Learn letters sound is the introduction phase in the KEDAP module. In this phase, users will be introduced with the letters sound in the exploration phase in the KEDAP module. In this phase, users need to distinguish the letters. As literacy application focused on lowest level of literacy, hence users will learn only alphabets as stated in KEDAP module.

If users click quiz, they will be directed to the score page after completing the quiz. Users can repeat the quiz. The quiz page is the evaluation phase in the KEDAP module.

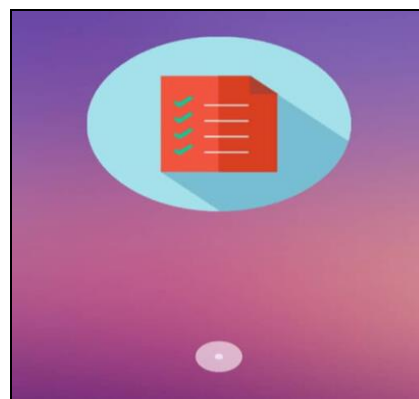
In this phase, users will be evaluated on the level of understanding the letters that have been learned at the introduction and exploration phase in the literacy application

Lastly, if users choose to look for example of life skills, they will be directed to the list of life skills with family theme. This page implements the

Language Experiential approach as it relates to adult life.

**Design**

Figures below shows the screenshot of the literacy application that have been developed.



**Figure 6** Splash screen

Upon launching the mobile apps, users were greeted with splash screen. The time interval for the splash screen is 3000. Figure 6 shows the application as viewed on the iNew mobile phone.



**Figure 7** Main menu screen

Figure 7 shows main menu screen. Main menu screen “Belajar ABC” and “Keluar”. Users will be required to choose “Belajar ABC” to start learning. The button will direct the users to “Belajar ABC” screen when clicked. Figure 8 shows the “Belajar ABC” screen. The screen has three (3) buttons which represents three main steps of learning, which are to recognize the letters, to relate the letters learned with life skills and to answer the quiz to evaluate learning. These steps are skills users should possess to master learning ABC.



**Figure 8** Belajar ABC screen

“Belajar Huruf” button is the step of introducing the letters with sound aid. While “Contoh” button is the practicing of letters learned with life skills’ examples. “Kuiz” button is the evaluation phase which comprises of questions related to life skills learned in the “Contoh” screen.

Figure 9 shows the “Belajar Huruf” screen. The concept of learning is simple; users only need to touch the letters. Every letter will produce its own sound. Therefore, users need to give particular attention to the letter and the sound from the letter in order to learn the letters.



**Figure 9** Belajar Huruf screen

Figure 10 shows the “Contoh” screen. The screen uses white background and default font text to suit adult learners’ needs and to reduce adult learners’ sight sensitivity. This screen prompt users to learn letters with images related to everyday life based on family theme. The sound of the letter will be pronounced when learners click on each letters. This audio sound will assist learners to learn the letters.



**Figure 10** Contoh screen.

After learning the letters, students will be tested with simple questions to test their understanding and memory about the letters and Life skills. Simple questions were given as users often have difficulty in understanding long instructions and sentences as their literacy skills is low (figure 11).



**Figure 11** Sample of question from Quiz

The quiz screen has the score and view answer button to show the users’ score after answering the questions. Figure 12 shows the score after all the questions have been attempted in the quiz. Score is given based on the number of correctly answered questions.



**Figure 12** Score screen

Figure 13 shows the view answers screen after learners complete answering the self-test questions. The screen will display all the answers related to each question.



**Figure 13** View answers screen

## RESULTS

User usability testing is the process of testing the system or application to identify if it is usable and match the user's expectation. This testing process measures user satisfaction in using the system. This testing also records the end users feedbacks, which is important for the fixing and improvement of the system. For this project, a total of 10 respondents were selected for testing the system and application. During the test, a Usability Test form were provided to each respondent and their feedbacks were recorded by the researcher.

The Usability Test form consists of three sections, which are Part A: User Interface of application, Part B: Learning material and Part C: Efficiency of learning material. The results were then analyzed and discussed for future improvement.

This study involved respondents from three locations which are Kampung Nechang, Kampung Chabang Empat and Kampung Cherang Melintang in Tumpat, Kelantan. All respondents are Malays with eight males and two females. Respondents were given the access to the application which was installed on their mobile phone.

### Part A & Part B: User Interface and Learning Material

Part A (figure 14) is about the user interface. Majority of respondents admitted the application is easy to use. 100% agreed that the instruction provided is clear. Majority (90%) of them agreed that the font usage is clear and interesting color is used. 80% of them agree that the structure is systematic and image used attract their attention. 70% agree that the application used suitable sound.

Part B (figure 14) is about learning material. All the respondents agree that activities used is helpful and encouraging. Majority (90%) of them agreed that the content suit the needs and they also understand the learning objective.



No of Learners: 10		Agree		Neutral		Disagree	
Question	No of Learners	%	No of Learners	%	No of Learners	%	
<b>Part 1: User interface</b>							
Easy to use	7	70	3	30	-	-	
Clear instruction	10	100	-	-	-	-	
Clear and suitable font usage	9	90	1	10	-	-	
Interesting color usage	7	70	3	30	-	-	
Systematic structure	8	80	2	20	-	-	
Images attract interest	8	80	2	20	-	-	
Suitable sound usage	7	70	2	20	1	10	
<b>Part 2: Learning material</b>							
Learning is interactive and fun	7	70	3	30	-	-	
Activity in learning is helpful and encouraging	10	100	-	-	-	-	
Content suit the needs	9	90	1	10	-	-	

Figure 14 Result of Section A and B

**Part C: Efficiency of Learning Material**

Question 1 of this section asked whether the time required by the respondents to acknowledge letters reduced. Figure 15 shows that 70% of respondents agree that time needed to recognize letters reduced after they used the app. While 20% of them very agree and 10% moderately agree that the application helps them to recognize letters faster.

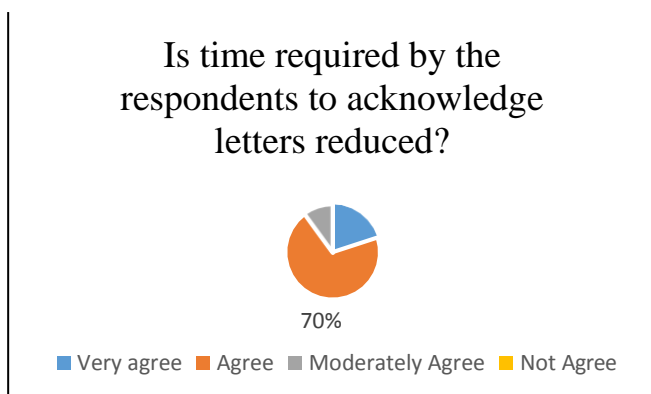


Figure 15 Time needed by the respondents to recognize the letters

**CONCLUSIONS**

To conclude, this Android Mobile Application aimed for adults with low literacy skills allows adults to learn alphabets through their Android smartphones. This application can also be used to assist teachers in teaching adult literacy.

The application was evaluated by the end users and the results of these tests showed that the idea is well accepted. The application allows adults to increase

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