**Jawi-AR Apps: Single Jawi Character Connecting Method to single words using AR Technology**

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Abstract. Jawi script is very important because the Jawi script position reflects the identity of the Malays and almost equals Arabic script which indirectly enables the reading of the Qur'an among those who study Jawi script. In addition, most sources of Islamic Education knowledge are written in Jawi script. Thus, Jawi script become one of the areas taught in the subject of Islamic Education. Based on the Jawi analysis of the mid-2018 examinations for second year students, Sekolah Kebangsaan Seksyen 19, showed that 56% of 157 students lacked the skills to recognize and write connecting and non-connecting character. This finding shows that some students are ignorant and incompetent in the Jawi ways of connecting. As a result, Jawi-AR Apps which is a smartphone application that integrates Augmented Reality (AR) technology has been developed with the aim of helping to improve Jawi characters' connecting knowledge and skills in keeping with digital technology in today's society. In conclusion, this app can help provide early exposure and interest of students to learn Jawi and provide self-learning.

1. Introduction

The mastery of reading and writing in Jawi character is crucial to mastering the content of knowledge in Islamic Education subjects. This is because most sources of Islamic Education knowledge are written in Jawi character [1]. The position of Jawi character contained in Act 32 of the National Language Act 1963/67 has been stated in the section "the national language text is the Rumi text: provided that it does not prohibit the use of the Malay words, better known as the Jawi character, for the national language".

Based on the observations during the teaching and facilitating sessions, students were not able to correctly identify some letters that could be connected to produce syllables. This is because the students do not know the letters and do not understand the correct method. Based on previous exam results, more than half of the students have not yet mastered the skills to identify the letters before and after. The objective of this study was to identify the problem of connecting single letters to produce words among elementary school students at SK Section 19, Shah Alam, Selangor and to test
improving students' skills for connecting single letters to produce correct words using Jawi-AR application Apps with modules during teaching and programming sessions. This study was focused on national elementary and religious primary students.

2. Related works
The Jawi writing in Malaysia had gone through a transformational process that changes through time. Long before in the 10th century Jawi writing were began to flourish through Arab trading activities that came to trade in the Archipelago which is a grip of the Malays[2].

The results of this record clearly show that Jawi writing at that time was widely used in important affairs and was considered a great writing in the Malay Archipelago. Its widespread use has attracted local and foreign authors such as W.G Shellaber [3] to write R.J.’s book Evolution of Malay Spelling Wilkinson and Winstedt with the publication of the Malay-English Jawi Dictionary (1901, 1903, 1913, 1939) that still uses the old Jawi spelling version.

To date, the Jawi script has been made from time to time by the famous Jawi figure Ahmad bin Mathlob or better known as Mr. Mathlob. His contribution in promoting Jawi scripts is huge as the Malaysian government is increasingly looking for an alternative to reviving Jawi scripts since elementary school. Thus, through the eleventh to the fourteenth centuries, Jawi writing was widely used throughout the Malay Peninsula and the Archipelago [5].

In addition, the "Jawi" term is known among Malay clusters in Malaysia, Singapore, South Thailand and Brunei Darussalam and Sri Lanka. While in Indonesia, Jawi script is known as "Arabic script".

However, the Jawi character began to fade away towards the end of the 20th century as it was gradually replaced by the Rumi character that have a very strong influence from the West. Robust changes in the education curriculum system bring up the Rumi literature as the official language and Jawi literature is forgotten. Jawi literature remains among Muslims and mostly Malays in their study medium of Islamic studies. Unlike the old times all races are Jawi literate. However, because of the modern world, Malaysians are more interested to master Rumi in pursuing a career progression and daily affairs.

Jawi character is facing a serious issue among Malays in Malaysia. It is now in a very critical stage where not many people know about Jawi alphabet yet again able to read or write in Jawi literature. Younger generations nowadays no longer fluent in Jawi literature compare to earlier days where everybody were Jawi literate regardless of their age category. This is due to the lack of awareness to preserve Jawi character as one of the Malay heritage and identity.

On the other hand, nowadays the Malaysian government had taken a few initiatives to preserve this Jawi character in Malaysia by organizing Jawi writing clinics in radio channel like IKIM, Jawi writing contests, Jawi literature conferences and exhibitions, enforce Jawi writing in Islamic subjects in school, a Jawi section in daily newspapers, free Jawi newspapers, Jawi writing on signboards, billboards, business premises as well as funding any research or development on Jawi applications, games, coursewares, websites or setting a Jawi international centres.

Learning the Jawi literature nowadays, began since the early aged of primary school, which is an effort to nurture the love towards Jawi character as one of the Malay heritage. Hopefully in the future, Jawi writings will remain used and considered as great writings as those great times through the whole world.

3. Methodology
The efficacy of the developed Jawi-AR Apps application was tested using a quantitative and pre-experimental design of a pre-test group (Midterm Examination) and a post-test method (Final Examination) on respondents. A total of 157 (one hundred and fifty seven) students from year two from a primary school in Shah Alam, Selangor, Malaysia were selected as respondents for this study. The Midterm Examination test scores were collected and analysed to identify the problems students faced. Once the analysis has been performed, an application has been developed to help improve
comprehension and improvement in the exam. Once these students have used Jawi-AR Apps, respondents will need to sit for the Final Examination and then the results of the test will be analysed. Subsequently, the findings comparing both pre-test and post-test were performed to assess the effectiveness of the Jawi-AR Apps development.

Figure 1 shows the methodology that used for this research. This methodology consist of four (4) phases. At Phase 1 involved the identifying the problems of the students from forms two from the primary student that related to the Jawi’s subject. The data was collected from midterm examination and analyses. When the problem was identify, then continue the Phase 2 which is to develop the Jawi-AR Apps Application. When the application was complete and tested, Phase 3 was implement. Phase 3 involve the data gathering and analysis from the Final Examination. Last phase (Phase 4) was implement which is to compare the results from both examinations (Midterm Examination and Final Examination).

To develop this application, the Rapid Application Development (RAD) model was selected as part of the project development [4]. The model consists of four phases: Quick Analysis and Design Phase, Prototype Cycle Phase (Build, Demonstrate, and Improve), Test and Implementation. This model was selected because the development of Jawi-AR Apps began by analysis and quick design to understanding and defining the user's needs. Then through prototype cycle phase for developing, demonstrating and refining. Next phase is testing and lastly deployment phase. Testing should be done at the beginning of the project and throughout the development process. This RAD model also allows user to provide quick feedback on the product being developed. Throughout this phase, reviews and updates will be ongoing.

**Figure 1. Research Phase**

**Phase 1**
- Identify the problems
  - Gathering data and analyse the data (Midterm Examination)

**Phase 2**
- Develop the Application
  - Jawi-AR Apps Application Development

**Phase 3**
- Test an effectiveness
  - Gathering data and analyse the data (Final Examination)

**Phase 4**
- Findings
  - Compare results from Midterm Examination and Final Examination

**Figure 2. RAD model for Application Development**
4. Results and Findings

The project involved 157 Year 2 students taking the Midterm Examination and Final Examination among elementary school students at SK Section 19, Shah Alam, Selangor. The Midterm Examination was used to identify the problem of connecting single letters as well as syllabus. Once the problem has been identified, Jawi AR-Apps comes with the Jom Mudah Jawi Module to help these students improve their Jawi skills. After using Jawi AR-Apps as a teaching aid (BBM) in teaching and facilitating sessions (PdPc), the students will sit Final Examination. The results was obtained from two examinations (Midterm Examination and Final Examination) were compared and analysed.

![Figure 3](image1.png)

**Figure 3.** Criterion Question 1- Divide the words below into single letters (boxes per letter)

![Figure 4](image2.png)

**Figure 4.** Criterion Question 2- Connect open letter letters
Figures 3, Figure 4 and Figure 5 compare the test scores between Midterm Examination and Final Examination, before and after the use of Jawi AR-Apps and the Jom Mudah Jawi Module in the teaching and facilitating session (PdPc). Generally, there is a reduction in error in student answer sheets after they are exposed to the use of Jawi AR-Apps with the Jom Mudah Jawi Modul. However, there are still some increasing in student error in answering the final examination questions. This increasing needs further studies to be conducted to identify the cause of the increase which will be seen from other factors such as student neglect, misunderstanding of the question given or the student not mastering the knowledge and skills in Jawi writing.

5. Conclusion
In conclusion, these innovations have been very beneficial for students in mastering Jawi literacy. This application has been integrated with AR technology that can help improve student understanding and skills while also changing the way students learn. The application also comes with modules to facilitate student self-learning and learning guides. Students can learn over and over again anytime and anywhere. When these connectivity skills are acquired, it will enhance students' motivation to learn to read and indirectly a reading culture can be implemented among students.

6. References
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