

# An Application of Multimedia for Basic Arabic Learning Using Fisher-Yates Shuffle Algorithm on Android Based

Wawan Gunawan\*, Herry Derajad Wijaya

Faculty of Computer Science, Universitas Mercu Buana-Indonesia

DOI:10.21276/sb.2019.5.7.6

| Received: 01.07.2019 | Accepted: 09.07.2019 | Published: 30.07.2019

\*Corresponding author: Wawan Gunawan

## Abstract

Indonesia is the largest Muslim country in the world followed by India in second place and Pakistan in third place [1], so that the majority of the population should understand the Arabic so that they will be able to read the Qur'an properly and correctly. The daily conversation learning process using Arabic we will use the android media application with the Multimedia Development Life Cycle (MDLC) research method and the Fisher-Yates Shuffle algorithm to perform a random process of problem training. At the stage of storyboarding using Balsamic Mockup tools, while collecting materials for images, sounds, text can be obtained free of charge or by ordering to other parties in accordance with the design made in the previous stage.

**Keywords:** Learning Application, Arabic, MDLC, Fisher Yates Shuffle, Android, Multimedia.

**Copyright @ 2019:** This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

## INTRODUCTION

Indonesia is the largest Muslim country in the world followed by India in second place and Pakistan in third place [1], so that the majority of the population should understand the hijaiyah letters so that they will be able to read the Qur'an properly and correctly. Understanding the letters of hijaiyah will then be followed by the learning of Arabic language so that later we can translate the meaning of the Qur'anic language, so that at least we will understand the content contained in the verses in each letter of the Qur'an [2].

Studying hijaiyah is one of the first steps to reading the Holy Quran. The ability to learn reading the hijaiyah letters requires a good strategy, therefore the choice of the right method or media of learning has a large contribution in improving the ability to read the hijaiyah.

Current technological developments can enable us to solve these problems by doing learning anywhere and anytime [3]. One of them is the use of mobile phones that are installed learning support applications, so that the content needed by users can be accessed easily.

The learning process is equipped with multimedia facilities that are able to combine text, images, and audio in one device can make it easier to

learn the hijaiyah letters that are presented in one application, especially if presented with an attractive and easy to learn[4]. So that there is a need for an introduction system that can later help with the presentation that is packaged in smartphone media.

This learning application will give a quiz randomly to find out whether the user has understood the learning presented, so that he will continue to sharpen understanding to user.

### The formulation of the problem in this study are

- How to make an application that is able to facilitate hijaiyah letter learning effectively and efficiently.
- How to pronounce hijaiyah with good and true.

Based on the above problems, this study aims to build an android application that can help the learning process of reading hijaiyah letters by adding sound into the application to make it easier in the learning process.

### Review of literature

#### Application

Applications according to Kamus Besar Bahasa Indonesia are computer programs or software designed to do certain tasks. While computer programs are programs that are created specifically to allow computers to perform certain functions [5].

## Multimedia

Multimedia can be defined as computer-based products that enhance information communication by combining two or more elements of text, graphic art, sound, animation, video, or interactivity [4].

The use of multimedia in learning media has no significant difference between adults (25-50 years old) and the age of children [4]. Multimedia applications must support all content access and communicate with native speakers or other users to support learning [6].

Nearly 80% of 26 respondents agreed that multimedia is able to attract students' attention and interest in anticipating the learning process, encouraging active students to understand learning and the images and animations presented can increase students' enthusiasm in understanding basic level vocabulary [7].

## Storyboard

Storyboard is a sketch of a picture arranged sequentially according to story ideas [8]. With storyboards, storytellers can convey story ideas more easily to others, because with storyboards the story maker can make someone imagine a story following the images that have been presented, so that it can produce the same perceptions as the story ideas made.

## Android

Android is an operating system issued by Google especially for smartphones and tablets. Android also has a store where there are 1 billion active users. Talking about programming is certainly not separated from the Integrated Development Environment (IDE) that can be used by Developers. By using Android Studio developers can create applications from scratch until publish into the store. Android Studio also has several built-in features that really help developers to maximize the process of creating applications such as Gradle, Code Completion, and integrated with several services from Google such as Firebase [9].

## Hijaiyah

According to Efendi, Purwandari, & Aziz [10]. The Hijriy or Arabic letters are letters that have been used by Muslims throughout the world to read the Quran. Number of Hijaiyah letters commonly known as 28 letters, namely: ط ظ ض ص ش س ز ر ذ خ ح ج ث ت ب ا [10]. But there is an addition of

Hijaiyah letters that often appear in Iqra 'books that are letters “ ء ” and “ ل ” bringing the number to 30 characters.

## Fisher-Yates Shuffle Algorithm

According to Bendersky [11] Fisher-Yates Shuffle is an algorithm to produce a random permutation from a finite set, the result of randomizing this algorithm has the same probability [11].

Fisher Yates Shuffle (taken from the name Ronald Fisher and Frank Yates) or also known as Knuth Shuffle (taken from the name Donald Knuth), is an algorithm to produce a random permutation from a finite set, in other words to randomize a set. If implemented correctly, the results of this algorithm will not be biased, so each permutation has the same possibility [12].

The basic process of the Fisher-Yates Shuffle is almost the same as taking cards one by one from a stack of cards until there is nothing left. The Fisher-Yates Shuffle algorithm is considered as an objective and optimal method by many people to produce truly random permutations from finite sets [13].

Then the algorithm used by the author is the Fisher-Yates Shuffle algorithm that is applied to the question quiz to display random questions.

## Research Methods

### Data Collection Method

The data collection method used in this study is:

- Observation Method. Observation or direct observation of the object of research. The observation technique is carried out by structured observation by preparing a list of data and data source needs.
- Literature review method. Methods of collecting data obtained by studying, researching, and reading books, information from the internet, journals, theses, and theses related to Arabic-language applications and daily conversations.

### Multimedia Development Life Cycle

Software development for implementation in this study uses Luther Sutopo's Multimedia Development Life Cycle (MDLC) method which consists of 6 (six) phases.

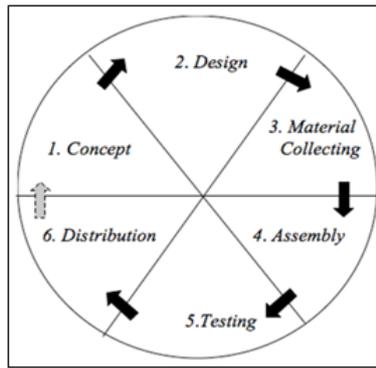


Fig-1: Phases of Development of Multimedia Development Life Cycle Systems

The phases in MDLC that are systematically arranged are as follows

**a. Concept**

The concept stage is the initial stage in the MDLC cycle. At this stage it starts by determining the purpose of making the application and determining the application user.

**b. Design**

The concept that is mature will make it easier to describe what should be done. The purpose of the design stage is to make specifications in detail about the project architecture, the appearance and requirements of the project material, and style. The storyboard function is as follows:

- Can be used to get the approval of the filmmaker or sponsor so that a clear picture is obtained.
- An approved storyboard can be used as a guideline for implementing the production process.
- The software that will be used to design the interface is Balsamiq MockUp.

**c. Material Collecting**

Collecting material is the stage for collecting materials that are suitable for your needs. These materials include clip art images, photos, animation, video, audio, as well as text that has been made or that still needs to be modified

according to existing needs. These materials can be obtained free of charge according to the design made in the previous stage.

**d. Assembly**

The assembly stage is the stage of making all multimedia materials. Applications that will be created are based on the design stage, such as storyboards. This stage will use authoring software, such as Android Studio.

**e. Testing**

Tests are carried out to ensure that the results of making multimedia applications are in accordance with the plan. There are two types of tests used, namely black box testing and white box testing.

**f. Distribution**

This stage is the last stage in the multimedia development cycle. Distribution can be done after the application is declared feasible to use. At this stage, the application will be stored in a storage media such as a CD, mobile device or website. If the storage media is not enough to hold the application, compression on the application will be done.

**Application Requirement Analysis**

Supporting equipment is the hardware and software used for making this application. The following are the specifications:

**Hardware**

Table-1: Hardware

Hardware	Spesifikasi
Processor	Intel Core i3 Processor
Processor Onboard	Intel® Core™ i3-3110M Processor (2.4 GHz, Cache 3MB)
Chipset	Intel® HM77
RAM	2 GB DDR3 (+4GB DDR3)
VGA	NVIDIA Geforce 705M 1GB
Display Performance	14" WXGA LED
Display	LED
Audio	Integrated
Storage	500 Serial ATA 5400 RPM

Software

**Table-2: Software**

<b>OS</b>	<b>Microsoft Windows 8 (64bit)</b>
Game Engine	Android Studio
Editor Gambar	Adobe Photoshop
UML	Enterprise Architect
APK Builder	Cocoon.io

**Design System**

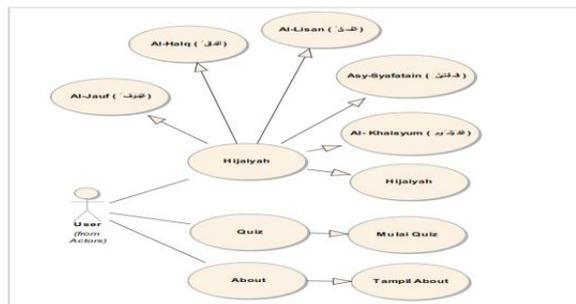
UML (Unified Modeling language) is one standard language that is widely used in the world industry to define requirements, make analysts and design, and describe architecture in object oriented programming.

The design of this application uses UML (Unified Modeling Language) which consists from the design of use case diagrams, to design activity diagram, and diagram design sequence.

**Use Case Diagram**

Use Case diagrams explain what will be done by the system to be built and who interacts with the system. Below is the design of use case diagrams from the Android-based letter makhoriJul learning application.

The Actors involved in this application are users. Users are actors who use Android-based mobile phones.

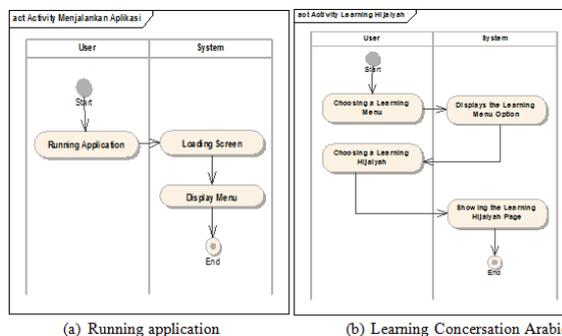


**Fig-2: Use Case Diagram**

**Activity Diagram**

The activity diagram illustrates the various activities in the system that are being designed, how each path starts, the decisions that may occur, and how they end. Activity diagrams can also describe parallel processes that might occur in several executions. the main menu on Fig. (a) and the user selects the learning menu on the main menu and then selects the Hijaiyah learning menu on Fig. (b).

In this Activity Diagram, the user runs the application and then displays the loading screen menu and after that



**Fig-3: Activity Diagram (a)(b)**

In this Activity Diagram the user selects the exercise menu and then enters the start training menu after which the user will work on the questions

randomly on Fig. (c) and the user selects the menu about then will appear about the application of the makhoriJul huruf learning on Fig. (d).

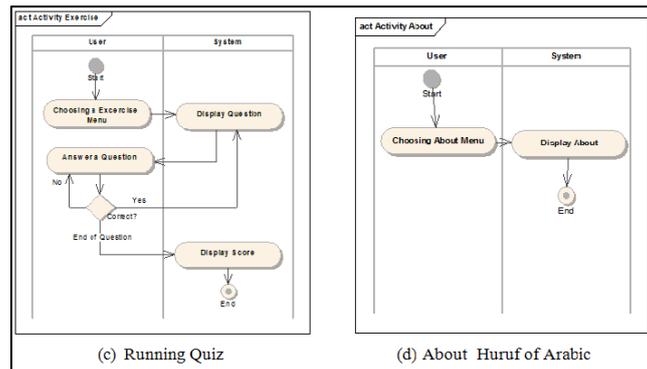


Fig-4: Activity Diagram (c) (d)

**Sequence Diagram**

Sequence diagrams are used to describe the behavior of a scenario. This diagram shows an example of an object and message (message) placed between these objects in the use case. The main component of sequence diagrams consists of objects written with a rectangular box named. Message is represented by a line with an arrow and a time indicated by vertical progress.

In this Activity Diagram, the user runs the application and then displays the loading screen menu and after that the main menu on figure (a) and user selects the learning menu on the main menu and then selects the Hijaiyah learning menu on figure (b).

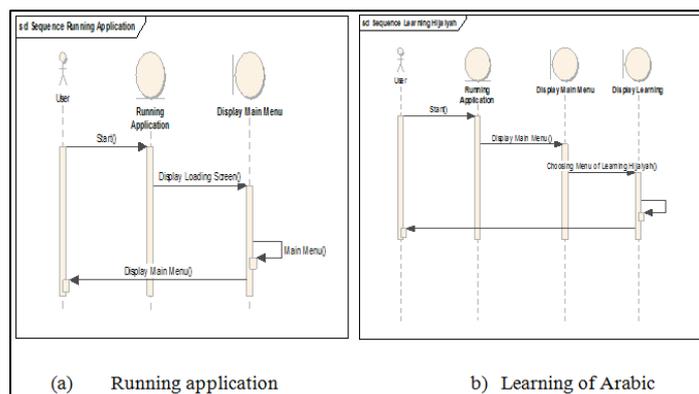


Fig-5: Sequence Diagram (a)(b)

In this Activity Diagram the user selects the exercise menu and then enters the start training menu after which the user will work on the questions

randomly on figure (a) and the user selects the menu about then will appear about the application of the makhoriijul huruf learning on figure (b)

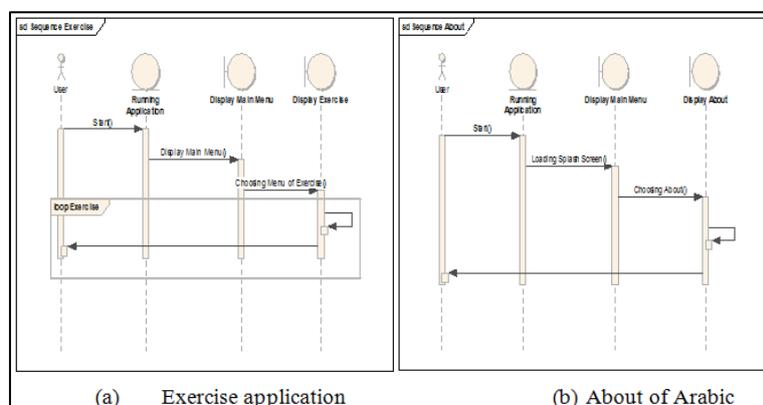


Fig-6: Sequence Exercise Makhoriijul Huruf of Arabic

## RESULT AND DISCUSSION

### Fisher-Yates Shuffle Algorithm

This algorithm will randomize practice questions to be not sequential or random in the exercise menu.

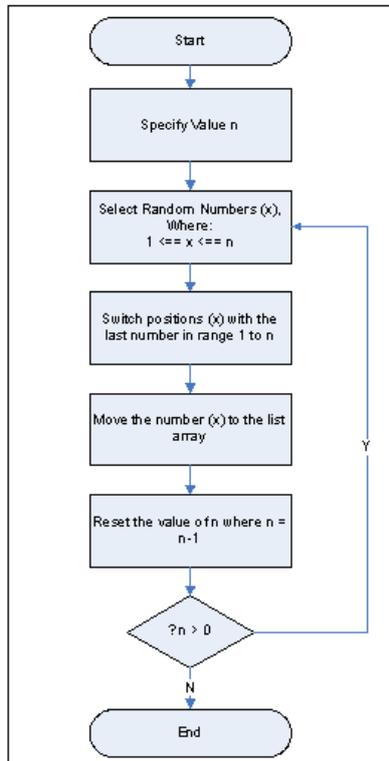


Fig-7: Flowchart Fisher-Yates Algorithm

Using the Fisher-Yates Shuffle algorithm will be used at the time of making the application exercise, where several questions will be provided regarding the discussion that has been submitted in this application and presented randomly. The purpose of giving this material is randomly so that users do not memorize the questions presented, but must understand the questions presented with the material presented. because the introduction of this application is the basis of the next stage of Arabic language learning

### User Interface

The splash screen will be displayed when the first time the application is activated is shown on figure 13(a), while the main menu will be displayed if the menu icon is selected is shown on figure 13(b). When the Home menu is selected it will appear is show on figure 14(a), and when one of the exits is selected it will be displayed is show on figure 14(b).

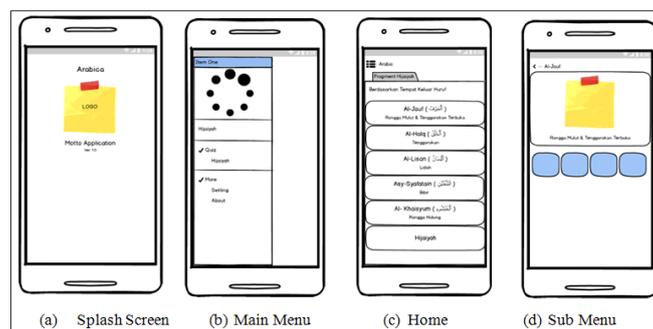
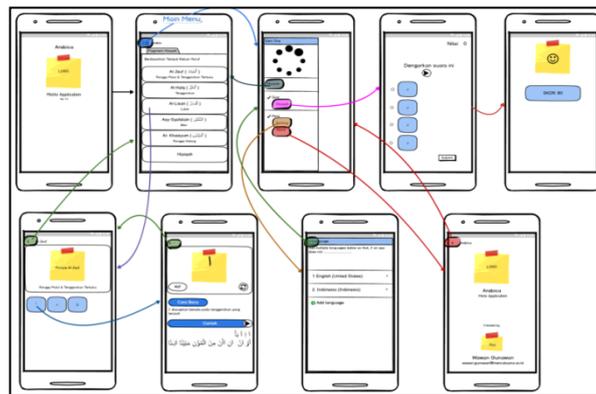


Fig-8: User Interface Application

one of these letters, it will be displayed is show on figure 15(a) and issued a sound based on the letters hijaiyah.

The initial sound can be repeated by selecting the button, then the user can listen to letters hijaiyah and read the text for the entire letter of meaning based on the selected one is show on figure 15(b).

**Storyboard**



**Fig-9: Storyboard of Arabic**

**Black Box Testing**

Black box testing is a test carried out only to examine the functions of the software and observe the results of execution through test data. If it is analogous to seeing a black box and we can only see the appearance of the outside without knowing what is behind the black wrapper. Just like black box testing, evaluates only from its external appearance (its

interface), its functionality without knowing what actually happens in the detailed process (only knowing input and output).

The results for BlackBox testing on the hijaiyah learning menu can be generated as in table 3 below

**Table-3: Testing Menu Learning**

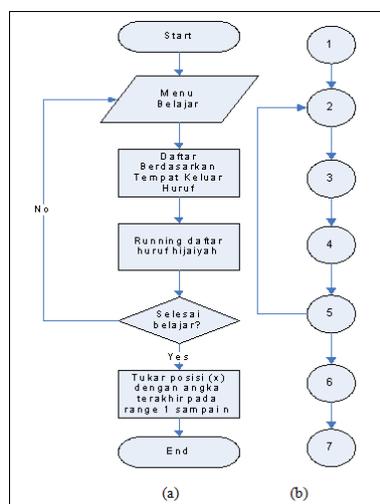
Testing			
Input Data	Which are expected	Observation	Conclusion
Select Font Exit	Displays the letter hijaiyah according to where the letter exits	Select the sound button and leave the sound	Display

The results of the presentation above, the results for testing Black Box on the main menu can be generated as in table 4 below

**Table-4: Testing the Main Menu**

Testing			
Input Data	Which are expected	Observation	Conclusion
Home Menu	Display the Main page	Choose hijaiyah menu	Display
Menu Hijaiyah	Showing hijaiyah menu	Choose hijaiyah menu	Display
Quiz Hijaiyah	Showing practice questions	Answer practice	Display
Setting	Display the settings page	Choose the language used	Display
About	Showing the page about	Showing the page about	Display

**White Box Testing**



**Fig-10: Flow Chart (a) & Flow Graph (b) of Menu**

Cyclic complexity of flow charts can be obtained by calculation

$$V(G) = E - N + 2$$

(1)

$$V(G) = 7 - 7 + 2 = 2$$

$V(G) < 10$  means fulfilling to its cyclomatic complexity, while the set lines generated from independent lines are as follows:

- a. 1-2-3-4-5-6-7
- b. 1-2-3-4-5-2

**Implementation**

The results of the explanation above will produce an application display for the splash screen when the first time the application is run as shown in

figure 18 (a), after the splash screen is finished, the main menu of the application will be displayed as shown in figure 18 (b)

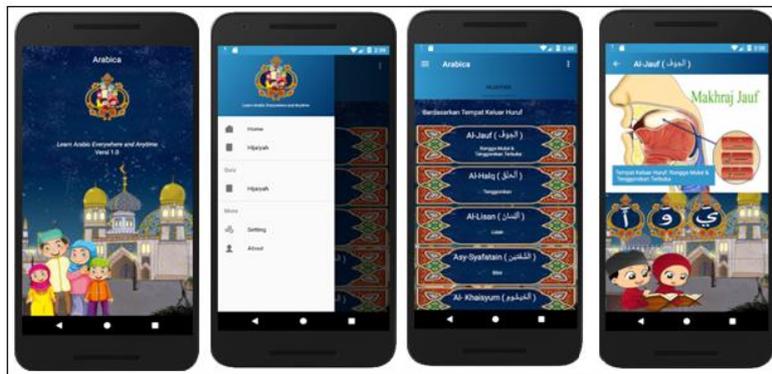


Fig-11: Implement Splash Screen (a) & Main Menu (b) of Menu

After displaying the application menu, then if we choose the hijaiyah menu, there will be a number of hijaiyah letter learning options based on the location of the letter exit as shown in figure 19 (a). after we have chosen one of several choices for the location of the letter exit, what letters will be included which include those categories which can be shown in figure 19 (b).

Next after the above description, then when we choose one of the hijaiyah letters it will be displayed as in figure 20 (a) and immediately emits the sound of the hijaiyah letter. If we want to do an overall test of the letters, we only choose the play button found in the application.



Fig-12: Implement Detil Voice (a) & About (b) of Menu

## CONCLUSION

As a conclusion from this research can be presented as follows

- The purpose of the research is to build an android application that can help the learning process of reading hijaiyah letters by adding sound into the application to make it easier in the learning process.
- The phases of research methodology are literature reviews, data collection, use case modeling, design and interface reports using the MDLC method.
- This application can help users know the forms and pronunciation of hijaiyah letters which are accompanied by practice questions developed using the Fisher Yates Shuffle algorithm.

## Suggestion

- It is hoped that this application will be developed for learning combining basic hijaiyyah or per-word letters.
- It is hoped that this application will be developed by providing knowledge to read the Koran in the form of learning recitation.

## ACKNOWLEDGEMENT

Praise be to the presence of Allah S.W.T. who has given His mercy so that the writing of this scientific article is resolved. And I do not forget to say thank you to the extended family of the Faculty of Computer Science, Universitas Mercu Buana, who has provided support in writing this scientific article.

## REFERENCES

1. Mahadevan, J., & Mayer, C. H. (2017). *Muslim minorities, workplace diversity and reflexive HRM*. Routledge.
2. Hafid, K. (2016). Relevansi kaidah bahasa arab dalam memahami al-qur'an. *Jurnal Tafseer*, 4(2).
3. Muyaroah, S., & Fajartia, M. (2017). Pengembangan Media Pembelajaran Berbasis Android dengan menggunakan Aplikasi Adobe Flash CS 6 pada Mata Pelajaran Biologi. *Innovative Journal of Curriculum and Educational Technology*, 6(2), 22-26.
4. Ellis, T. J. (2001). Multimedia enhanced educational products as a tool to promote critical thinking in adult students. *Journal of educational multimedia and hypermedia*, 10(2), 107-124.
5. Indonesia, K. B. B. (2008). Departemen Pendidikan Nasional. *Jakarta: Pusat Bahasa*.
6. Ratnasari, A., & Haji, W. H. (2018). Developing Interface Design of Interactive Multimedia for Learning English in Senior High School. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT)*, ISSN, 2456-3307.
7. Wijaya, H. D., & Devianto, Y. Application of Multimedia in Basic English Vocabulary Learning with the ADDIE Method.
8. Khulsum, U., Hudiyono, Y., & Sulistyowati, E. D. Pengembangan Bahan Ajar Menulis Cerpen dengan Media Storyboard pada Siswa Kelas X SMA. *Diglosia*, 1(1), 1-12.
9. Fazrie, M. (2017). Aplikasi android pendeteksi masalah komputer berbasis windows. *Faktor Exacta*, 10(2), 144-153.
10. Efendi, R., Purwandari, E. P., & Aziz, M. A. (2015). Aplikasi Pengenalan Huruf Hijaiyah Berbasis Marker Augmented Reality Pada Platform Android. *Pseudocode*, 2(2), 124-134.
11. Bendersky, E. (2010). "Eli Bendersky's website," 28 May 2010. Available: <https://eli.thegreenplace.net/2010/05/28/the-intuition-behind-fisher-yates-shuffling>. [Accessed 23 February 2019].
12. Ade-Ibijola, A. O. (2012). A simulated enhancement of Fisher-Yates algorithm for shuffling in virtual card games using domain-specific data structures. *International Journal of Computer Applications*, 54(11).
13. Banyumanis, I. U., & Fitriannah, D. Aplikasi Alarm Weker Berbasis Android Dengan Algoritma Fisher Yates Shuffle Untuk Mengacak Pertanyaan. *Jurnal Ilmu Teknik dan Komputer*, 1(1),1-10.