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Master's thesis

Academic Year 2017

Japanese Kanji Learning Method
for Arabic Speakers

Keio University
Graduate School of Media Design

Alsharif Afnan
A Master’s Thesis

submitted to Keio University Graduate School of Media Design

in partial fulfillment of the requirements for the degree of

MASTER of Media Design

Alsharif Afnan

Thesis Committee:
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Abstract of Master’s Thesis of Academic Year 2017

Japanese Kanji Learning Method for Arabic Speakers

Category: Design

Summary

Arabic speakers who wish to learn Japanese deal with a very limited number of Kanji resources. This is because for several centuries the cultural exchange between Japan and the Arab world has been inactive which reflected on the amount of published work between the two nations. Learners mostly rely on English resources but this is not an efficient way to learn because first, not every Arabic speaker knows English and second, during translation meaning lost can happen. We address this challenging problem by proposing a learning method specific to native Arabic speakers. It employs two ideas: The first is Arabic Kanji Equivalent which is a copied version of Kanji in Arabic words. The second is Phrase Based Learning where Japanese text along with Arabic translation is given for active reading practice. Finally, we evaluate the proposal to see if it is effective in learning Kanji all information as one unit (meaning, reading, writing), gain confidence in learning and finally preserve the Kanji knowledge gained.

Keywords:

（常用漢字）Daily used Kanji, Native Arabic speakers, Japanese Language, Kanji learning, Japanese transliteration.

Keio University Graduate School of Media Design

Alsharif Afnan
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Chapter 1

Introduction

1.1. Motivation

In 2013, I decided to do my graduate study in Keio University Graduate School of Media Design. My goal was to have a master degree as well as learn Japanese language. In preparation for my study, I started to look up Japanese learning resources. It was only then when I learned the difficulty of finding resources for Arabic speakers. None of the large bookstores in my city, Mecca, had Japanese learning books. I searched the internet and found that some resources are available but only outside my country in Lebanon where foreigner book publishers are located or in Egypt where the Japan Foundation Office is established in Cairo. After reviewing the available publications, I found them to be very insufficient and eventually decided to invest in English resources which were much richer in content.

Later in 2014 I came to Japan and joined Sendagaya Language Institution which had students from various nationalities but Chinese and Arab national formed the largest groups. During my study, I noticed that Arabic speakers who were not fluent in English and relied only on school resources struggled with Kanji learning. One of the teachers has explicitly stated that Arab students do well in grammar and conversation but they are very poor in Kanji. The difficulty I had searching for Kanji resources in my native language before coming to Japan and seeing my Arab colleagues struggle with Kanji learning even after joining a language school within Japan has very much motivated me to contribute to this problem.
1.2. Background

Determining the difficulty of a language is highly relative and based on several factors. Some are related to the learner, such as the mother language, and some are related to the language itself such as the average required time to master it. However, no matter what is the background of the difficulty assessor, Japanese never fails to score a high position in the world most ten difficult languages rank.

The western view identifies the following as factors for Japanese difficulty: First, Japanese has an extensive grammatical system; nearly over 600 grammatical structures (Makino 1989, Makino 1995, Makino 2008) need to be mastered in order to communicate effectively. Second, Japanese vocabularies express a meaning and a context. For instance, one can use the English words (a little, somewhat, for a certain degree) interchangeably with minimal change in meaning. On the other hand, one cannot use the Japanese words (幾分, いささか, やや) the same way because in addition to their meaning they could carry negative or positive implications. In other words, the learner is not ready to use the word by learning its meaning only. Finally, written Japanese is an admitted challenge. It uses three mixtures of symbols called Hiragana, Katakana, and Kanji each with its own role. While Hiragana and Katakana are limited in number (46 per syllabary) and simple in form, Kanji however amount to almost 2000 characters. They are complicated in form, and have several readings. The writing system specifically Kanji can be considered the biggest challenge in learning Japanese.

In the Middle East, Arabic is the most spoken language, officially by 22 Arab countries and for religious and cultural reasons by non-Arab countries. A survey of language difficulty also shows that Arabic speakers view Japanese as the most difficult language to learn. This however is neither due to Arabic language background nor the characteristics of Japanese language. It is due to rather more difficult barrier which is the seeming absence of adequate learning resources.
Historically, the cultural exchange between Japan and the Arab world was not active compared to the exchange with western world. This lack of interaction reflected deeply on the amount of published work. One could argue that this phenomenon is equally observed in other languages. Since English is the most dominant in western world, it is only natural that amount of published work, to and from English, exceeds other languages. However this is not the case. While English is indeed the language with richest published work and learning resources, other western languages have their adequate share of resources as well. French, Italian, or Spanish learners for example could find publications to serve them progress in Japanese learning from beginner to advance level.

The same cannot be said about Arabic however. Arabs learning Japanese deal with very limited number of learning resources. Until the moment of writing this thesis I was not able to find Arabic Japanese electronic dictionary. I could not find a book covering grammatical structures enough to enable me speak fluently. All I could find was phrases pocketbook listing daily greetings, days of week, how to make request etc... I was even more surprised to realize that Kanji characters, the core difficulty in Japanese, have no official translation into Arabic. How could any learner master Japanese without learning Kanji?

To overcome this situation, Arab learners may need to join a language or cultural institution where educators fluent in both languages compensate for the resources role. Or else they may use English as medium and refer to resources written for English speakers. This method despite popular has its drawbacks. First, the efficiency is very low. For example, it is time consuming to look up a Kanji meaning in Japanese English dictionary, and then look for its Arabic equivalent in English Arabic dictionary. Second, the two-step translation could cause meaning lost. Only a direct version of translation gives a better understanding of meanings as well as context in which to use.
The unavailability of direct learning method has inspired this research. I believe that we can contribute to the Arab learning Japanese problem by tackling the issue of Kanji learning. Kanji is the most challenging aspect of Japanese. Developing a method to teach Kanji for Arabic speakers will enable them to acquire the ability to read and write effectively. Reading and writing are the main pillars of any language learning thus assisting Arabic speakers learn Kanji could fill a huge gap in the Japanese language learning problem.

1.3. Research Problem

As introduced earlier, the focus of this research is Kanji teaching to Arabic speakers. There are many researches about teaching Kanji to specific target language but they are different from this research in two aspects. First, they start where other work has ended and gradually build on previous findings. Second other researches may not need tedious work to compile necessary teaching content since Kanji resources are rich and there are free online database dictionaries to utilize.

In this research however we almost start from scratch as we could not find previous work dedicated to Arabic speakers. Furthermore, we miss an essential component which is translation of Kanji into Arabic. How can we correctly translate Kanji into Arabic without worrying about mistakes or meaning lost? Besides translation of Kanji there is the issue of Kanji information database. The several recognized readings and writings for each Kanji are indeed available for access but we need to find an effective way to present this information to Arabic speakers. For that we need to deeply review Arabic language background and try to utilize some of its characteristics to aid in the learning process.
Another important consideration is the independency of the learning method. We assume absence of other resources as well as lack of English fluency. We expect the method to stand alone as sufficient to learn Kanji. It does not need to be used in combination with other references or other learning methods. Finally, the target of this research is adult Arabic speakers who are learning or have learned Hiragana and Katakana and have basic grammatical knowledge of Japanese language for N5 or N4 level. This covers simple sentences pattern, different verb tenses and verb conjugations as well.

In summary, the problem this research is trying to solve is how to develop an independent method to teach Japanese Kanji to Arabic speakers. The scope is daily used Kanji, a list of 1945 characters. The solution metric is the method effectiveness in teaching all Kanji information which includes meaning, reading and writing as one unit.
Chapter 2

Related Work

2.1 Kanji Characteristics

2.1.1 Kanji Background

Before examining other contributions in this problem, it may be helpful to summarize essential characteristics of Japanese Kanji which should have large impact on the direction of this research. Kanji were originally adopted from China. They are mainly used for conceptual words such as substantives, verbs and adjectives in addition to indigenous names. The most comprehensive Japanese Kanji dictionary includes about 10,000 Kanji. However in 1981 the Japanese Language Council recommended a list of 1945 characters called Joyo Kanji (Kanji for daily use) and a guideline for the permitted readings and writings of these Kanji was issued for the press to follow (Hadamitzky and Spahn 1989).

2.1.2 Form and Construction

In terms of form, Kanji characters can be classified into three categories: First, Pictographs which are a simple illustration for natural phenomena in daily life. Pictographs serve as building blocks for the rest of characters. Figure 1 illustrates some Kanji Pictographs.
Second, Ideographs which are symbols representing abstract concept such as numbers and directions. Figure 2 shows examples of Ideograph Kanji.

![Figure 2 Ideographs](image)

Third is the largest group Logograms where the already available Kanji were combined together to create more complex characters as seen in Figure 3.

![Figure 3 Logograms](image)

It is also important to mention that the components that make up a complex character are referred to as radical. A Kanji may have one or two radicals.
2.1.3 Recognized Readings

A Kanji character may have two types of reading: *On reading* taken originally from Chinese Kanji reading, and *Kun reading* which represents the Japanese word pronunciation. In the daily used Kanji list 1160 Kanji have both On and Kun readings, 750 have only On readings, and 35 have only Kun reading (Hadamitzky and Spahn 1989)

2.1.4 Writing and Styles

Every Kanji character has its practiced stroke directions as well as stroke counts. The smallest number of strokes is one while the largest number is twenty three. The order in which to write stroke is indispensable for many reasons. The first is it enables correct writing as it helps keep relative size and proportion accurate. Another benefit is stroke count can be key information to access Kanji dictionaries which have three indices: reading index, radical index, and stroke count index. Furthermore, Japanese writing has three calligraphic styles called Kaisho, Gyosho, and Sosho which represents standard, semi-cursive, and running cursive styles respectively. While the standard writing style is easy, Kanji learners may find it difficult to recognize cursive and running cursive styles. See Figure 4 to see how change of style simplifies and changes Kanji strokes

![Figure 4 Japanese Kanji three writing styles](Source: Visual i Plastic Website)

This review concludes ground information about Kanji. The method to be developed needs to take into account these important characteristics of Kanji. It must introduce an effective way to transmit them to Arab learners.
2.2 Kanji Resources

2.2.1 Basic Resources for Arabic speakers

In this section we review examples of available resources to teach Arabic speakers Japanese language and how they confront the challenge of Kanji.

Basics and Grammar of Japanese Language (Haroon 2009)

The reason this book is very famous is its availability for free on the internet. The author stated in his introduction that this is a work dedicated to the Arab learners struggling to find resources. The book is 260 pages long and serves as basic introduction to Japanese language which includes Kana rules, pronouns, adjectives, verbs and brief introduction to Kanji. It explains the origin of characters, the fact that they have different readings and provides several practices to read a list of most common Kanji word.

Japanese Language for Native Arabic Speakers (Shihab 2001)

This is a series of three books. The first one covers Kana with extensive practice. The second is about basic sentence patterns, phrases of daily use, and a list of common vocabularies written in Kanji with furigana along with Arabic translation. The last book covered some aspects of the Japanese culture including horrific speech.

Learning Japanese for Arabic Speakers (Samer 2012)

This is a small book which occurs in 92 pages. It focused on the problems of learning Japanese language and introduces Arabic learners briefly to the nature of learning Japanese, why is it a difficult language? What does it take to master it? The book strongly emphasizes Kanji as the biggest challenge.
2.2.2 Other Resources Availability and Types

To get an idea about the nature of resources other language speakers can access, we review examples in English, Chinese and Italian. The assistance we had from those language speakers enabled us to review them. Resources that document daily Kanji list are either physical books such as dictionaries or soft with interactive interface. Examples follow:

2.2.3 Kanji and Kana a Handbook and Dictionary

of the Japanese Writing System (Hadamitzky and Spahn 1989)

This book is widely popular as single sufficiency reference to progress from beginner to advanced level. Its size makes it comfortable to carry as well. The book was originally in German but later translated into English. The Kanji presented in the book were sorted from most to least commonly used order. Every index provides the information illustrated in Figure 5

![Figure 5]

Source: Hadamitzky and Spahn 1989

Figure 5 a sample from Kana and Kanji Dictionary book

Kanji dictionaries for other language speakers perform the same function which is to present each Kanji meaning, reading and writing along with most frequent compounds. They only differ in the format they follow in presenting and whether or not they provide a space for the learner to practice in the book pages.
2.2.4 Kanji Wall Poster

Published by White Rabbit Press this is a poster that includes all Daily Used Kanji. Each Kanji in the poster is numbered to coordinate with the Kanji flashcards published by same company—we will examine flashcards soon. The number also serves in looking up Kanji meaning and reading which are printed on a secondary poster that comes with the product. The Kanji are colored to reflect the level of JLPT exam, green for N4 and N5 level, blue for N2 and N3 level, finally purple for N1 Kanji level. Figure 6 and Figure 7 illustrates series 3 posters.

Source: White Rabbit Press

Figure 6 The dimension for Kanji poster is (84 x 119 cm / 33 x 47 in)

Source: White Rabbit Press

Figure 7 The dimension of reading/meaning poster is (59.4 x 84.1 cm / 23 x 33 in)
2.2.5 Chinese Tool: (BaoBaoXueHanZi- Baby Learn Kanji)

This is a software that requires a local installation on personal computer. Learners choose a Kanji from index fixed on the left. Then all Kanji information appears on the right. This includes a picture illustrating the meaning, order of strokes as well as compound words.

2.2.6 Italian Tool: (EduKanji)

This is a website that was introduced to us by Italian Professor Mantelli Alessandro from Ca’ Foscari University who was part of the team which built it. It aims to assist teachers teaching Kanji to classes of large number of students. The tool provides Kanji lessons for student to learn on their own. It also provides assessment and grading features for the teachers to check students’ progress. See Figure 8.

2.2.7 English Tool: (Tanoshi Japanese)

Tanoshi Japanese is a famous website to teach Japanese in an enjoyable way. It includes a dictionary, vocabulary lessons and Kanji lessons. The Kanji lessons are divided into four levels. Each lesson introduces Kanji information as well as large number of compounds. There is a separate section for practice in the website. It asks learner what specific aspect of Kanji he or she wants to practice whether it is reading, meaning, or stroke order.

Source: EduKanji

Figure 8 Edukanji tool interface
2.3 Kanji Learning Methods

In the previous section we examined Kanji references but in this section we examine Kanji learning method. The difference between the two is orientation and function. A reference of Kanji acts as source of all its information. It may or may not serve as a learning method. Learning methods however refers to the technique employed by learners to gain Kanji knowledge. A Kanji reference is usually oriented toward specific target i.e certain language speakers or certain level of efficiency while learning methods are independent of language background and may be used regardless of learner levels. Also learners can mix learning methods the same way they refer to various resources. Below is a list of the most common methods employed to learn Kanji:

2.3.1 Active Writing
This is the most classical method. Usually a script paper called “Genkoyoshi” with a grid is used. The learner may have a guide for sequence of strokes to follow in copying. Every Kanji is written within single square space. Furigana and Okurigana follow the same rule. The purpose of active repetition is to become able to produce character readily from memory. The effectiveness of this method is very high but it requires hard work and diligence. See Figure 9

Source: Tower of Air Website

Figure 9 In active writing method learner repeatedly copy Kanji to master it
2.3.2 Visual Representation

The concept of this method is to use the structure of Kanji in an illustration conveying its meaning. The purpose of this is to reduce the effort of memorizing writing strokes and in the same time use Kanji shape to infer meaning. This method proves effective with Kanji characters falling into pictographs category such as (山,木, and 門) But it may be hard to visualize logogram characters such as (船,散, and 繁) which does not corresponds to natural phenomena. Another drawback with this method is that it does not cover Kanji readings. Figure 10 illustrates some example.

Source: JapanToday Website

Figure 10 Visual representation method simplifies learning Kanji strokes

2.3.3 Kanji Mnemonic

A mnemonic is a memory aid method that involves creating a short rhyme or a phrase to make memorization easier. When using this method to learn Kanji, the phrase is made of words representing the elements or radical making the Kanji. This method may help in learning characters falling in the logogram category but it causes inaccuracy concerns. The mnemonic phrase does not capture the position of the element. Furthermore some Kanji characters may share the same elements which make the mnemonic sentence to be repeated several times.
2.3.4 Kanji Flashcards

This method was developed recently for those who need to engage their touch sense in order to learn. Every card teaches one Kanji. As seen in Figure 11. On the face displayed: the Kanji, the order of strokes, similar Kanji that could cause confusion, and compounds. The back of the card shows the meaning and the compounds reading. The learners are expected to see the card face first to acquire Kanji details, then he or she can check reading answers on the back.

Source: White Rabbit Flashcards

Figure 11 Kanji flashcards front and back face

2.3.5 Summary of Current Kanji Learning Methods

This review showed that virtually none of the methods cover all Kanji information, see the Table 2.1. Physical methods have the limitation of focusing on one or two aspects of Kanji. Soft methods however do cover all Kanji information but they function as a reference more than learning method. There is no guided interaction between learners and software. The method we seek must cover all learning Kanji aspects.

<table>
<thead>
<tr>
<th>Learning Method</th>
<th>Meaning</th>
<th>Reading</th>
<th>Writing</th>
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<td>Active writing</td>
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<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Visual representation</td>
<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>Kanji mnemonics</td>
<td>○</td>
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<tr>
<td>Flashcards</td>
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Chapter 3

Characteristics of Arabic Language

After we reviewed the resources available for Arabic speakers and the various methods of Kanji learning, we gained knowledge on the ways other language speakers approach the challenge of Kanji. We concluded that the methods employed focused more on Kanji information instead of learners’ background. None of the methods available were specifically tailored to target language speakers. In this research however, we try to make use of learner background. We believe that some of the Arabic language characteristics may help in proposing a method most appropriate.

3.1 Direction of Writing

One of the most emphasized features of Arabic is the direction. While Japanese can be written horizontally or vertically and English, sometimes, for aesthetic reasons can be written vertically too, Arabic however is always written horizontally and writing always flows from right to left.

3.2 Alphabet System

Arabic uses 28 alphabet characters, 10 of them cannot be represented using Latin letters while remaining 18 can arguably be represented and that because although the letter is presented in both system Arabic and Latin, the pronunciation and accent seems different from each other. Refer to Figure 12 to see characters with Latin letter representation under in blue.
All Arabic characters are formed of simple strokes. The least number of strokes is one with no change in direction while the largest number of strokes is three. (Khalid Mohammad 2014). See Figure 13 for example.

Figure 13 Arabic letters ranges from one to three strokes.

3.3 Arabic Vowels

The Arabic script is abjad script which is a writing system where each letter stands for a constant then it is left for the reader to supply the appropriate vowels based on context. But in some cases the vowel is supplied for different reasons which can include teaching young children in school or explaining how an unfamiliar word should be pronounced. The vowels are symbols which have their fixed position from characters either below or above them.
There are only three vowels in the Arabic language which can be mapped to the Japanese vowels (あ・A, い・I, and う・U) however they are much shorter in pronunciation. Arabic language unlike Japanese and English cannot represent the (え・E and お・O) vowels. Figure 14 illustrates their symbols and position.

![Figure 14](image)

Figure 14  A and U vowels are located above letters while I vowel is below

### 3.4 Changing Forms

Another essential characteristic of Arabic is the change of characters from. Each character has three forms according to its position within a word: initial position, middle position, and final position. See Figure 15.

![Figure 15](image)

Figure 15 observe how T and B letters in Arabic connect in a similar way
3.5 Characters Learning Order

There is a characters order conducted in schools to simplify learning process. It groups characters similar in forms or way of connecting and introduce them together to emphasize the similarity. Once a character is learned, it makes learning the next one easier thus reduces the effort from 28 characters into a few groups with common strokes and common rules for connecting. Figure 16 summarizes the common strokes in which the learning order was based. The basic stroke is illustrated in red while the remaining strokes which makes each individual letter is shown in black.

Figure 16 Arabic letters grouped by stroke shapes
Chapter 4

Representing Japanese Sounds in Arabic

4.1 Extension of Constants

In the Arabic characteristics chapter, we showed that Arabic has 18 of its characters common with English. Most of English words can be represented in Arabic easily. Sometimes however the “o” and “e” vowels are ignored and treated as “u” and “i” respectively. If a certain book is a textbook intended to teach Arabic speakers English language, a pronunciation file available on accompanying CD or internet link is given. In summary, when translating from English to Arabic the missing vowels has presented no problem. What presented a challenge however was the missing constant in Arabic G, as in “game”, P, and V. Those have no equivalent in Arabic (W. Wright 2005). When a translator needs to write an English word or a foreign name containing those letters, he or she used the closest Arabic constant to represent that sound. See Table 4.1

<table>
<thead>
<tr>
<th>Missing constants</th>
<th>G</th>
<th>P</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabic letter used for representation</td>
<td>ج</td>
<td>ب</td>
<td>ف</td>
</tr>
<tr>
<td>Those letters pronunciation</td>
<td>ج</td>
<td>ب</td>
<td>ف</td>
</tr>
</tbody>
</table>

As we can see this was not accurate but closest way possible to represent the sounds. This practice continued until a team of novel translators from Lebanon decided to extend Arabic alphabet by slightly modifying the above characters to correctly represent the missing constants. They did so by manipulating the number of dots above or below the characters so it looks as illustrated in Table 4.2
Table 4.2 the number of dots was increased to derive new characters

<table>
<thead>
<tr>
<th>Base character</th>
<th>Pronunciation</th>
<th>Derived character</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ب</td>
<td>B</td>
<td>پ</td>
<td>P</td>
</tr>
<tr>
<td>ج</td>
<td>J</td>
<td>چ</td>
<td>G</td>
</tr>
<tr>
<td>ف</td>
<td>F</td>
<td>ف</td>
<td>V</td>
</tr>
</tbody>
</table>

This extension was incorporated into computer Keyboard, not on the top of Arabic keyboard keys but can be used by “insert command” using the corresponding Unicode code.

4.2 Transliteration Japanese Alphabet

4.2.1 Transliteration Definition

Transliteration refers to the transcription of alphabet into another alphabet by representing letters into corresponding ones. Some transliterations pay attention to the sound system while others are just concerned with one to one relationship between characters.

4.2.2 The Benefits of Transliteration

Transliteration can serve several purposes which include the ability to learn a language without mastering the writing system. There are many travel books called “point and speak” that write Japanese text for example in English letters to help travelers say basic sentences while in Japan for tourism. See Figure 17 for a sample from the book.
Another purpose is to process computational text. Instead of having a keyboard with 2000 Kanji characters, transliteration maps the pronunciation into Roman letters and enables to simply input text in mobile phones or electronic dictionary keyboard. See Figure 18 where users can search words using original or transliterated Japanese.
4.2.3 Transliteration of Japanese Into Roman Letters

In 1952 the Japanese government issued a recommendation for the transliteration of Japanese into roman letters. Two systems were introduced:

1) **Kunrei-shiki romaji system**: Patterned after the fifty sound table. The five syllables are represented uniformly with the same roman letter despite any phonetic variation associated with the letter.

2) **Hebon-shiki romaji system**: Similar to the Kunrei system except that constant sounds in the same row are not represented uniformly with the same letter. See Table 4.3 for two systems’ differences.

<table>
<thead>
<tr>
<th>Transliteration system</th>
<th>Syllabary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kunrei shiki</td>
<td>し ち つ ふ</td>
</tr>
<tr>
<td>Hebon shiki</td>
<td>しち ちつ ふ</td>
</tr>
</tbody>
</table>

In summary, both systems represent Japanese alphabet using 22 roman letters. The Hebon system however is used more widely and mainly in dictionaries. This can be due to the fact that it does not require the learner to remember any unfamiliar pronunciation. For instance, the representation of word is different: ふじ is “huzi” in the Kunrei-shiki but in the Hebon-shiki system is represented as “fuji”.

Table 4.3 the Hebun system attempt to capture uniformed syllabary pronunciation
4.3 Transliteration of Japanese into Arabic Letters

The word Arabize means to make something conform to Arab culture or customs. The same way Romanization helped English speaker in learning Japanese we believe Arabization can help Arabic speakers learning Japanese. In fact, Arab learner might be in more need for transliteration system than English speaker and that is due to the unavailability of certain constants and vowels in Arabic alphabet which could lead to problems with pronunciation accuracy. Furthermore, it would be efficient for Arabic book explaining Japanese grammar to dispense with Romanization and rely only on Arabic alphabet to communicate rules with Arabic speakers.

4.3.1 The Anatomy of Japanese Sound Table

The Japanese sound table is divided into three groups: 五十音 (Gojūon The fifty sounds), 濁音 (Dakuon The voiced sounds), and 拗音 (Yōon The twisted sounds). There are also other pronunciation cases such as 促音 (Sokuon The assimilated sounds) and postpositional particles such as (へ, は, and を). In order to put Arabized version of the table we analyze deeply each group on itself and then make proposal. Refer to Table 4.4 for details.

4.3.2 The Fifty Sounds Gojuon Table Analysis

Japanese linguistics has changed over the centuries. This has led some sounds to be no longer used. This is why despite being called the fifty sounds table it actually includes 45 sounds or 46 if constant ん is counted. Refer to Table 4.4 The first row in the table represents the five vowels in Japanese (あ, い, う, え, and お). The rows that follow combine eight constants: K, S, T, N, H, M, Y, and R with those vowels to form five syllables or three
syllables in the case of constant Y. However we keep in mind that four syllables in this table have uniformed sound which are (し, ち, つ, and ふ).

In chapter three Characteristics of Arabic Language, we mentioned that Arabic has three vowels represented as symbol below or above constants. We also mentioned that some of Arabic constants can be represented using roman letters, among those are the eight constants K, S, T, N, H, M, Y, and R. This means we can represent part of the fifty sounds table by default which is highlighted in gray in Table 4.4.

Table 4.4 the full Japanese sounds table and sounds classification

<table>
<thead>
<tr>
<th>五十音 Gojūon</th>
<th>拗音 Yōon</th>
</tr>
</thead>
<tbody>
<tr>
<td>The fifty sounds</td>
<td>The twisted sounds</td>
</tr>
<tr>
<td>あ い う え お</td>
<td>や ゆ よ</td>
</tr>
<tr>
<td>か き く け こ</td>
<td>きゃ きゅ きょ</td>
</tr>
<tr>
<td>さ し す せ そ</td>
<td>しゃ しゅ しょ</td>
</tr>
<tr>
<td>た ち つ て と</td>
<td>ちゃ ちゅ ちょ</td>
</tr>
<tr>
<td>な に ぬ ね の</td>
<td>にゃ にゅ にょ</td>
</tr>
<tr>
<td>は ひ ふ へ ほ</td>
<td>ひゃ ひゅ ひょ</td>
</tr>
<tr>
<td>ま み む め も</td>
<td>みゃ みゅ みょ</td>
</tr>
<tr>
<td>ら り る れ ろ</td>
<td>りゃ りゅ りょ</td>
</tr>
</tbody>
</table>

| わ を ん へ は っつ |
| 濁音 Dakuon The voiced sounds |
| が ぎ ぐ げ ご | ぎゃ ぎゅ ぎょ |
| ざ じ ず ぜ そ | じゃ じゅ じょ |
| だ ち ぢ で ど | ぢゃ ぢゅ ぢょ |
| ば び ぶ ぺ ぽ | びゃ びゅ びょ |
| ぱ ぴ ぷ ぺ ぽ | ぴゃ ぴゅ ぴょ |

25
4.3.3  Arabization of Gojūon The Fifty Sounds Table

In order to fully represent the table using Arabic letter we need to represent the vowels (え E and お O) We propose extending the Arabic vowel symbols by slightly modifying the existing ones. Since (う U) is phonetically close to (お O) and (いい I) is phonetically close to (え E), we use them as base to derive the new vowels. See Figure 19 to see they also inherit their base position.

\[
\begin{array}{cccc}
  O & E & U & I \\
  \text{え} & \text{え} & \text{う} & \text{い}
\end{array}
\]

Figure 19 Extension of Arabic vowels to include え Е and О お

With this vowel extension, we can now represent five sounds syllable and only uniformed sounds highlighted in red in Table 4.4 are left to complete the table which we will examine next.
• Arabization of Uniformed Sounds

Figure 20 explains how we break down every Kana syllabary into (1) constants highlighted in green or red and (2) vowels heighted in blue.

□ し (SHI) syllable

Unlike English, Arabic has a special one letter to represent the sound SH. Which is the letter (ش) called shin in Arabic. This constant combined with vowel mark I, can represent し syllable by default. See Figure 20 case A.

□ ち (CHI) syllable

There is no special character for CH sound in Arabic. Instead it is treated like SH using (ش) symbol. Arabic speaker pronounce chocolate as shokolata. But since we want accurate representation for ち syllable, we introduce an Arabic letter based on ち syllable components which can be mapped into three elements the first is T constant with its Arabic equivalent (ت). The second is SH constant with its Arabic equivalent (ش). And the third is the vowel I symbol represented below the character (ِ). See Figure 20 case B.

□ つ (TSU) syllable

To represent this syllable we use same mapping method above. つ can be mapped into three elements: first is T constant with its Arabic equivalent (ت). Second is S constant with its Arabic equivalent (س). And third is the U vowel symbol represented above the character (ِ). See Figure 20 case C.

□ ふ (FU) syllable

Same as し syllable the ふ syllable can be represented in Arabic using the constant F (ف) with U vowel symbol represented above the character (ِ). See Figure 20 case D.
4.3.4 Arabization of Constants

Japanese has only one constant which is 与. It is represented by N in roman letter. がまん is Romanized as “gaman”. In some cases when the end of syllable sound n is followed by a vowel or y constant, an apostrophe is inserted to avoid slurring the n with them together. Example is まんいち “man’ichi” こんやく “kon’yaku”. In Arabic we can avoid use of punctuation since there is a special symbol called (Sukūn) to denote that a certain letter is a constant. Sukūn is a small circle fixed above the letter. See Figure 21

Figure 20 Arabization of uniformed sounds based on analysis of constants and vowels

Figure 21 Arabic Sukūn mark helps represents the only Japanese constant 与
4.3.5 Arabization of Sokuon the Assimilated Sounds

In Japanese, small つ denotes that the character next is to be stressed. In English however stressed sounds are represented by doubling the constant. For example, みっか is represented as “mikka”. Three information are embedded for stress representation. First stress symbol, second constant symbol, and third vowel symbol. These are illustrated in Figure 22

![Figure 22 stress symbol in red, constants in green and release vowels in blue](image)

To represent stressed sounds, Arabic use a special symbol called (Shadda ّ) it is located above constant. Shadda takes one of the five vowels introduced. (あA, いI, うU, えE, and おO) all fixed above it except いI and えE which are fixed below. These vowels guide reader how to release a constant after it has been stressed. Figure 23 illustrates Arabization of stressed sounds.

![Figure 23 the Shadda mark in Arabic functions as small つ in Japanese](image)
4.3.6 Arabization of Postpositional Particles:

The topic marker (は wa), the direction marker (へ e) and the object marker (を o) are the last left to fully represent the fifty sounds table. Fortunately は is representable by default. へ and を became representable after extension of vowels. With this addition the fifty sounds table now is transliterated into Arabic letters as seen in Figure 26.

4.3.7 Arabization of Dakuon the Voiced Sounds

In Japanese voiced constant or sonant constant are denoted by placing a short diagonal strokes called Dakuten above corresponding Kana. This is the case for B, D, G, and Z constants. The constant P however is represented in a different way by adding a small circle called Handakuten above corresponding Kana. Only two of the five constants are not natively part of Arabic but they were introduced by Lebanese translator team as stated early. We make use of this extension combined with extended vowel to Arabize Japanese voiced sound as seen in Figure 24.

![Figure 24 Sounds representable by defualt in black, by extension in red](image-url)
4.3.8 Arabization of Yōon, the Twisted Sounds

Twisted sounds take one of three vowels (あA, うU and おO). The constant is combination of Y preceded with K, N, H, M, G, B, or P. See Table 4.4. To Arabize twisted sounds we use Arabic Y constant (ي) called (Yaa) as a base. Above this base is one of the seven combined constants K ك, N ن, H هـ, M م, G ﻖ, B ب, or P ﻝ. Then the vowel mark is fixed above the combination. Figure 25 illustrate representation of twisted sounds which conclude the Arabization of Japanese sound table fully shown in Figure 26.

<table>
<thead>
<tr>
<th>Kya きゃ</th>
<th>Kyu きゅ</th>
<th>Kyo きょ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nya にゃ</td>
<td>Nyu にゅ</td>
<td>Nyo にょ</td>
</tr>
<tr>
<td>Hya ひゃ</td>
<td>Hyu ひゅ</td>
<td>Hyo ひょ</td>
</tr>
<tr>
<td>Mya みゃ</td>
<td>Myu みゅ</td>
<td>Myo みょ</td>
</tr>
<tr>
<td>Gya ぎゃ</td>
<td>Gyu ぎゅ</td>
<td>Gyo ぎょ</td>
</tr>
<tr>
<td>Bya びゃ</td>
<td>Byu びゅ</td>
<td>Byo びょ</td>
</tr>
<tr>
<td>Pya ぴゃ</td>
<td>Pyu ぴゅ</td>
<td>Pyo ぴょ</td>
</tr>
</tbody>
</table>

Figure 25 in red the first constant, in blue Y sound with vowel mark above
4.3.9 Sample Text in Arabic

Finally we conclude this chapter with Japanese text and its Arabized version as seen in Figure 27

Text source: Ino, Satomi, Mitaya 2011

Figure 27 Japanese text transliterated into Arabic
Chapter 5

The Appropriate Order of Teaching Kanji

The concept of dividing characters, sorting and ordering them was not originated entirely by foreigner nationals intending to learn Japanese. It was practiced by The Japan Foundation and Japan Educational Exchanges and Services, the main organizer of JLPT examination. The foundation divided characters according to exam levels which range from N5 to N1. Usually 300 Kanji for N3 level, 750 for N2 and 850 for N1 level (Hodges and Okazaki 2010). The criterion followed by the foundation was Kanji popularity or specifically common of use. Characters which are most frequent such as daily life situations are given in low levels of the test. Characters that are less frequent and used in newspaper editorial, critiques or science language are given in higher levels of the test.

When we observe learning methods or resources of other languages we also see the same concern about Kanji learning order. Several ways of ordering Kanji characters were introduced. We review them in this section to study their pros and cons as well as to help us propose an order appropriate for Arabic speakers. The list of the common most orders includes:

5.1 Order by Simplicity

This order is concerned with the construction and from of the character, how many strokes does it take to writ it and how often does stroke change direction determine its order. Characters such as (一 and 乙) will be given first since they consist of one stroke, then characters of two strokes will follow (丁 and 七) etc. The pros of this method is it helps gives solid background to improve writing skills, however the learners may consume long time of progress until he or she encounters characters frequently used and are more necessary to learn early.
5.2 Order by Common Use

This is the order recommended by most books as well as language institutions. It is also the order used by JLPT test organizer. In this order, characters that are most frequently used are given first. This includes Kanji representing numbers, days of the week, basic verbs such as see, “walk”, and “eat”. Less frequent characters may refer to more abstract concept such as “drain” 溝 or “axil” 軸 are given later. The pro of this method is reading skill develops very quickly. The cons is learners could confuse similar characters not introduced together due to different grade of common use. Example is the Kanji representing “seek” 仰 which is more common than Kanji representing “hold down”抑 are separated far in this order.

5.3 Order by Associated Radical

This order is adopted from radical index concept. Radical information is one of the means by which to lookup a Kanji in a dictionary. For example, all the Kanji containing the water radical will be listed together (沈 and 沿). Of course this order does not follow this criterion only. First, it divides Kanji into three levels: beginner, intermediate and advanced. Then within each level it orders character based on associating radicals together. This shares the same pros and cons with order by common use method.

5.4 Summary of the Surveyed Orders

We have seen that almost every method has its drawbacks. It is seemingly not possible to develop a method that satisfies all criteria. Instead, we focus on important points for Arab learners of Kanji and try to benefit from strong points of other methods. The most important of which are:

1. Gradual learning: Starting from simple to most complex build solid writing skills. This emphasis is also stressed in Arabic character learning order.

2. Confusion avoidance: the order should ensure learner confident about their knowledge. He or she should understand the differences and similarities among certain Kanji.
5.5 Accumulative Order Proposal

This is an order based on the way Arabic speakers learn Alphabet. It is called accumulative because it makes use of the last information learned and builds on it with minor changes to progress. These minor changes may be a (1) small addition or (2) modification to the previous character or a (3) repetition of the entire character. Examining Kanji shows that they exhibit the same pattern. As seen in Figure 28

![Figure 28](image)

Figure 28 we can take advantages of Kanji similarity focusing on those three patterns

In order to determine the first Kanji in the list we follow the simple rule of what was the last information learned? In this case it will be Hiragana and Katakana characters. We know that the shapes of Katakana characters are parts of many of the Daily Kanji List so we start to scan Katakana row by row in order to derive possible Kanji by capturing similarity in shapes. Figure 29 illustrates some examples.

![Figure 29](image)

Figure 29 some Kanji characters resembles Kana shapes modified or added to
We can directly quote a Kanji character occurring in Katakana. Or we can pick the minor changes made to Katakana characters which makes it look similar to certain Kanji. This emphasizes Kanji stroke details and serves in gaining solid writing skills. Following this method enabled us to determine the position of first 100 characters in the accumulative order list by examining the Daily Used Kanji List and tracking Kanji similar in shapes to Katakana. After that we further examine the possible repetition, addition or medication that can be done to that Kanji strokes to produce another Kanji. Figure 30 illustrates this by derivation from Katakana group by group.

<table>
<thead>
<tr>
<th>アイウエオ</th>
<th>カキクケコ</th>
<th>サシスセシュ</th>
<th>タチツテト</th>
</tr>
</thead>
<tbody>
<tr>
<td>工 江 駿</td>
<td>力 刃 切</td>
<td>差 弓 引 弁</td>
<td>世 他 池 地</td>
</tr>
<tr>
<td>ナニヌネノ</td>
<td>ハピヘホ</td>
<td>マミムメモ</td>
<td></td>
</tr>
<tr>
<td>左 任</td>
<td>ニー三元示</td>
<td>双</td>
<td>友</td>
</tr>
<tr>
<td>リルレロ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>今 含 吟 具</td>
<td>列 例</td>
<td>料</td>
<td>匹</td>
</tr>
<tr>
<td>ヤエヨ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>当</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 30 the position of the first 100 Kanji were determined by tracking Katakana stroke shapes and further derive other Kanji.
5.6 Preliminarily Evaluation of Accumulative Order

We need to test the effectiveness of this method against the methods proposed previously before incorporating it into the final method. To do that we perform a simple experiment with ten participants divided into two groups. The first group is given 50 Kanji sorted using radical association order. The second group is given 50 Kanji sorted using accumulative order. Between the two groups 11 Kanji are common so we pay special attention to learning performance of those Kanji see Figure 31.

Every participant is asked to learn the meaning of given Kanji. After that an assessment is made and number of correct answers is recorded. Then the average coverage is recorded for the 50 Kanji in all and for the eleven common Kanji to make specific comparison. Table 5.1 proves accumulative order was more effective for learning as average coverage was higher.

Figure 31: Two list used with eleven common Kanji and different sorting order

<table>
<thead>
<tr>
<th>Table 5.1: The result of preliminary evaluation of accumulative order</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Associated Radical Order</strong></td>
</tr>
<tr>
<td><strong>Participants</strong></td>
</tr>
<tr>
<td>Out of 50 Kanji</td>
</tr>
<tr>
<td>Out of 11 common Kanji</td>
</tr>
<tr>
<td><strong>Accumulative Order</strong></td>
</tr>
<tr>
<td><strong>Participants</strong></td>
</tr>
<tr>
<td>Out of 50 Kanji</td>
</tr>
<tr>
<td>Out of 11 common Kanji</td>
</tr>
</tbody>
</table>
Chapter 6

Proposed Methods for Arabic Speakers

Before proposing a method that satisfies solution metrics i.e. ensures Arab learners master Kanji meaning, reading, and writing as one unit, we break the problem into smaller pieces in order to make it more manageable. We cut the three dimensional shape representing Kanji learning formula into two halves. Refer to Figure 32. The first half focuses on reading/meaning aspects and the second half focuses on meaning/writing aspects of a Kanji. The meaning aspect is most important and all current learning methods (except active writing) cover meaning of Kanji. The purpose of this division is to simplify evaluation of the method. If we manage to make effective solution that proves to help learn both halves, we can worry about combining them together in later phases.

This approach has led to the introduction of two proposals: Phrase Based Learning method and Arabic Kanji Equivalent method which we will examine deeply next.
6.1 Phrase Based Learning Background

6.1.1 Reading for Learning Japanese

Reading is inarguably one of the fastest methods to improve language skills. Especially reading an enjoyable text tends to help memorize vocabularies and capture grammatical structures. Reading has helped many people learn English. Almost every English language schools have several level courses called *Reading and Comprehension*. Japanese language schools however do not follow this approach due to the difficulty of Kanji. Delving into active reading without solids skills in Kanji can turn the activity into tedious search process where every unknown Kanji need to be looked up in order to understand. To take advantage of reading to learn Kanji we may need to provide furigana as well as translation in Arabic.

6.1.2 Content Enjoyable by Arabic Speakers

Arabs since old ages have been fond of poetry. It was not only viewed as literature work but as part of everyday life. If you search Arabic literature you can find poems about everything including historical events, countries and locations, how to use certain tools etc. The main reason old Arabs did not develop writing system is because they relied on memorization only. Poetry was Arabs form of documentation. This phenomenon is present until today although not in the same extent but Arabic speakers from all age groups appreciate poetic sentences that convey some sort of wisdom or parody. It is also stressed in language classes at Arab schools.
Having this information in mind we consider what type of Japanese texts can meet Arab preferences and we think the answer might be proverbs. Japanese proverbs may be interesting and enjoyable to Arabic speakers especially that some of them have their equivalent in Arabic such as (蛙の子は蛙) which means a child usually behaves in a similar way to his or her parents. Another example is (豚に真珠) which means casting pearl before swine. In addition to that Japanese have three categories: proverbs, idiomatic expressions and four characters expression, a unique feature of languages using Kanji. This can serve greatly in Kanji learning and introducing Japanese rich culture as well as way of thinking.

6.1.3 Phrase Based Learning Preliminary Evaluation

We want to check whether or not phrase based learning is effective in learning Kanji meaning and reading so we perform a small experiment of twenty participants for two rounds. In the first round, we provide them with 38 Kanji and ask to learn them using their traditional method. After they finish learning, we ask participants about each Kanji meaning and reading, and record number of correct answers. In the second round, we provide participants with a new set of 38 Kanji. But this time they have to learn it within a sentence. The 38 new Kanji were part of 30 sentences. We varied the sentences by dividing them into three types: The first ten were proverbs, the second ten idiomatic expression and the third ten were four idiomatic expressions. See Figure 33. After that we ask learners each Kanji meaning and reading and record the correct answers to compare the coverage. We found that Kanji learning has improved by 40%. Refer to Table 6.1
Figure 33 a sample of the sentences given to participants.

Table 6.1 phrase based method evaluation data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Preferred method result out of 38 characters</th>
<th>Proposed method result out of 38 characters</th>
<th>Learning outcome improvement percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>23</td>
<td>53.3</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>36</td>
<td>50.0</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>36</td>
<td>38.4</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>29</td>
<td>81.25</td>
</tr>
<tr>
<td>5</td>
<td>21</td>
<td>29</td>
<td>38.1</td>
</tr>
<tr>
<td>6</td>
<td>19</td>
<td>25</td>
<td>31.5</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
<td>22</td>
<td>57.1</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>37</td>
<td>23.3</td>
</tr>
<tr>
<td>9</td>
<td>13</td>
<td>19</td>
<td>46.1</td>
</tr>
<tr>
<td>10</td>
<td>18</td>
<td>28</td>
<td>55.5</td>
</tr>
<tr>
<td>11</td>
<td>31</td>
<td>38</td>
<td>22.5</td>
</tr>
<tr>
<td>12</td>
<td>17</td>
<td>23</td>
<td>35.3</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>18</td>
<td>63.6</td>
</tr>
<tr>
<td>14</td>
<td>23</td>
<td>30</td>
<td>30.4</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>33</td>
<td>65</td>
</tr>
<tr>
<td>16</td>
<td>22</td>
<td>34</td>
<td>54.5</td>
</tr>
<tr>
<td>17</td>
<td>27</td>
<td>34</td>
<td>25.9</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>19</td>
<td>30</td>
<td>38</td>
<td>26.6</td>
</tr>
<tr>
<td>20</td>
<td>24</td>
<td>35</td>
<td>45.8</td>
</tr>
</tbody>
</table>

Average improvement: 44.5%
6.2 Kanji Arabic Equivalent Background

6.2.1 The Importance of Kanji Decomposition

This proposal deals with the second half of Kanji learning formula focusing on meaning and writing aspects. But since meaning learning was already covered in the Phrase Based Learning method we focus specifically on writing aspect now. Three of the currently available methods help learn Kanji writing. These are active writing method, visual representation method, and Kanji mnemonic method. The common limitation of these methods is they help learn one type of Kanji category - be it pictographs, ideographs or logograms - and fail to cover other categories. Another thing to note is that visual representation and Kanji mnemonic methods both try to decompose Kanji characters and have the learners understand the meaning of the elements that make up the Kanji. Based on that we have set two conditions for the proposed learning method:

- **First** it must work for all three categories of Kanji
- **Second** it must enable Arab learners to understand Kanji components

To satisfy these conditions we propose a method called Kanji Arabic Equivalent. In which for every Kanji a copy in Arabic is made. This copy functions as mnemonic that helps memorize Kanji by decomposing its components. But it is different from regular mnemonic in two aspects, first it substitutes Kanji components with words in Arabic, second it tries to capture Kanji components position. See Figure 34 section A. This Kanji falls in the logograms category. It is complex enough to enable us to make a sentence made of its components but how about the rest of categories Pictographs and ideographs? In their cases we do not need to form a sentence. Substituting the components with part translation in Arabic is sufficient for the acquisition of their meaning. See same Figure section B and C.
We can see that the purpose of substituting in Arabic is not to form a mnemonic sentence but rather to stand for the components meaning. This might be very helpful for learning Kanji writing because one: it is very engaging to have the learner think in mother language while memorizing the parts that make up the Kanji. Two, it decomposes parts and commits them to learners’ memory. We assume this is more effective to utilize than active writing which relies entirely on hand memory by storing random strokes which may not be easily recalled when needed.
6.2.2 Kanji Arabic Equivalent Preliminary Evaluation

To evaluate the effectiveness of Kanji Arabic Equivalent we make an experiment of twenty participants. For each one we provide a set of 15 Kanji and ask to learn their meaning and writing using traditional method. After they finish learning we assess them and record number of correct answers. Then we provide them with a new set of 15 Kanji this time is along with Arabic Equivalents. After they finish learning we assess learning outcome to compare the coverage between the two methods.

Table 6.2 Kanji Arabic Equivalent method evaluation data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Number of memorized characters out of 15 using preferred method</th>
<th>Number of memorized characters out of 15 using proposed method</th>
<th>Difference in performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>11</td>
<td>57%</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>14</td>
<td>55%</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>14</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>10</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>15</td>
<td>66%</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>15</td>
<td>36%</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>13</td>
<td>30%</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>12</td>
<td>50%</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>8</td>
<td>60%</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>10</td>
<td>66%</td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>10</td>
<td>66%</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>8</td>
<td>100%</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
<td>8</td>
<td>60%</td>
</tr>
<tr>
<td>14</td>
<td>10</td>
<td>14</td>
<td>40%</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>9</td>
<td>80%</td>
</tr>
<tr>
<td>16</td>
<td>9</td>
<td>12</td>
<td>33%</td>
</tr>
<tr>
<td>17</td>
<td>6</td>
<td>10</td>
<td>66%</td>
</tr>
<tr>
<td>18</td>
<td>7</td>
<td>10</td>
<td>42%</td>
</tr>
<tr>
<td>19</td>
<td>7</td>
<td>11</td>
<td>57%</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
<td>8</td>
<td>33%</td>
</tr>
</tbody>
</table>

average of performance improvement 59%

We found that Kanji Arabic Equivalent has effectively improved learning outcome by 60%
6.3 Proposal to Merge the Two Solutions

Previously we divided the Kanji learning formula which includes (meaning, reading, and writing) into two halves. The first half dealt with meaning reading learning while the second half dealt with meaning writing learning. The preliminary evaluation—used on very small sample—has shown indications of effectiveness. Now we want to merge the two halves into one solution in order make final evaluation on larger number of participants.

6.3.1 Pre Evaluation: Kana Efficiency Test

The purpose of the test is to check whether participants have enough efficiency in Hiragana and Katakana since they are essential requirement to test our methodology. The methods of testing Kana efficiency are not various. In fact, there are only two ways to conduct Kana test. The first is by providing Kana syllabary with choices of reading in Hebun. See Figure 35 A. The second one is the opposite, the reading is provided in Hebun while Kana syllabary are given as choices. See Figure 35 B. Usually if 90 percent of recorded answers are correct, the learner is judged to be proficient.

![Figure 35 Two methods of testing Kana efficiency](image)

(A) (B)
6.3.2 The Accumulative Index

This index is the mean by which we implement the learning order we proposed. We presumed accumulative order is most effective in learning Kanji based on the preliminary evaluation performed in chapter five. To incorporate this order into the final solution we create an index screen where learners will first view one Kanji character (the Kanji 工 which took the first position in accumulative order list, refer to image 29). By interacting with this character, the learner will be taken to the interactive tutor to start learning process. Only after the Kanji is mastered do learners proceed to the next one. See Figure 36 and 41 to see index after and before update.

![Tutor interface sketch](image)

Figure 36 Accumulative index screen

6.3.3 Meaning Phase

In this phase, two pieces of information are given, first all recognized meanings of the Kanji selected. Second, is the Kanji Arabic Equivalent. The recognized meaning will be highlighted and displayed first. The purpose is to get learners to think about those meanings in the mother language. After that, the Kanji Arabic Equivalent ,which shows decomposed Kanji components, encourages learners to think about those components and map them to the Kanji meaning highlighted above. See figure 37. After learning all Kanji meanings, learners will proceed to reading phase.
6.3.4 Reading Phase

In this phase, for each recognized reading a single sentence is given. For example, the first Kanji (工) has two readings, the first is (こう Kō) and the second is (く Ku). Reading phase will provide a sentence for each reading along with Arabic translation. The number of sentences is equal to the number of recognized readings. Japanese proverbs, idiomatic expressions and four characters expression are the first candidate from which we select those sentences. The goal of reading phase is to eliminate reading difficulties by providing Kanji reading and meaning along with the Japanese text. See figure 38. Next learners will proceed to writing phase.
6.3.5 Writing Phase

This phase emphasizes writing skill. It does that by showing learners Kanji writing strokes in series of steps. Following those steps helps keep Kanji proportions to appear natural. Learners should practice those steps until the Kanji can be produced easily from memory without viewing writing guide. Writing phase do not only guide how to write Kanji but how to recognize written Kanji as well. The hand-written Kanji by Japanese in note taking for example uses simplified strokes which could make it hard for nonnative speakers to identify the characters. To overcome that, writing phase displays three Kanji writing styles Kaisho, Gyosho, and Sosho to get learners into the habit of recognizing them. See figure 39. After writing phase learners will proceed to assessment phase.

![Tutor interface sketch]

Figure 39 Writing phase helps write and recognize written Kanji

6.3.6 Assessment Phase

The assessment phase aims to measure learning outcomes by providing questions with multiple choices. There are three questions, one for each learning phase. The first question is concerned with meaning skill. It asks the learners to identify the incorrect meaning of a certain Kanji. See figure 40 question one. By practicing this with every Kanji, learners will develop a boundary of meaning for each Kanji. The second question is concerned with Kanji reading, it shows one of the Kanji compounds and asks leaners to choose its correct reading. See figure 40 question two.
The third question is concerned with Kanji writing. It asks learners to choose the correct representation of Kanji among three possible versions. Same as with the other questions we rely on exclusions to draw boundary around each Kanji information. See figure 40 question three.

Figure 40 Assessment screen

6.3.7 Updating the Index

After performing the assessment, a result is calculated. If half of the answers are correct, then learners will be taken back to accumulative index screen where the next Kanji will appear and learners will cycle through the three learning phases for that next Kanji. See figure 41.

Figure 41 Index updated after mastering last Kanji
Chapter 7

Hypothesis Evaluation

7.1 Evaluation of Proposed Method

The question of this research has been how to develop an independent method to teach Japanese Kanji to Arabic speakers. Our hypothesis was making a tutor that incorporate (1) Kanji Arabic Equivalent and (2) Japanese phrases is the solution to teach Arabic speakers Japanese Kanji. In this chapter we will evaluate this hypothesis. We will make quantitative analysis to assess the effectiveness of learning method in helping Arabic speakers to:

1. Learn Kanji meaning
2. Learn Kanji reading
3. Learn Kanji writing
4. Gain confidence in Kanji skills
5. Preserve gained Kanji skills.

7.2 Experiment Setting and Procedures

Our goal is to conduct a comparative experiment between two groups of Arab learners. The first group learns using the proposed method while the second group learns using their traditional method. Then we compare learning outcomes. See figure 42 for an overview of the experiment steps. Detailed explanation of experiment procedures is given after.
1. Step one: sourcing participants
It is important to note that this experiment was performed during our study in Japan. The number of native Arabic speakers around and outside campus is very few. They have the ability to communicate in English and some have learned Japanese language. This caused us to look for participants using the internet mostly from Japanese language forums dedicated to Arabic speakers. We tracked participants based on reading their posts in the forums. If they comment about struggling with Kanji learning or Kanji English translation, we send them a private message to see if they are willing to contact us using Skype to perform experiment. Using this method of communication we arranged 26 participants.

2. Step two: performing Kana test
As seen in Figure 42, the first thing we need to do is make sure participants know Hiragana and Katakana or have learned the majority of the syllabary. But in our case we did not perform a test to check Kana efficiency for two reasons, first for lack of time and second because the participants posts in the forums were enough proof for their efficiency. They were also capable of understanding basic grammatical structures that equals N3 level .So we skipped testing Kana step and move to the next one.
3. Step three: assigning participants to group

The 26 participants were assigned to one of two groups randomly. The first group will learn Kanji using traditional method, from now on called \textit{(the Traditional Group)} and the second group will learn using proposed method, from now on called \textit{(the Proposal Group)}. It is important to mention that members of Traditional Group will not follow one way of learning. Each participant is free to use the way of learning they are accustomed to. They also do not have the same restriction as Proposal Group which means they can learn by referring to English materials or any outside Kanji sources.

4. Step four: providing the list of Kanji

In this step we prepare 10 Kanji characters to be distributed to both groups. However, the Proposal Group will have to learn those characters in an accumulative order. The Traditional Group on the other hand will have the same list of Kanji but randomly sorted. When Traditional Group receive the list of Kanji no comments will be made about learning order. Refer to Figure 43 for the list of Kanji.

![Figure 43 Traditional Group follows random order of learning unlike Proposal Group](image-url)
5. Step five: learning process
Time is arranged between us and participants to make Skype call. If the participant belongs to Traditional Group we (1) send them the list of Kanji characters (2) ask them to learn the Kanji by explicitly saying “we are going to make an assessment later so make sure you learn all the Kanji information”. Then the call ends and participants start learning Kanji. Later he or she should call back to start the assessment in one hour at maximum. If the participant belongs to the Proposal Group however we (1) send them the tutor page file which is an implementation of the methodology explained in Chapter 6 under Proposal to Merge the Two Solutions, (2) and we ask to learn all Kanji information for future assessment. (3) We explicitly ask not to use other references but only this file. Then we walk with the participant through the meaning, reading, writing phases. We make sure each participant does not exceed one hour.

6. Step six: assessment process
After learning step, we call the Traditional Group participants and provide them with assessment questions. These are four questions about Kanji meaning, reading, writing and finally how confidence the learner is about his or her answers. As for the Proposal Group members they will have the assessment questions as part of the tutor file received. Table 7.1 and Table 7.2 summarize the result of assessment performed for both Traditional Group and Proposal Group.
Table 7.1 Traditional Group assessment result

<table>
<thead>
<tr>
<th>Participants</th>
<th>Meaning out of 10</th>
<th>Reading out of 10</th>
<th>Writing out of 10</th>
<th>Confidence out of 10</th>
<th>Total skill average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>47%</td>
</tr>
<tr>
<td>2.</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>55%</td>
</tr>
<tr>
<td>3.</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>57%</td>
</tr>
<tr>
<td>4.</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>85%</td>
</tr>
<tr>
<td>5.</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>65%</td>
</tr>
<tr>
<td>6.</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>3</td>
<td>52%</td>
</tr>
<tr>
<td>7.</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>77%</td>
</tr>
<tr>
<td>8.</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>55%</td>
</tr>
<tr>
<td>9.</td>
<td>8</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>10.</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>75%</td>
</tr>
<tr>
<td>11.</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>47%</td>
</tr>
<tr>
<td>12.</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>55%</td>
</tr>
<tr>
<td>13.</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>52%</td>
</tr>
<tr>
<td>Average per skill</td>
<td>64%</td>
<td>61%</td>
<td>64%</td>
<td>53%</td>
<td>61%</td>
</tr>
</tbody>
</table>
## Table 7.2 Proposal Group assessment result

<table>
<thead>
<tr>
<th>Participants</th>
<th>Meaning out of 10</th>
<th>Reading out of 10</th>
<th>Writing out of 10</th>
<th>Confidence out of 10</th>
<th>Total skill average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>50%</td>
</tr>
<tr>
<td>2.</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>67%</td>
</tr>
<tr>
<td>3.</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>57%</td>
</tr>
<tr>
<td>4.</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>55%</td>
</tr>
<tr>
<td>5.</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>75%</td>
</tr>
<tr>
<td>6.</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>65%</td>
</tr>
<tr>
<td>7.</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>8</td>
<td>90%</td>
</tr>
<tr>
<td>8.</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>45%</td>
</tr>
<tr>
<td>9.</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>10.</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>60%</td>
</tr>
<tr>
<td>11.</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>82%</td>
</tr>
<tr>
<td>12.</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>92%</td>
</tr>
<tr>
<td>13.</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td><strong>Average per skill</strong></td>
<td><strong>66%</strong></td>
<td><strong>65%</strong></td>
<td><strong>78%</strong></td>
<td><strong>63%</strong></td>
<td><strong>68%</strong></td>
</tr>
</tbody>
</table>
7.3 Experiment Result Representation

Table 7.1 and Table 7.2 summarize assessment result for Traditional Group and Proposal Group respectively. We can see that each row represents one participant performance in terms of four Kanji skills: meaning, reading, writing and finally confidence. Since we provided ten Kanji characters, the highest possible score for each column is ten. We calculate the average value for each skill individually and we also calculate the average of all Kanji skills combined. The Proposal Group average skill value was found to be higher than the Traditional Group by 7%. But further analysis of each skill follows.

7.4 Experiment Result Analysis

7.4.1 Analysis of Meaning Learning Effectiveness

Refer to Figure 44 which illustrates meaning learning outcome for each participant numbered from 1 to 13. For Traditional Group members, highlighted in blue, the highest score was 9 while the lowest score was 4. The same numbers are obtained from Proposal Group members. The average score for meaning learning outcome was 64% for Traditional Group and 66% for Proposal Group. The difference is 2% which is not a large indicator of improvement.
7.4.2 Analysis of Reading Learning Effectiveness

Refer to Figure 45 which illustrates reading learning outcome for each participant numbered from 1 to 13. For Traditional Group members, highlighted in blue, the highest score was 8 while the lowest score was 4. For Proposal Group members, their highest score was 9 and lowest score was 6. The average score for reading learning outcome was 61% for Traditional Group and 65% for Proposal Group. The difference in reading learning outcome improvement is 4%.
7.4.3 Analysis of Writing Learning Effectiveness

Refer to Figure 46 which illustrates reading learning outcome for each participant numbered from 1 to 13. For Traditional Group members, highlighted in blue, the highest score was 8 while the lowest score was 4. For Proposal Group members, their highest score was 9 and lowest score was 6. In this skill we obtained numbers lowered than 4 which proves Kanji writing is the most difficult skill to gain. The average score for writing learning outcome was 64% for Traditional Group and 78% for Proposal Group. The difference is 14% which is an indicator of writing learning improvement.

![Figure 46 Writing learning outcome for each participant](image)

7.4.4 Analysis of Gaining Confidence Effectiveness

Refer to Figure 47 which illustrates reading learning outcome for each participant numbered from 1 to 13. For Traditional Group members, highlighted in blue, the highest score was 8 while the lowest score was 2. For Proposal Group members, their highest score was 9 and lowest score was 3. The average score for confidence gaining was 53% for Traditional Group and 63% for Proposal Group. The difference is 10% which could also indicate improvement of gaining confidence. With this the analysis of skills is completed and Figure 48 summarizes the difference between both groups.
7.5 Analysis of Participants Feedback

In order to gain more knowledge about the participants perspective we thought of collecting information about the process experience. Two information was of interest to us: the first is what learning method did the Traditional Group employ to learn? And the second is: how did the Proposal Group found the learning experience using the tutor.
7.5.1 The Resources Used by Traditional Group

After the assessment we asked Traditional Group members about what resources they used to lookup Kanji information and we found they all used English references. Since their English skill is not very high they translate the English meaning of Kanji into Arabic. We believe this is why they relatively took more time in the learning process than Proposed Group members who had the materials ready in Arabic and performed assessment right after each Kanji. Finally the Figure 49 illustrates the type of English resource they used.

We can see that he majority of participant relies on mobile applications or websites which is a common practice in this age even for searching about one’s native language information. It was interesting however to see that some participants still use books such as Kanji textbooks or Kanji dictionary for learning despite their difficulty to search and time consumption. Their justification was that books explanation was gradual while software solutions only lay out information without proper explanation. This comment reflects the same observation we made about software resources ineffectiveness to communicate with learners. See Chapter two 2.2 Kanji Resources, Software Resources.
7.5.2 Proposal Group Feedback about the Tutor

When we walked the Proposal Group member through the interactive tutor from reading to assessment phase, we received comments such “*where can I buy this tool from?*” and “*Does it cover all the Kanji characters?*” This encouraged us to ask them for the reasons so we asked why would they continue to use or recommend this method to any Arabic speaker learning Kanji. Their response is illustrated in Figure 50.

Based on the Figure we can see the major reason participants will recommend this solution is due to resources limitations. The limited number of Kanji resources in Arabic has always been a struggle to Arab learners. The second major reason was time saving. Some participants stated that using this solution reduced the time they spend on Kanji learning which usually took longer. We think this is because no search was needed with this method and learners can start comming information into their memory right way.

Finally enjoying the learning process and having all information in one place were the minor reasons some participant would recommend the solution. Of course there are many ways this qualitative data can be interpreted but we can say that they all stressed the need for a smooth learning method that enabled to spend longer time learning than searching for Kanji or struggling with how to learn them.
7.6  Analysis of Learning Outcome Perseverance

In this step we evaluate the perseverance of gained Kanji skills which is the fifth goal of the evaluation process. Making learning outcome retain longer in learner memory can be an additional advantage for the proposed method. To test that we assess the experiment participant after two months period.

7.6.1 Analysis Setting and Procedures

The first experiment was completed in June 16 2017. This test was completed by August 18 2017, almost 63 days separate the two experiment. Members of the first experiment were contacted again to perform learning outcome perseverance evaluation without notice. Unfortunately, I could not reach all participants in the previous experiment. Four of them did not answer my request to contact. Also I had to remove two participants because they were reviewing daily and one of them answered all question correctly. I kept the participants who were studying at regular interval without specifically looking at the characters introduced in the previous evaluation. This has left us with 20 participants. Ten from the Traditional Group and ten from the Proposal Group. During the interview only questions are given and each participant has 10 minutes to answer.

7.6.2 Perseverance Result Representation

Traditional Group members are highlighted in blue while Proposal group members in orange. The dark color represents the performance in June while the light color represent the performance in August. For a detailed comparison of participant perseverance one by one see the Figures that follow. For meaning perseverance, see Figure 51; for reading perseverance, see Figure 52; for writing perseverance, see Figure 53; for confidence perseverance, see Figure 54.
Figure 51 Average meaning perseverance improved by 17%

Figure 52 Average reading perseverance improved by 25%

Figure 53 Average writing perseverance improved by 38%
Figure 54 Average confidence perseverance improved by 25%

7.6.3 Perseverance Result Analysis

Table 7.3 summarizes the value obtained in this test. We were very surprised that none of the participants kept their performance the same. We can see that the average meaning skill for Traditional Group was 66% in August then dropped to 30%. For the Proposal Group, it was 72% in June then dropped to 47% in August. As for the reading skill, the Traditional Group value was 59% in June then dropped to 17% in August which is a big lost in learning outcome. The Proposal Group however scored 70% in June and dropped to 42% in August. The writing skill for Traditional Group was 64% in August and dropped to 28% in June while Proposal Group scored 83% in June and 66% in August. As for confidence, Traditional Group value was 55% in June and dropped to 19% in August while Proposal Group scored 70% in June and dropped to 44% in August.

Both groups experienced learning outcome lost but the lost value was bigger for the Traditional Group. The skill the Traditional Group lost the most was reading skill. It is also the skill the Proposal Group lost the most. This sparked more questions about why Kanji reading skill was hardest to maintain. For a summary refer to Figure 55. Where it shows that the proposed method has improved to preserve learning outcome by 23%.
### Table 7.3 Learning Outcome Perseverance Evaluation

<table>
<thead>
<tr>
<th></th>
<th>Traditional Group Result</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>June average</td>
<td>August average</td>
<td>Lost average</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meaning</td>
<td>Reading</td>
<td>Writing</td>
<td>Confidence</td>
</tr>
<tr>
<td>Traditional Group</td>
<td></td>
<td>66%</td>
<td>59%</td>
<td>64%</td>
<td>55%</td>
</tr>
<tr>
<td>Proposal Group</td>
<td></td>
<td>83%</td>
<td>42%</td>
<td>36%</td>
<td>36%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Proposal Group Result</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>June average</td>
<td>August average</td>
<td>Lost average</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meaning</td>
<td>Reading</td>
<td>Writing</td>
<td>Confidence</td>
</tr>
<tr>
<td>Traditional Group</td>
<td></td>
<td>72%</td>
<td>70%</td>
<td>83%</td>
<td>70%</td>
</tr>
<tr>
<td>Proposal Group</td>
<td></td>
<td>47%</td>
<td>42%</td>
<td>66%</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25%</td>
<td>28%</td>
<td>17%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Figure 55 Average Kanji skill perseverance improved by 26%
7.7 Supplementary Experiment

7.7.1 Purpose and Method of Supplementary Experiment

During first experiment, we were bound by limited timeline. This caused to lookup for participants who met our minimum criteria quickly and they were very small in number. But in order to gain more certainty about the proposed method we perform a supplementary evaluation with larger number of participants. Unlike the previous participants those were sourced with the help of Japanese forum administrator who provided us with a list of keen Japanese learners. They fulfill all the condition required for evaluation. We performed the same evaluation steps as the previous group. Please refer to 7.2 Experiment setting and procedures for detailed review.

The key change however this time is 1) the number. The total number of perspirants is 50 and they were divided into two groups of 25 members which is almost the total number of participant in the previous experiment. 2) they are very keen to learn Japanese so the motivation factor this time might be higher.

7.7.2 Result and Analysis of Supplementary Experiment

Table 7.3 and 7.5 summarizes the result for Traditional Group and Proposal Group respectively. We can see that the Proposal Group scored higher value in all the Kanji skills: Meaning skill is higher by 18%; reading skill is higher by 28%; writing skill is higher by 37%; confidence gaining is higher by 31%. Nevertheless the values scored by Traditional Group members were not low. They might be better than Proposal Group of the first experiment. The members of both groups were very interested in learning and they process was smoother than the first trial. Finally see Figure 56 which illustrates that the total learning outcome improvement was 28%.
Table 7.4 Supplementary Traditional Group Assessment Result

<table>
<thead>
<tr>
<th>Participants</th>
<th>Meaning out of 10</th>
<th>Reading out of 10</th>
<th>Writing out of 10</th>
<th>Confidence out of 10</th>
<th>Total skill average</th>
</tr>
</thead>
<tbody>
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<td>4</td>
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<td>3</td>
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<td>2.</td>
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<td>3.</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<td>27%</td>
</tr>
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<td>4.</td>
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<td>3</td>
<td>3</td>
<td>3</td>
<td>32%</td>
</tr>
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<td>35%</td>
</tr>
<tr>
<td>6.</td>
<td>8</td>
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<td>4</td>
<td>4</td>
<td>52%</td>
</tr>
<tr>
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<td>2</td>
<td>30%</td>
</tr>
<tr>
<td>8.</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>47%</td>
</tr>
<tr>
<td>9.</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>35%</td>
</tr>
<tr>
<td>10.</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>82%</td>
</tr>
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<td>11.</td>
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<td>5</td>
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<td>12.</td>
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<td>3</td>
<td>3</td>
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</tr>
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<td>13.</td>
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<td>14.</td>
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<td>17.</td>
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<td>18.</td>
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<td>4</td>
<td>3</td>
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</tr>
<tr>
<td>20.</td>
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<td>3</td>
<td>4</td>
<td>37%</td>
</tr>
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<td>21.</td>
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<td>1</td>
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</tr>
<tr>
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<tr>
<td>23.</td>
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<td>5</td>
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<td>57%</td>
</tr>
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<td>24.</td>
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<td>3</td>
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</tr>
<tr>
<td>25.</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>77%</td>
</tr>
<tr>
<td>Average per skill</td>
<td>52%</td>
<td>38%</td>
<td>38%</td>
<td>33%</td>
<td>42%</td>
</tr>
</tbody>
</table>
Table 7.5 Supplementary Proposal Group Assessment Result

<table>
<thead>
<tr>
<th>Participants</th>
<th>Meaning out of 10</th>
<th>Reading out of 10</th>
<th>Writing out of 10</th>
<th>Confidence out of 10</th>
<th>Total skill average</th>
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<tbody>
<tr>
<td>1.</td>
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<td>70%</td>
</tr>
<tr>
<td>2.</td>
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<td>47%</td>
</tr>
<tr>
<td>3.</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>75%</td>
</tr>
<tr>
<td>4.</td>
<td>6</td>
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<td>6</td>
<td>5</td>
<td>57%</td>
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<tr>
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<td>7</td>
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</tr>
<tr>
<td>7.</td>
<td>6</td>
<td>6</td>
<td>8</td>
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<td>62%</td>
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<tr>
<td>8.</td>
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<td>7</td>
<td>8</td>
<td>6</td>
<td>70%</td>
</tr>
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<td>9.</td>
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<td>6</td>
<td>5</td>
<td>52%</td>
</tr>
<tr>
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<td>10</td>
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<td>8</td>
<td>82%</td>
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<tr>
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<td>57%</td>
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<tr>
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<td>7</td>
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<td>70%</td>
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</tr>
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<tr>
<td>17.</td>
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<td>6</td>
<td>7</td>
<td>6</td>
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</tr>
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<td>19.</td>
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<td>8</td>
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</tr>
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<td>21.</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>8</td>
<td>90%</td>
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<tr>
<td>22.</td>
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<td>9</td>
<td>7</td>
<td>75%</td>
</tr>
<tr>
<td>23.</td>
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<td>9</td>
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<tr>
<td>25.</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>85%</td>
</tr>
<tr>
<td>Average per skill</td>
<td>70%</td>
<td>66%</td>
<td>75%</td>
<td>64%</td>
<td>70%</td>
</tr>
</tbody>
</table>
Figure 56 Learning outcome improvement in the second experiment was 28%
Chapter 8

Conclusion

In this chapter we provide our comments and conclusions based on the revelation of hypothesis evaluation that was performed in Chapter 7. We do that by highlighting the limitations of the experiment we conducted since it has a large impact on the result retrieved. After that we dive into the details of the experiment findings.

8.1 Experiment Limitations

The major limitation was the small sample of participants. In the first trial we had only 26 participants while in the second trial we had 50 participants. We believe that a larger sample would enable us to judge the effectiveness of the method more confidently. This was unviable due to our existence in Japan where we could not find many Arabic speakers who met the criteria.

Another limitation would be the small number of Kanji characters which was only ten. But we had to document rich information for each single one of those Kanji. This as explained earlier included all recognized meanings, readings and writing. In addition, we needed to create three assessment questions that correspond to each skill. This process of content creation was very time consuming. We believe that even if we had time to create more content we would not be able to find participants willing to traverse the whole list of Kanji.

Each participant had their own preferences about duration of the experiment call and the time to make it. For a participant from Morocco for example, the time difference is nine hours. All these factors contributed to the difficulty of increasing experiment sample.
8.2 Summary of Experiment Observations

When we conducted the experiment, our criteria were learning outcome and learning perseverance. We focused on four metrics: Kanji meaning, reading, and writing and confidence in skills. The result we obtained from the first trial confirmed that participants who used our methodology performed better in all these criteria individually and combined. The result however was very low with total average improvement of 7%. Then in the second experiment we had help with sourcing participant from Japanese forum administrator. As the number of participants got higher the improvement in learning outcome went higher as well. With score of 28%

Some Kanji skills were low in both experiments. For example meaning and reading skills showed minor improvement of 2% and 4% in the first time and 18% and 28% in the second time. On the other hand, the two remaining criteria of Kanji writing and learning confidence scored higher improvement by 14% and 10% in the first time and 37% and 31% the second time. This parallelism in the result was very interesting to us. It might that showing the order of strokes step for each Kanji and the different calligraphic styles has been an effective way to improve writing skill and distinguish what seems like rather identical Kanji. Such skill is very essential for passing JLPT exams (Japanese Language Proficiency Test)

The difficulty of reading skill might be justified by the absence of linking. Any learner can link a Kanji meaning and writing to his/her mother language – Arabic in this case- but it might be hard to link the several readings a Kanji has. This requires an active reading practice to learn and maintain. Also, we view the improvement of Kanji confidence score as natural reaction to interacting with a reference or a resource written in the mother language.
What is more interesting is the ability of some participants to guess the exact number of their incorrect answers. Furthermore no participant has overestimated their performance. This might be an added benefit for using software to learn Kanji. Software can give learners a close idea about their skill level.

The second goal of evaluation is to see whether or not this method effective in retaining learned Kanji skill. The assessment we performed after two month period showed that none of the participants kept the information they learned complete. However, the Proposal Group did better against the Traditional Group by having a perseverance average 26% higher. In addition, we tribute the satisfactions participant expressed with the proposed solution to finally having a reference in Arabic language and not to the specifications or features of the solution itself. We could not conclude that decisively since there was no other Arabic software to compare it with. And thus, felt more comfortable to interpret it as such.

Finally, given the sample we had and the values of experiment we performed we can conclude that the proposed method proved effective. Our hypothesis of using a combination of 1)Arabic Kanji Equivalent and 2)Phrase Based Learning proved effective in learning Kanji information (meaning, reading and writing) it also increased Arab learners confidence as well as perseverance of the learning outcome.

8.3 Future Work

Despite the limitation of the experiment performed we believe the method proposed has the potential to develop and spread between Arabic speakers leaning Japanese. It might as well become a part of the recognized Kanji learning method list. Because of that we intend to continue this research in the future focusing on the limitation we had in the present as well as introduce new ideas.
For overcoming the current limitations we intend to re-perform the experiment in an Arabic speaking country in order to obtain larger number of participants. We also intend to increase the number of used Kanji to cover at least 300 characters which is the number of Kanji assigned to beginner level. Obtaining a large sample will help us draw more decisive conclusion on the learning outcome improvement.

Another thing we wish to do in the future is to build an automatic Kanji decomposer that will generate Kanji Arabic Equivalent. This will help save time and effort of illustrating the Daily Kanji list by graphical design. The tool will break the Kanji into components and substitute the component names with their Arabic equivalents.

Finally we wish to take advantage of the free electronic dictionary and richest Kanji database available online EDICT file. We believe that translating its entries and incorporating them into other solutions for Arabic speaker similar to the Tanoshi Japanese website will not only have impact on Kanji learning but learning Japanese language as a whole.
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