COGNITIVE SCIENCES AND HUMAN DEVELOPMENT

# An Error Analysis of Orthographic Representation in Written Chinese Characters

**Wee-Ling Kuan**
Faculty of Language and Communication, Universiti Malaysia Sarawak,
94300 Kota Samarahan, Sarawak, Malaysia.

## ABSTRACT

This paper reports an error analysis of orthographic representation in written Chinese characters among Mandarin as foreign language (MFL) learners studying at an elementary level at a Malaysian public university in their dictation assessment. A total of 262 stroke error types of their orthographic representation in written Chinese characters were collected and analysed. The errors were consequently classified into four main categories among 165 MFL learners who took part in the study. The study found that participants made most mistakes in the stroke numbers and shape of orthographic representation in written Chinese characters. It was also found that there were detectable mistakes in stroke relation and stroke direction of orthographic representation in written Chinese characters. The cognitive factors contributing to the orthographic representation error types in written Chinese characters are discussed. It is concluded that beginner MFL learners would have a greater tendency to commit several character errors in writing Mandarin because of their low level of orthographic awareness and presumably a high cognitive load given to them as they transit from writing alphabets scripts to writing Chinese characters. Future research could examine how MFL learners cognitively adapt when transitioning from alphabet scripts to Chinese characters. Findings would guide instructors in the teaching Chinese characters more efficient and subsequently, it would allow them to interpret orthographic representations and write Chinese characters more accurately.

**Keywords:** Mandarin as a foreign language, error analysis, orthographic representation, written Chinese characters, cognitive factors

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Email address: wlkuan@unimas.my (Wee-Ling Kuan)
*Corresponding author)
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# 1 INTRODUCTION

Learning Mandarin as a foreign language (MFL) is a popular trend in the era of globalization, followed by the rapid development of China over the years. As of the beginning of 2017, there were 137 Confucius Institutes and 131 Confucius Mandarin language learning courses announced in more than 50 "One Belt, One Road" (OBOR) countries to increase general interests and providing foreigners with more opportunities to learn about Chinese cultures and Mandarin language (Dos Santos, 2018).

Universiti Malaysia Sarawak (UNIMAS), one of the public higher education institutions in East Malaysia, also provides Mandarin as a foreign language (MFL) course. Many students register for the Mandarin course every semester. Most of the students registering for the course are non-native speakers such as Malay, Iban, Bidayuh, and other bumiputeras (Lam & Hoe, 2013).

Writing Chinese characters is considered one of the biggest challenges for non-native speakers in learning MFL because most are from an alphabetic writing system background (Lam et al.,2018).

In learning Mandarin, they must change their learning behaviours from an alphabetic writing system to a logographic writing system. In the transition of changing their learning behaviours, the orthographic representation of the students in written Chinese characters needs to be taken seriously to guide the students to the correct Chinese characters writing process.

Many studies have investigated orthographic knowledge, phonology, grapheme and semantics used in Chinese character writing (Perfetti &Tan,1998; Ding, Peng & Taft, 2004; Kuo et al., 2004; Yang et al., 2018).

Researchers such as Xiao (2002), Guo (2008), Kitterman (2012), Li (2014), Feng (2015) and Ch'ng, Ting & Chuah (2018) specifically investigated the error analysis of the feature of Chinese characters. Their studies were about the analysis of written Chinese characters based on the students' homework or exercises.

However, little research has been conducted on the students' dictation assessment. The gap in research signals the need to look at how students go through the comprehensive teaching of Mandarin, with their limited scope of knowledge of Chinese characters and how they coped with the given time to prepare for dictation assessments.

This study aims to examine the under-researched aspect of learning MFL through an error analysis of orthographic representation in written Chinese characters among Mandarin students learning the language at an elementary level.

The study will provide insight into the types of errors of orthographic representation in written Chinese characters even when students have gone through comprehensive teaching, the limited scope of Chinese characters and were given time to prepare for the dictation assessment. The

cognitive factors that contribute to the error types of the orthographic representation in written Chinese characters are also discussed in this study.

## 2 STROKE ERROR TYPES OF ORTHOGRAPHIC REPRESENTATION IN WRITTEN CHINESE CHARACTERS

Perfetti and Tan (1998) described how Chinese characters are often considered a logography. A written Chinese character consists of a unit of meaning and morpheme. It is also composed of one or more radicals.

A radical is an important part to form a Chinese character, and it is the fundamental orthographic unit of written Chinese. The radicals are structured by strokes. A stroke is a continuous line in a Chinese character. Some radicals can stand alone as a simple character, such as 口 and 木 (Su, 2010).

Yang et al. (2018) discussed about how Chinese characters have a square configuration, offering a high degree of visual complexity, in contrast to the linear structure of alphabetic words, which are built from orders of letters.

They also pointed out that written development is an essential form of human language that involves many cognitive, linguistic, and perceptual-motor operations that can be divided broadly into two parts: central and peripheral processes. The former refers to the processing involved in orthographic code retrieval, and the latter refers to the processing of the motor.

When processing written Chinese characters, it involved orthographic processing where it is a dynamic way of deriving from the proportional and abstract structural representation of written words (Kuo et al., 2004). The unique and complex features of Chinese characters involve high demand in working memory and a greater cognitive load (Xu et al., 2020; Zimmer & Fischer, 2020).

Guo (2008) pointed out that there are common errors in the shape of stroke, the direction of the stroke, the relation of stroke and the number of strokes among MFL learners.

He also mentioned that the most common shape of an alphabetic writing system is a curve; however, the most common shape of the Chinese character writing system is a straight line. Therefore, it is seen that MFL learners tended to make mistakes in the shape of stroke when writing the Chinese characters because they were facing problems converting the idea from writing alphabets to Chinese characters.

He also pointed out in an alphabetic writing system, the direction of writing alphabets is typical, from left to right and from top to bottom, however, in the Chinese character writing system, other than the horizontal strokes (横) and vertical strokes (竖), the stroke of slash (撇), or hook (钩) are

much more complicated in writing because it is only moving in one direction across a writing surface.

The relation of a stroke is another aspect that causes problems in learning the writing of Chinese characters. Guo (2008) said that if the learners are not sensitive or not paying attention to the disconnected, connected, or intersected strokes, they will make mistakes in writing Chinese characters.

Guo (2008) saw that beginner MFL learners tended to recognize Chinese characters as a whole. Thus, while learning Chinese characters, if MFL learners are careless, they will undoubtedly overlook certain strokes. Their written Chinese characters will show redundant or fewer strokes.

Other studies have also investigated error analysis of the written Chinese characters. Many stroke error types have been discussed and analyzed. A few stroke error types frameworks also have been established (Xiao,2002; Guo, 2008; Su, 2010; Kitterman,2012; Li,2014; Feng, 2015; Ch'ng, Ting & Chuah, 2018).

In sum, it is customary to see MFL learners at the elementary level make several character errors because of their low orthographic awareness and a high cognitive load given to them during the transition from writing alphabets scripts to writing Chinese characters.

## 3 PURPOSE OF THE STUDY

The study aims to：

1. identify error types of orthographic representation in written Chinese characters among Mandarin as foreign language (MFL) learners at the elementary level in UNIMAS in their dictation assessment.

2. discuss cognitive factors contributing to the orthographic representation error types in written Chinese characters.

## 4 METHODOLOGY

### 4.1 Participants and materials

One hundred and sixty-five MFL learners (elementary Mandarin) in semester 1, session 2020/2021, were selected in this study. All of them are from an alphabetic writing system background. The participants went through comprehensive teaching in elementary Mandarin classes for six weeks.

During the six weeks, participants are taught to read and write the targeted 51 Chinese characters. Basic radicals, basic strokes, basic stroke order and Chinese character structures were introduced to the participants. Participants were given time to revise the targeted 51 Chinese characters before the study.

### 4.2 Instrument

The study was conducted in week 7. There was a dictation assessment conducted using WebEx videoconferencing. The participants need to write down all 10 Chinese characters out of the 51 Chinese characters that the instructor has read.

The selected 51 Chinese characters were consisting of simple characters (radical) and complex characters. An example of a simple character is 女 and an example of a complex character is 妈. The concept of simple characters (radical) and complex characters are introduced by Ding, Peng & Taft (2004). Participants were explained and instructed on the procedure of the study. No extra time, hint, aid, and reference were given during the dictation.

### 4.3 Data Collection

All the answer sheets for the dictation were collected for analysis. The errors of orthographic representation in written Chinese characters were categorized by the framework adopted from Guo (2008). Categorized errors were examined independently and then as a group.

## 5 RESULTS AND DISCUSSION

**Table 1.** Frequency of errors type based on dictation

| No. | Stroke error type | Total | Percentage (%) |
|---|---|---|---|
| 1 | Stroke number | 128 | 48.85 |
| 2 | Stroke shape | 78 | 29.78 |
| 3 | Stroke relation | 43 | 16.41 |
| 4 | Stroke direction | 13 | 4.96 |
| | **Total errors** | 262 | 100.00 |

Overall, the data analysis shows that the study participants made more mistakes in the stroke numbers and shape of orthographic representation in written Chinese characters. The mistakes followed by stroke relation and stroke direction of orthographic representation in written Chinese characters.

### 5.1 Stroke number of errors

In support of Guo's study (2008), the analysis of this study is revealed that the stroke number of errors is the most frequent stroke error in writing Chinese characters, which is 128 errors or 48.85% of 262 errors.

Chinese characters belong to the square configuration, which requires higher visual information. Each character consists of various strokes formed by different lines as the basic components (Yang et al., 2018; Xu et al., 2020; Zimmer & Fischer, 2020). To write a Chinese character correctly, learners need to understand the stroke order in a Chinese character (Guo, 2008; Kuo et al., 2004).

For learners from alphabetic writing system backgrounds, they found the Chinese characters are complicated and confused from the structure of orthographic representation. They found it abstract and tended to overlook certain strokes. They were facing a high cognitive load during this writing process. This result has corresponded to the study of Guo (2008) and the study of Kuo et al. (2004).

Most of the learners accidentally put redundant stroke(s) or ignored particular stroke(s). For the character of "医", the horizontal stroke (横) is added "  ". The learners tended to ignore the hook of Chinese characters as well, for example, the " 钅 " in the character of " 银 ," they wrote it as "  ."

### 5.2 Stroke shape of errors

There are several types of strokes in Chinese characters, such as dot (点), horizontal stroke (横), slash stroke (撇), backslash stroke (捺), tick stroke (提), hook stroke (钩).

Based on the analysis from the MFL learners' dictation, slash stroke (撇), backslash stroke (捺), tick stroke (提) and hook stroke (钩) are the biggest obstacles for them. The high demand in visual working memory processing caused students to make this kind of mistake (Kuo et al., 2004; Xu et al., 2020; Zimmer & Fischer, 2020).

For example, many of them made mistakes when writing a slant hook stroke(斜钩) in the character of " 我. " Instead of writing " 𠂉 ", students wrote into an alphabet "v". This is the second-highest stroke errors in frequency (78 errors or 29.78% of 262).

As discussed in Guo (2008), MFL learners were found to write a straight line into a curve in a stroke. The error is due to the strong influence of their alphabetic native language. MFL learners were confused with specific strokes with certain shapes in their prior knowledge in the alphabetical writing system. For example, “阝” in the character of 邮, they would write it like an alphabet, "B". This example was found to be the same mistake in Guo’s findings.

### 5.3 Stroke relation of errors

Since a Chinese character consists of a stroke or compound strokes, there are situations where MFL learners make errors at some disconnected, connected, or intersected strokes in a Chinese character. This type of error contributes to stroke relation errors in writing Chinese characters.

The study participants showed that 16.41% of them were doing stroke relation of errors in their written Chinese characters. Before the study, the MFL learners have been taught to write the Chinese characters based on the correct stroke order, and they should be aware of basic radicals, basic strokes, and Chinese character structure at this stage. However, somehow, they still made mistakes in their dictation assessment.

In this study, the result has somehow been in line with Guo’s research in 2008. Guo explained that the MFL learners were careless in writing the Chinese characters. They did not notice any difference between the ratio of each stroke in a Chinese character.

For example, the character of “见”, MFL learners in this study wrote it as “贝”. They are confused with the stroke of “乚” with “丶". This result also supported Kubota's findings in 2005. Since the learners were facing a higher cognitive load, they tended to make mistakes with stroke length.

The analysis of this study shows the situation is found to occur at the start and end of a stroke in the written Chinese characters. It could be the cause of the unintentional mistake, or they were insensitive and ignored it while they were writing Chinese characters.

### 5.4 Stroke direction of errors

Stroke direction errors occur when the study participants have mirror writing. It happened when they confuse the direction of the stroke(s) of the Chinese characters (Guo, 2008; Ch’ng, Ting & Chuah, 2018).

A particular stroke should be written on the right side, but the study participants misplaced it on the left side. They wrote the Chinese character in the direction that is the reverse of the natural way for Chinese characters. For example, the "钅” in the character of “银”, the learners wrote it as “”.

The category of errors discussed the direction of the stroke(s) is/are written inaccurately. Guo (2008) explained that this is because the study participants did not have enough writing practice. Thus, they were not clear about the correct direction of the stroke and were confused with the left and right sides. Their cognitive processing level was low at this point.

## 6 CONCLUSION

The finding of the study shows that MFL learners at the elementary level in UNIMAS tend to make mistakes in the stroke numbers of Chinese characters (48.85%), followed by stroke shape of Chinese characters (29.78%), stroke relation of Chinese characters (16.41%) and stroke direction of Chinese characters (4.96%).

The result reported that most students were confused about stroke numbers and stroke shapes in the Chinese characters and needed more writing practices to make it perfectly (Hsiung et al., 2017). The instructor is encouraged to highlight the typical errors to the learners, so the learners will be more aware when they write the Chinese characters.

This study has added to the field of foreign language acquisition. It has given us a glimpse into how MFL learners at the elementary level acquired Chinese characters through the several types of stroke errors in their writing.

There are some limitations to this study. This study was conducted in one learning context only and is bound by the number of participants and their existing language levels and competencies. Also, the limited scope of 51 Chinese characters may affect the representation of optimal study results. Other factors, such as students feeling nervous and misunderstanding what the instructor has read during the dictation assessment, led to the bias of the study's result.

Future studies should examine learners with different language levels or those with a greater vocabulary to understand how MFL learners can adjust when moving from alphabets scripts to Chinese characters. It is to aid instructors in teaching Chinese characters more effectively, further helping students interpret the orthographic representation more accurately and write the Chinese characters more correctly.

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