

CHAPTER FOUR

ANALYSIS AND DISCUSSION

This chapter presents the results and the analysis of data collected from the subject' performance in the tests carried in the two stages. Moreover, discussion on the causes of the subjects' errors will be included as well. The analysis and discussion will mainly be approached from the following perspectives—spelling strategy, L1 transfer and phonological rules. Other factors related to the analysis will also be taken into consideration.

4.1 Analysis of Stage One Results

In this section, the results of the translation test, that is, a vocabulary spelling test, are analyzed in details. This is a quantitative test with one hundred and six students from four classes engaged. However, only ninety-nine copies of the test papers are collected and analyzed. Papers of the subjects lacking desire or ability to complete the test are excluded. The errors subjects produce in spelling are divided into four groups based on the substitute vowel letter which replaces the target ones. They are substitute letter **a**, substitute letter **e**, substitute letter **o**, and substitute letter **i** as listed in Table 4.1.

Table 4.1 Classification of Substitution

Substitution
1. Substitute letter a
2. Substitute letter e
3. Substitute letter o
4. Substitute letter i

Each substitution is further divided into several groups according to the replaced target vowel letters. 1. In the category of Substitute letter **a**, there are five subcategories: (a) letter **a** replacing letter **e**, (b) letter **a** replacing letter **o**, (c) letter **a** replacing letter **u**, (d) letter **a** replacing digraph **ea**, and (e) letter **a** replacing letter **i**. 2. In the category of substitute letter **e**, there are subcategories: (a) letter **e** replacing **a/a-e**, (b) letter **e** replacing digraph **ea**, (c) letter **e** replacing letter **i**. 3. In the category of substitute of letter **o**, there are two subcategories : (a) letter **o** replacing letter **a**, and (b) letter **o** replacing digraph **ou/ow**. 4. In the category of substitute letter **i**, there are three subcategories: (a) letter **i** replacing **e**, (b) letter **i** replacing letter **a**, and (c) letter **i** replacing digraph **ai**. The classification shown in Table 3.1 is given again for the analysis need: Table 4.2 (3.1). Detail analysis of this table is given in the following sections.

Table 4.2 Results of Vowel Substitution in Stage One

Substitution	
1. Substitute letter a	(1) letter a replacing letter e
	(2) letter a replacing letter o
	(3) letter a replacing letter u
	(4) letter a replacing digraph ea
	(5) letter a replacing letter i
2. Substitute letter e	(1) letter e replacing letter a/a-e
	(2) letter e replacing digraph ea
	(3) letter e replacing letter i
3. Substitute letter o	(1) letter o replacing letter a
	(2) letter o replacing digraph ou/ow
4. Substitute letter i	(1) letter i replacing letter e
	(2) letter i replacing letter a
	(3) letter i replacing digraph ai

4.1.1 Substitute Letter “a”

In the substitute letter “a” category, target vowel letters replaced by letter **a** are letter **e**, letter **o**, letter **u**, letter **i**, and digraph **ea**. (See Table 4.3)

Table 4.3 Substitute Letter “a”

example replacing	T.F.	E.F.	F	T.F.	E.F.	F
1.replacing letter e	go to bed	go to bad	12	restaurant	rastarant	2
	elementary	elemantary	7	special	spacial	2
	letter	latter	6	sentence	santand	1
	lesson	lasson	4	remember	remanber	1
	decorate	dacrite	4	February	Fabeary	1
	desk	dask	3	slept	slapt	1
	spent	spant	3	spell	spall	1
	vegetable	vagetabl	3	credit	cradit	1
	pencil	panciel	2	weekend	weekand	1
2.replacing letter o	terrible	tarrible	2			
	grandmother	grandmather	3	doctor	dacter	2
	brother	brather	1	block	black	2
3.replacing letter u				dollar	daller	5
	husband	hasband	8	summer	sammer	1
4.replacing digraph ea	beach	bach	3	speak	spake	2
	weather	wather	2	teacher	tacher	2
5. replacing letter i	ticket	tacket	2	little	lattle	2

Note: “F” in the table indicates the error frequency. “T.F.” means target form. “E.F.” means error form.

4.1.1.1 Letter “a” Replacing Letter “e”

In the case of letter **a** replacing letter **e**, the subjects tend to use letter **a** to replace **e**, such as **bed** spelled as *bad*, **desk** as *dask*, **elementary** as *elemantary*, and **letter** as *latter*. It seems that letter **a** is treated to represent sound /ε/, which is usually represented by the target letter **e**. Such occurrences can be attributed to the lack of

discrimination on the front vowels /ɛ/, /æ/, and /e/. The other possibility is that letter **a** with its letter name pronounced as [e], which for many Chinese students is very similar to the target sound /ɛ/ and accordingly the subjects choose letter **a** to represent their intended sound /ɛ/ by using letter-name strategy. In short, in this type of errors, the subjects tend to relate letter **a** to sound /ɛ/ either because of their lack of distinction of /ɛ/, /æ/, and /e/ or because of the employ of letter name **a**. Concerning the subjects' using letter names to spell words, such application of letter name strategy is often found in children's spelling (Treiman, 1993; Gentry, 1982; Henderson & Beers, 1980; Read, 1975).

4.1.1.2 Letter “a” Replacing Letter “o”

In the case of letter **a** replacing letter **o**, letter **a** is used to replace **o** under the circumstances that **o** is pronounced as /ɑ/ or /ʌ/. In the examples of **doctor** and **dollar**, letter **a** seems to be regarded as the representation of sound /ɑ/--the corresponding sound of letter **o**. It is probably in the subjects' mind that letter “a” and phonetic symbol [ɑ] are mixed together due to the disturbing written form of “ɑ”, which can mean a phonetic symbol or simply an alphabet letter. That is why subjects spell **doctor** as *dactor* and **dollar** as *daller* (see Table 4.3). On the other hand, letter **a** is used to represent sound /ʌ/ as **mother** spelled as *mather*. This should result from the confusion of /ʌ/ and /ɑ/ and the subjects tend to use /ɑ/ to replace /ʌ/ because phoneme /ɑ/ seems more similar to the Chinese phoneme /a/ ㄚ.

4.1.1.3 Letter “a” Replacing Letter “u”

In the case of letter **a** replacing letter **u**, letter **a** is used to replace letter **u** under the circumstances that **u** is pronounced as /ʌ/. It is probably that the subjects confuse letter “a” and phonetic symbol [ɑ] as mentioned earlier. And at the same time the subjects also fail to distinguish /ɑ/ and /ʌ/ in pronouncing or ignore the subtle differences between the two sounds in perception. Therefore confusion arises and sound /ʌ/ is mistaken as /ɑ/ and the subjects use letter **a** to represent sound /ɑ/. And that leads to letter **a** replacing letter **u**. That is why the subjects tend to spell **husband** as *hasband* (see Table 4.3). In short, substitution of letter **a** replacing letter **u** involves two factors; the first is the confusion of the sounds /ɑ/ and /ʌ/, which letter **o** and letter **u** represent respectively and the second is the confusion of letter form **a** and a phonetic symbol of [ɑ].

4.1.1.4 Letter “a” Replacing Digraph “ea”

In the case of letter **a** replacing digraph **ea**, the subjects tend to drop letter **e** in segment **ea**. There are examples of *wather* (**weather**) and *bach* (**beach**). One reason might be that in the beginning, **ea** is pronounced as /e/ or /ɛ/ in the subjects’ mind, when the subjects attempt to spell, they then use letter **a** to represent their intended sound /ɛ/, /e/, or even /æ/. Thus subjects produce the incorrect spelling such as *wather* for **weather** or *spake* for **speak**. In the meantime the error may also result from the subjects’ overgeneralization of the principle of letter-sound correspondence—one letter corresponding to one sound. Under such circumstances, subjects tend to omit one letter to conform to the principle of the one-to-one

letter-sound correspondence.

4.1.1.5 Letter “a” Replacing Letter “i”

In this substitution, letter **a** replaces target vowel letter **i**. This kind of replacement only occurs where letter **i** is pronounced as /ɪ/ and usually in a stressed syllable. From data listed above (Table 4.3), they are **little** spelled as *lattle* and **ticket** as *tacket*. According to Li (2002), when Chinese students try to pronounce /ɪ/ with an intention to draw a clear distinction between /i/, some students would lower their jaws too much and open their mouths too wide so that the sound they make is very similar to sound /ɛ/ and eventually it is hard for the subjects to tell /ɪ/ and /ɛ/ from each other. So if this is the case in the substitution of letter **a** replacing letter **i**, such a replacement is understandable. For as Reid (2003) indicates that some children confuse /ɪ/ with a neighboring front vowel such as /i/ or /ɛ/. It is possible that the subjects confuse front vowels /ɪ/, /ɛ/, and /æ/ in the beginning so that they spell **little** as *lattle*. Or this can be another phenomenon mentioned by Fromkin (1998) and Wolfram and Johnson (1982). They indicate there is a neutralization of /ɪ/ and /ɛ/ before nasal consonants, which are observed in African American English and in Southern dialects of English. In short, it is obvious that the subjects’ confusion of /ɪ/ and /ɛ/ (or similar sounds /æ/ and /e/) causes letter **a** to replace letter **i**.

4.1.2 Substitute Letter “e”

The second replacement occurs when the original vowel letter(s) is/are

substituted by letter **e**. This type of replacement can be further divided to three groups (see Table 4.4): replacing letter **a/a-e**, replacing digraph **ea**, and replacing letter **i**.

Table 4.4 Substitute letter “e”

example replacing	T.F.	E.F.	F	T.F.	E.F.	F
1. replacing letter a/ a-e	grandmother	grendmother	5	baseball	besball	2
	cram	crem	4	basketball	basketball	2
	happy	heppy	4	roller-skate	reller-sket	2
	stand	stend	3	Jane	Jen	1
	bad	bed	2	glass	gless	1
	last	lest	2	celebrate	selebret	1
	practice	pretice	2	embarrassing	embarrassing	1
	thanks	thenks	2	examine	exceming	1
2. replacing digraph ea	great	grent	1	please	pless	6
	steak	steck	1	really	relly	3
	beach	bench	2			
3. replacing letter i	listen	lesson	2	comic book	come book	2
	winter	wenter	1			
	dictionary	decionary	3			

4.1.2.1. Letter “e” Replacing Letter “a/a-e”

In replacing letter **a/a-e**, the subjects have a preference to switch **a/a-e** to **e**. There are many cases undergoing such a change. Examples are **basketball** substituted by *basketball*, **bad** by *bed*, **cram** by *crem*, **glass** by *gless*, and **last** by *lest*.

From the collected data, letter **e** replacing letter **a** mainly takes place when the target letter **a** is pronounced as /æ/. From the viewpoint of spelling strategy, many students nowadays tend to produce the sound silently before they attempt to spell. Therefore the replacement implies the subjects’ confusion of /æ/, /ɛ/, and /e/. A reasonable explanation for the substitution is that while pronouncing these sounds, the

subjects fail to notice the subtle difference of height among them or approximate them in pronunciation and eventually that causes the confusion. For example, /ɛ/ and /e/ are both mid front vowels, but differ in terms of tense or lax. As for low front /æ/, though quite different in tongue position when compared to the mid front /ɛ/ or /e/, it is still a neighboring sound to /ɛ/. Such a nearby tongue position usually causes confusion, especially when there is no such distinction in Chinese vowels. The subjects thus tend to ignore the difference of these English vowels. Besides, the subjects also lack the knowledge of a spelling pattern that a vowel in the form of CVCe is a long vowel. This explains why some subjects use letter **e** to replace letter **a-e**.

All these mentioned above account for the substitution of letter **e** replacing **a/a-e**. To sum up, first, confusion usually comes from neighboring sounds. Second, it comes from L1 transfer because in Chinese there is no distinctive feature of tenseness to determine the quality of a vowel. And these contribute to the confusion among the three front vowels /e/, /ɛ/, and /æ/ and in turn cause the substitution of letter **e** replacing letter **a**. Last, further with the lack of spelling knowledge that a final silent **e** represents a long vowel, the subjects use letter **e** to replace letter **a-e**.

4.1.2.2 Letter “e” Replacing Digraph “ea”

Digraph **ea** is sometimes shifted to **e** with one letter missing. For example, word **great** is spelled as *grent*, **steak** spelled as *steck*, and **please** turns into *plless*. Based on these data, a tendency shows that subjects drop an “**a**” when digraph **ea** is pronounced as /e/ or /i/. This switch may result from two different factors. First when the replaced digraph **ea** is pronounced as /e/, the reason for the substitution may be the

approximate pronunciations of the two phonemes /e/ and /ɛ/, a confusion of similar sounds. For some Chinese subjects, they do not pay attention to the differences between /e/ and /ɛ/ in pronunciation even if they are aware of the differences. Thus letter **e** is used as a representative of sound /ɛ/ to replace digraph “**ea**” pronounced as /e/. Similar errors are found in previous research which indicates vowel digraph reduction is often seen in children’s spelling such as **oa** spelled as **o** in **road**, and **ai** spelled as **a** in **mail** (Lombardino, Bedford & Fortier, 1997).

Second, when digraph **ea** is pronounced as /i/, by letter name strategy, the subjects tend to use letter name “**e**” to stand for sound /i/. So naturally letter **e** is used to replace digraph **ea** when pronounced as /i/.

4.1.2.3 Letter “**e**” Replacing Letter “**i**”

In the case of letter **e** replacing letter **i**, the subjects are prone to make a switch from letter **i** to **e**. There are some examples, like **listen** spelled as *lesson* and **comic book** as *come book*. From the data listed above, the subjects show their tendency to mix **i** and **e** together. This substitution exhibits a possibility that by using letter name strategy, letter **e** is used to stand for **i**, sounded as /ɪ/.

In short, letter **e** replacing letter **a** is mainly due to the confusion of vowels /e/, /ɛ/, and /æ/, as for the cases of letter **e** replacing digraph **ea** or letter **i**, the possible cause could be the letter name strategy, using letter **e** to represent sound /i/ or /ɪ/ or it could be a neutralization or confusion of sound /ɪ/ and /ɛ/ as mentioned above.

4.1.3. Substitute Letter “o”

This is the third substitution, in which letter **o** substitution takes place when letter **o** replaces other vowel letters. The substitution is further divided into two subcategories—replacing letter **a** and replacing digraph **ou/ow** (see Table 4.5):

Table 4.5 substitute letter “o”

replacing \ example	T.F.	E.F.	F	T.F.	E.F.	F
1. replacing letter a	department	deportment	3	Wang	Wong	2
	supermarket	supermorket	1	*walk	work/wolk	6
	wallet	wolly	2	*warm	worm	10
	want	wont	2			
2. replacing digraph ou/ow	down	done	3	thousand	thosand	1
		don	2		thow	1

Note: “*” means the word marked has quite different pronunciation of its replaced vowel from that of other examples in its category.

In the case of letter **o** replacing letter **a**, the subjects tend to replace **a** with letter **o**. Spellings like *deportment* for **department**, *supermorket* for **supermarket**, *Wong* for **Wang**, and *wont* for **want** support this statement. Such an alteration can stem from the cause that letter **o** is the common spelling for back vowel /ɑ/ sound. And by using phonics information in their spelling, the subjects tend to use letter **o** for the /ɑ/ sound. Furthermore, in the subjects’ performance, this “rule” is also applied to the vowel letter followed by consonant “**r**”. For example, **market** is replaced by *morket*, in which segment “**ar**” is substituted by “**or**”. Meanwhile large portion of substitution occurs when the target letter **o** is pronounced as /o/ or /ɔ/, this phenomenon indicates the subjects spell in the way they pronounce, for example, *wolk* for **walk** and *worm*

for **warm**.

The other alteration in “**o**” substitution is replacing digraph **ou/ow**. In this replacement, digraph **ow** or **ou**, both representing diphthong /*au*/, is reduced to a simple vowel, which is usually represented by letter **o**. There are two examples to account for this alteration. One is **thousand** spelled as *thosand*, the other **down** spelled as *done* or *don*.

The simplification of a diphthong in English may attribute to the way the subjects treat Chinese diphthongs. For instance, Chinese diphthong ㄨㄛ is usually pronounced as /*ɛ*/, with the final gliding disappearing and only the nuclear vowel is left. So likewise, the subjects tend to treat English diphthongs as simple vowels which only carry the vowel nucleus.

4.1.4 Substitute Letter “**i**”

The last category is the substitution of letter **i**. In the subjects’ spelling errors, letter **i** seems to function as some other letters rather than itself (a most common letter for /*i*/ sound). There are three different subcategories in this substitution. They are replacing letter **e**, replacing **a** and replacing **ai**” (see table 4.6).

Table 4.6 Substitute Letter “i”

example replacing	T.F.	E.F.	F	T.F.	E.F.	F
1. replacing letter e	credit	crity	8	bell	bill	2
	question	quiction	5	spell	spill	1
	doorbell	doorbill	3	welcome	willcome	1
	special	spicial	3	*decide	dicide	5
	twelve	Twive	3			
	twenty	twinty	2			
	Wednesd	Winthday	2			
2. replacing letter a	wash	wish	5	small	smill	2
	decorate	decorite	3	Wang	Wing	1
	practice	prictice	2	brand	bride	1
	walk	wilk, wilt	2			
3. replacing digraph ai ¹	waiter	witer	3	afraid	afird	2
	train	trin	2			

4.1.4.1 Letter “i” Replacing Letter “e”

In the case of letter **i** replacing letter **e**, many examples show that letter **e** is often replaced by letter **i**. They are **question** realized as *quiction*, **credit** as *cride*, **doorbell** as *doorbill*, and **spell** as *spill* (see Table 4.6). Letter-name strategy seems to be employed again in the subcategory of letter **i** placing letter **e**, but in an opposite direction. In the previous explanation of letter **e** replacing letter **i**, the subjects use letter **e** to represent the target sound /ɪ/, while in this substitution, the subjects seem to treat letter name **e** (pronounced as /i/) as the pronunciation of the target letter **e** and

¹ In this category, digraph **ai** is reduced to letter **i**. It might be the cause of neutralization of /ɪ/ and /ɛ/ and then subjects further extend this neutralization to /ɪ/ and /e/. In this way, **waiter** becomes *witer*, and **train** turns to *trin*. Or it may simply a common error pattern indicated in Chapter 2, a reduction in digraph.

then choose letter **i** (pronounced as /ɪ/) to represent their intended sound /ɪ/. In this way, letter **i** replaces letter **e**. This is a confusion of letter name and letter sound. On the other hand, the main reason for the substitution may result from the confusion of /ɪ/ and /ɛ/ as mentioned in section 4.1.1.5. Apart from the above reason, the replacement of **decide** spelled as *dicide* is another example to indicate that subjects tend to mix the letter with the phonetic symbols.

4.1.4.2 Letter “i” Replacing Letter “a”

As for the subcategory of letter **i** replacing letter **a**, it seems hard to find something in common among these examples from the viewpoint of various pronunciations of the target letter. (see Table 4.6 for a closer comparison). As the data show, letter **a** is pronounced in different ways as in **decorate**, **practice**, **walk**, and **wash**. All these examples show that letter **a** is replaced by the same letter **i**, regardless the actual pronunciation of the target letter. For this phenomenon, one thing has been noticed, that is, the subjects prefer letter **i** and use it to present the sound intended. Only some examples (**practice** spelled as *prictice*, **brand** as *bride*, and **decorate** as *decorite*) in this category can be explained by the phenomenon of interchange of letter **i** and letter **e**. That is, the lack of distinction of sound /ɛ/ and /ɪ/ as indicated in section 4.1.1.5. As the sounds of the target letter (/æ/ or /e/) here are often articulated as /ɛ/ for Chinese subjects, thus /æ/ and /e/ and /ɪ/ seem to be neutralized as well.

4.1.5. Findings on Stage One Experiment

From the above detailed description of each major substitution on vowel letters, the researcher concludes three main reasons that cause the incorrect spellings. One is

the confusion of similar sounds with nearby tongue positions. That is to say, the subjects get confused with some similar disturbing sounds (phonemes), and that causes the subjects to choose wrong vowel letters to represent the sounds they intend. The second is L1 transfer. This means some features that are absent or different in the first language cause confusion for the subjects. In other words, the subjects who lack the sense of tenseness tend to confuse tense and lax vowels. And the subjects who lack the awareness to differentiate similar sounds by tongue height and tongue position, tend to confuse the neighboring sounds. The third is the confusion of different representing systems, which refers to the confusion of alphabet and phonetic symbols and the confusion of letter names and letter sounds. This kind of confusion causes the subjects to have a false identification in sound-letter correspondence.

4.1.5.1 Confusion of Similar Sounds

With respect to the confusion of similar sounds, according to the data collected from the experiment in stage one, there are three major groups causing problems for Chinese subjects. The phonemes in each group usually substitute each other, and they are also interchangeable for each other in the subjects' spelling performance. The first group consists of mid and low front vowels /e/, /ɛ/, and /æ/, usually represented by letter **a** and **e** separately, and the second is made up of /ʌ/ and /ɑ/, a central and a back vowel, usually presented by letter **u** and letter **o** respectively, and the last group is made of high and mid front vowels /ɪ/ and /ɛ/, which are presented by letter **e** and letter **i** mostly.

And the factor to account for the confusion according to the discussion in stage one is nearby tongue positions. The most common error is the replacement of letter **e**

and **a**, for example, **baseball** is spelled as *besball*, **bed** as *bad* and **cram** as *crem*. The three vowels /e/, /ɛ/, /æ/ in the target words, all front but with different heights, are confusing for the subjects.

4.1.5.2 L1 Transfer

On the other hand, the confusion of similar sounds can also be attributed to L1 transfer. For example, in Chinese vowels, there is only one mid front vowel (ㄝ-/ɛ/) and moreover, there is no distinctive feature such as tense/lax. For some Chinese students, it is not easy to discriminate the three front vowels /e/, /ɛ/, /æ/, which sound similar but differ in tongue height. That is why letter **a** and letter **e** replacing each other is very common in vowel letter substitution. Another frequently occurring error is the replacement of letter **o** and letter **u** replaced by letter **a**. As there is only one low vowel ㄚ/a/ in Chinese, while in English there are two similar ones--/ʌ/ and /ɑ/ usually represented by letter **u** and letter **o**. For this reason, subjects use the familiar sound ㄚ/a/ and phonetic symbol form **ɑ** to stand for both /ʌ/ and /ɑ/. That is why **husband** spelled as *hasband* and **doctor** as *dacter*. In addition, the lack of diphthongization is also due to L1 transfer for Chinese students tend to omit the glide sound in pronouncing a Chinese diphthong. Therefore some subjects tend to spell **thousand** as *thosand* and **down** as *don*.

4.1.5.3 Confusion of Different Representing Systems

Two factors are attributed to the confusion of different representing systems. One is the confusion of letter name and letter sound. The subjects tend to use letter name **a**

to represent the similar sound /ɛ/, which is the sound of letter **e**. In this way, **desk** is spelled as *dask*, or by using letter name **e**, **dictionary** is spelled as *decionary*.

The other confusion stems from the mixing up of the forms of alphabet and phonetic symbols. The prominent example of this kind is the substitution of letter **a** replacing letter **o** and letter **u**. The identical form shared by the written form of letter **a** and phonetic symbol [ɑ] leads the subjects to confuse these two symbols. Then letter **a** is wrongly pronounced as /ɑ/ and thus replaces letter **o**, which usually represents sound /ɑ/ (e.g. **doctor** spelled as *dactor*). And due to the confusion of /ʌ/ and /ɑ/ as mentioned earlier, subjects further relate letter **a** to letter **u**. Therefore letter **a** replaces letter **u** (e.g. **husband** spelled as *hasband*).

4.2 Analysis of Stage Two Data

In the previous stage, the experiment has been focused on a quantity analysis to find out the common error patterns in spelling. While in this stage, a quality analysis is conducted with three tasks (reading, listening, and dictated spelling tests) to examine six subjects' error patterns in detail. To verify the quality analysis, error patterns of the six subjects are given in Table 4.7.

Table 4.7 Error Patterns of the Six Subjects in Stage Two

Error pattern Subjects	letter a	letter a, e, ai, →	letter o →	letter u →	digraph ou/ ow →	r+vowel letter e → letter i
	letter e	letter i	letter a	letter a	letter o	
1						
2						
3						
4						
5						
6						

Note: “→” indicates the direction of substitution “↔” means the substitution takes place in both direction. And “ ” means “yes” or “true”

As Table 4.7 shows, the error pattern with the highest frequency is the replacements between letter **a** and letter **e**. Letter **o** replacing digraph **ou** or **ow** is the least substitution in the substitution errors; only two subjects commit this kind of errors. Besides, according to an oral interview, the subjects also share a common strategy in memorizing vocabulary and in spelling, that is, pronouncing the word before spelling, except one subject.

4.2.1 Reading Test

This test is to see to what extent and what kind of vowels the subjects have trouble differentiating from each other by assessing their reading production. The reading test 1 is designed to see the differentiation on the front vowels of / ϵ /, / e /, / æ /.

The result is given in Table 4.8.

Table 4.8 The Result of Reading Test 1

test item	target sound	subjects' production			
		/ɛ/	/e/	/æ/	errors
1. let	/ɛ/	5	1	0	1
2. wait	/e/	1	5	0	1
3. hat	/æ/	4	1	1	5
4. <i>mat</i>	/æ/	2	1	3	3
5. <i>bake</i>	/e/	2	0	4	6
6. late	/e/	4	1	1	5
7. wet	/ɛ/	1	4	1	5
8. hate	/e/	2	3	1	3
9. met	/ɛ/	3	2	1	3
10. back	/æ/	3	0	3	3

Note: The shadowed area is to indicate the errors with higher frequency, which are discussed below. The test items in italics do not appear in the textbooks.

Table 4.8 shows that though subjects do try to make a difference when producing these vowels, they do not succeed all the time. That is, they sometimes still get confused with these vowels and most of the time the subjects replace them with each other. The confusion in this area is obvious. The test items 3,5,6,7 in the blocked area receive more error responses. The responses for items 3 and 6 reveal that the subjects tend to use /ɛ/ to replace /æ/ or /e/ as mentioned in Chapter Two, the difficulties Chinese speakers have with English vowels. This is apparently influenced by L1 transfer for there is no tense/lax distinctive feature in Chinese vowels and sound /æ/ is absent in Chinese. Responses for items 5 & 6 further indicate the subjects lack the

knowledge that the vowel pattern of final **e** represents long vowels. Besides, the subjects' errors are not restricted to the new words (the words in italics). It is thus further supported that the subjects have not learned to differentiate these similar vowels and neither have they acquired the vowel pattern of the final silent **e**.

As for the reading test 2, it is designed to see the differentiation on the central and back vowels /ʌ/ and /ɑ/. The result is given in Table 4.9.

Table 4.9 The Result of Reading Test 2

test item	target sound	subjects' production							
		/ɑ/	/ʌ/	/ɜ/	/ɛ/	/ɔ/	/ʊ/	/u/	errors
1. not	/ɑ/	5	1						1
2. luck	/ʌ/	2	4						2
3. got	/ɑ/	4	1		1				2
4. cup	/ʌ/	1	5						1
5. <i>shut</i>	/ʌ/	3			1		1	1	6
6. <i>nut</i>	/ʌ/	1	2	1	1			1	4
7. lock	/ɑ/	3	2				1		3
8. <i>gut</i>	/ʌ/	3	1		1			1	5
9. <i>cop</i>	/ɑ/	2	4						4
10. shot	/ɑ/	3	2			1			3

Table 4.9 shows that the replacement of these two sounds demonstrates higher frequency than replacement with other vowels like /ɛ/, /ɔ/, /ʊ/, /u/ and /ɜ/. It is clear that the confusion exists between these two vowels /ɑ/ and /ʌ/. Take items 5 & 8 for example. Half of the subject use /ɑ/ to replace /ʌ/, which is represented by letter **u**. The errors of test item 9 reveal that /ʌ/ is also used to replace /ɑ/. All these errors

indicate a poor distinction of /ɑ/ and /ʌ/. In addition, some others relate letter **u** to phonetic symbols /u/ and /ʊ/ and pronounce letter **u** accordingly. Obviously, this kind of errors result from the confusion of different representing systems. On the other hand, the items with higher error frequency are new words. This implies that for the words they have learned, the subjects basically count on their memory without noticing the differences between the sounds of letter **o** and letter **u**.

The reading test 3 is designed to see the differentiation on /ɛ/ and /ɪ/. The result is shown in Table 4.10.

Table 4.10 The Result of Reading Test 3

test item	target sound	subjects' production					
		/ɪ/	/ɛ/	/i/	/e/	/æ/	errors
1.desk	/ɛ/		6				0
2.sit	/ɪ/	6					0
3.wet	/ɛ/		4		2		2
4.pin	/ɪ/	4	1			1	2
5.check	/ɛ/	1	5				1
6.disk	/ɪ/	3	3				3
7.set	/ɛ/	1	3			2	3 ²
8.wit	/ɪ/	1	2	2	1		5
9.pen	/ɛ/		5			1	1
10.chick	/ɪ/	2	3	1			4

As Table 4.10 shows, though the total error frequency in this item is a little bit lower

² The errors of this item is excluded in the discussion as its errors stem from the confusion of similar sounds /e/, /ɛ/, and /æ/, not from the confusion of /ɪ/ and /ɛ/.

than other groups (see Table 4.8, 4.9, 4.11, and 4.12), the replacement of /ɪ/ and /ɛ/ is still noticeable. Erroneous productions in items 6, 8, and 10 indicate a confusion of /ɪ/ and /ɛ/ in pronunciation, especially /ɛ/ replaces /ɪ/. The errors are obviously restricted to the new words. It further confirms the confusion really exists.

The reading test 4 is designed to see the differentiation on /aʊ/, /ɑ/, and /ʌ/. The result is shown in Table 4.11.

Table 4.11 The Result of Reading Test 4

test item	target sound	subjects' production						
		/ɑ/	/ʌ/	/aʊ/	/u/	/o/	/ɔ/	errors
1.found	/aʊ/	4	1		1			6
2.town	/aʊ/	3	1	1				5
3.front	/ʌ /	1	4	1				2
4.Tom	/ɑ/	3	2	1				3
5.down	/aʊ/	2	1	2			1	4
6.fond	/ɑ/	3	1	1		1		3
7.done	/ʌ/	3	3					3

As seen in the table above, /aʊ/, /ɑ/, and /ʌ/ replace each other and the target diphthong /aʊ/ is often reduced to a simple vowel /ɑ/. This is due to the L1 transfer (lack of diphthongization).

The last group of the reading tests is designed to see the alternation of vowels following consonant **r**, or consonant cluster with letter **r**--CC_(letter r)V³. The result is

³ This group is added to observe the influence of consonant **r** on vowels. Quite a few examples found in the category of substitute letter **i** include vowels preceded by letter **r**, such as **credit** /crity,

given in Table 4.12.

Table 4.12 The Result of Reading Test 5

test item	target sound	subjects' production							
		/æ/	/ɑ/	/ɪ/	/i/	/ɛ/	/e/	/aɪ/	errors
1.cram	/æ/	2			1	2	1		4
2.rich	/ɪ/			2	4				4
3.tree	/i/			1	5				1
4.red	/ɛ/					6			0
5.train	/e/	1				3	2		4
6.rid	/ɪ/			1	3	1		1	5
7.drip	/ɪ/			2	2	1		1	4
8.ranch	/æ/			1	1	4			6
9.drape	/e/		1			5			6
10.cream	/i/	2				2	2		6

Most of the replacements in this test show that the subjects use a similar sound to replace the target one, such as vowel /æ/ replaced by /ɛ/ or /e/ and vice versa (items 1,5,8,9) and /ɪ/ replaced /i/ and vice versa (items 2,6,7). However, /ɛ/ is still the most frequent substitute for /æ/ and /e/. L1 transfer (lacking sense of tense/lax) and nearby tongue positions are the main causes for the errors. As very few examples are found of vowel substitution from /i/ or /ɪ/ to /ɛ/, /æ/, or /e/, except for item 10, the influence of consonant **r** in vowel substitution does not show. Item 10, an exception here, implies that the subjects pronounce digraph **ea** as /ɛ/, /æ/, or /e/ mostly, instead of /i/ or /ɪ/.

decorate/*decorite*, **practice**/*prictice*, **train**/*trin*, and **afraid**/*afird*.

Besides, most of the errors are restricted to the new words. It means that the subjects cannot really discriminate these similar sounds by the vowel letters or the spelling patterns.

Generally speaking, the subjects' confusion of the vowels with the neighboring or similar ones is salient and that makes most substitutions take place within the vowels of the same group. For example, front vowels /æ/, /ɛ/, or /e/ replace each other in the subjects' reading performance and so is group of /ɑ/ and /ʌ/. As to the diphthong /aʊ/, it is usually replaced by /ɑ/ and /ʌ/ or sometimes by other simple vowels as well. In addition, the direction of the diphthong's alternation is specific, always diphthong (combination of two sounds) replaced by one sound (a simple vowel). So the tendency remains the same, that is, the subjects substitute vowel sounds with the neighboring sounds (/ɪ/ and /e/) or (/e/, /ɛ/, and /æ/). To sum up, sounds of nearby tongue positions cause the problems in the reading test.

4.2.2 Listening Test

This test is to examine subjects' perception of the vowels which they often have problems in reading. In this test, similar to the previous reading test, five groups of test items are presented; the substitution distribution of the vowels in each group is then observed.

In listening test 1, target sounds are focused on front vowels /e/, /ɛ/, and /æ/.

Two options are offered for the subjects' choice. The result is shown in Table 4.13.

Table 4.13 The Result of Listening Test 1

test item	target sound	subjects' selection		error
1.bad	/æ/	bad	5	1
		bed	1	
2. Sam	/æ/	Sam	3	3
		same	3	
3. <i>gate</i>	/e/	<i>gate</i>	0	6
		get	6	
4. <i>snake</i>	/e/	<i>snake</i>	2	4
		<i>snack</i>	4	
5.west	/ɛ/	west	2	4
		waste	4	
6. <i>edge</i>	/ɛ/	<i>edge</i>	1	5
		age	5	

As indicated in table 4.13, most of the test items receive wrong answers from more than half subjects. Apparently, knowledge of letter-sound correspondence in this area is not sufficient, especially of spelling patterns, such as CVCe standing for long vowels. Subjects confuse these sounds of front vowels and much of the time fail to identify the right vowel letter or the correct pattern to represent the sound they have heard. Items 3, 4, 5, & 6 reveal that subjects' lack of distinction of tense and lax vowels (L1 transfer) or the corresponding spelling patterns. Based on the fact that the errors are restricted to the new words, we conclude that the subjects tend to use a familiar word to represent a new word which has a similar vowel. The subjects totally ignore influence of the spelling pattern.

Turning to listening test 2, it is a test to examine subjects' discrimination of central and back vowels /ʌ/ and /ɑ/. The result is shown in Table 4.14.

Table 4.14 The Result of Listening Test 2

test item	target sound	subjects' selection		error
1. <i>pot</i>	/ɑ/	<i>pot</i>	4	2
		<i>putt</i>	2	
2. <i>bug</i>	/ʌ/	<i>bug</i>	5	1
		<i>bog</i>	1	
3. <i>dull</i>	/ʌ/	<i>dull</i>	2	4
		<i>doll</i>	4	
4. <i>cod</i>	/ɑ/	<i>cod</i>	5	1
		<i>cud</i>	1	
5. <i>hut</i>	/ʌ/	<i>hut</i>	4	2
		hot	2	

As the errors shown in the table, some of the subjects get confused with the two vowels /ʌ/ and /ɑ/. Very likely, subjects have a false association between letter and sound, that is, they are not quite aware that vowels /ʌ/ and /ɑ/ are mostly represented by letter **u** and **o** respectively. Overall, the confusion of this pair still exists and influences subjects' performance.

Test listening 3 is to detect the distinction of vowels /ɛ/ and /ɪ/. The result is shown in Table 4.15.

Table 4.15 The Result of Listening Test 3

test item	target sound	subjects' selection		error
1.led	/ɛ/	led	5	1
		lid	1	
2.bin	/ɪ/	bin	6	0
		Ben	0	
3.rid	/ɪ/	rid	3	3
		red	3	
4.den	/ɛ/	den	5	1
		din	1	
5.sense	/ɛ/	sense	6	0
		since	0	
6.spill	/ɪ/	spill	3	3
		spell	3	

The result reveals that the discrimination in this area is not totally clear; the subjects still err on these two vowels despite that there are two test items receiving correct answers from all the subjects. Items 3 & 6 show the subjects use letter e to represent sound /ɪ/, a letter name strategy. The errors result from the confusion of different representing systems (confusion of letter name and letter sound).

As for the outcome of listening test 4, the result is shown in Table 4.16.

Table 4.16 The Result of Listening Test 4

test item	target sound	subjects' selection		error
1. <i>Don</i>	/ɑ/	Down	5	6
		done	1	
		<i>Don</i>	0	
2. <i>brunt</i>	/ʌ/	<i>brunt</i>	6	0
		<i>bound</i>	0	
		<i>bond</i>	0	
3. run	/ʌ/	run	4	2
		round	2	
4. <i>hound</i>	/aʊ/	<i>hound</i>	6	0
		* <i>hund</i>	0	
5. <i>scout</i>	/aʊ/	<i>Scot</i>	1	1
		<i>scout</i>	5	

Note: “*” indicates nonwords to avoid inference from the final consonant. The speaker on the tape is also asked not to emphasize the final part in pronouncing.

As the table shows, the errors are significantly decreased. However, sound /ɑ/, as in item 1, **Don**, is the most confusing item when presented with words containing /ʌ/ and /aʊ/. As mentioned earlier, the subjects tend to replace /aʊ/ with /ɑ/ for the lack of diphthongization in pronouncing. This kind of error results from L1 transfer.

Finally, the listening test 5, which is to assess subjects' performance on vowels preceded by letter r consonant cluster—(C)+ letter r + V. The result is given in Table 4.17.

Table 4.17 The Result of Listening Test 5

test item	target sound	subjects' selection		error
1. <i>rail</i>	/e/	<i>rail</i>	3	3
		<i>reel</i>	3	
2. <i>crack</i>	/æ/	<i>crack</i>	4	2
		<i>crick</i>	2	
3. <i>bring</i>	/ɪ/	<i>bring</i>	6	0
		<i>brain</i>	0	
4. <i>frail</i>	/e/	<i>frail</i>	1	5
		<i>frill</i>	5	
5. <i>grail</i>	/e/	<i>grail</i>	5	1
		<i>grill</i>	1	

According to the results, subjects tend to perceive sound /æ/ or /e/ as /ɪ/ (item 1, 2 & 4), and the key to the alteration, seems to be the vowel sound blending with consonant **r**. The confusion of sounds /ɪ/ and /e/ (including neighboring sound /æ/) still exists in subjects' perception. As to item 3 **bring**, though it is not on the vocabulary list of the textbooks, it is frequently seen in the students' outside reading. This may be the reason why the subjects have no serious problem with the word.

So overall, the whole listening test results confirm the finding in the stage one experiment: the sound confusion within each group, L1 transfer, and confusion of different systems cause the problem, no matter the results are obtained by way of reading or of listening performances.

4.2.3. Spelling Test

From the results of the former two tests, subjects reveal some confusion in

production (reading) and in perception (listening) of the vowels. To further examine the confusion, this spelling test is conducted to explore the relationship between pronunciation and spelling, that is, the relationship between sound and letter. And most of the test items are new to the subjects, except for 9 items, which are underlined as shown in Appendix E.

As it is mentioned earlier, the subjects' confusion stems from similar sounds, L1 transfer, or different systems. As expected, the substitution of the vowels in this stage exhibits the patterns observed in stage one, except for some subcategories. According to the six subjects' spelling errors, seven major patterns are found (Appendix F). A detailed description is given as follows:

- (1) Substitute letter **a**⁴, which is further divided into replacing letter **e** (e.g., **fell** spelled as *fall*, **fret** as *frat*), replacing letter **o** (e.g., **dock** spelled as *dark*, **mop** as *marb*), replacing letter **u** (e.g., **rub** spelled as *rab*, **bun** as *ban*) and replacing letter **i** (e.g., **crib** spelled as *crab*, **Rick** as *rake*)⁵.
- (2) Substitute letter **e**, which is further divided into replacing letter **a/a-e** (**prank** spelled as *prenk*, **fate** as *fet*) and replacing letter **i** (**fill** spelled as *fell*, **lift** as *left*)⁶.
- (3) Substitute letter **o**, which is further divided into replacing letter **u** (**plum** spelled as *plom*, **suck** as *sock*) and replacing digraph **ou** (**shout** spelled as *shot*, **doubt** as *dot*).
- (4) Substitute letter **i**, which is further divided into replacing **a/ai**⁷ (**bait** spelled as *bit*, **fate** as *fite*) and replacing letter **e** (**deck** spelled as *did*, **debt** as *dit*). Except for the subcategory of letter **o** replacing letter **u**, all the above mentioned four patterns are

⁴ The category of substitute letter **a** also includes substitute **a-e** as in the subcategory of replacing letter **e**, **check** spelled as *chake* and **set** spelled as *sate*.

⁵ A subcategory appearing in stage one is absent here. That is letter **a** replacing digraph **ea**.

⁶ A subcategory appearing in stage one is absent here. That is letter **e** replacing digraph **ea**.

⁷ The reason for digraph **ai** also included in the subcategory of letter **i** replacing letter **a** is digraph **ai** pronounced as /e/.

also shown in stage one. The following are the patterns that only appear in stage two.

- (5) Substitute digraph **ea/ee**⁸, which is further divided into replacing letter **a**, replacing **e**, and letter **i**. In this category, the subjects tend to pronounce digraph **ea** or **ee** as /e/ (or /æ/), /ɛ/, and /ɪ/. The examples are *greap* for **grape**, *breab* for **crab** in the case of replacing letter **a**, **bet** spelled as *beat*, **fell** as *feel* in the case of replacing letter **e**, and **Rick** spelled as *reak*, **grip** as *greap*, and **frit** as *freet* in the case of replacing letter **i**. It seems that the subjects in this stage begin to notice digraph **ea** can be pronounced in three ways /e/, /ɛ/, and /i/. Further with the confusion of /e/, /ɛ/, /æ/ and /i/, /ɪ/, the subjects use digraph **ea** to present their intended sounds /e/, /ɛ/, /æ/, and /ɪ/. And some of the subjects wrongly apply this “rule” to digraph **ee**, therefore digraph **ee** also replaces letter **a**, letter **e**, and letter **i**.
- (6) Substitute digraph **ow/ou**, which is further divided into replacing letter **o** and replacing letter **u**. This kind of substitution takes place under the circumstance that target letters **o** and **u** are pronounced as /ɑ/ and /ʌ/ respectively. Besides, the replacing digraph **ow** and **ou** are both pronounced as diphthong /aʊ/. In stage one, similar examples are restricted to the substitution of letter **o** replacing digraph **ow**, which means the subjects tend to reduce a diphthong to a simple vowel. While in this stage, the six subjects seem to prolong a simple vowel to a diphthong. One possible reason is that the vowels in the target items are followed by a nasal (**pond** is spelled as *pound*, **dumb** as *down*). Another possible reason is that the vowels

⁸ The errors of this category may result from the effect of “overlearning” or “hypercorrection”, for the

the subjects hear from the tape are prolonged a little bit in pronunciation and the subjects thus misperceive them as diphthongs. And further with their poor distinction between /aʊ/, /ʌ/, and /ɑ/, digraph **ow/ou** is used to replace letter **o** and letter **u**.

(7) Substitute letter **u**, which is further divided into replacing digraph **ou** and replacing letter **o**. In this category, the subjects seem to reduce diphthong /aʊ/ to a simple vowel in perception, and further with the confusion of /ʌ/ and /ɑ/, the subjects use letter **u** to replace digraph **ou**. So apart from the misperception of diphthongs, the subjects do not have a clear distinction between /ʌ/ and /ɑ/ and very likely they also have a confusion of the sounds of letter **o** and letter **u**. That is why they spell **pound** as *pund* and **sob** as *sub*.

As indicated, patterns (5), (6), (7), and the subcategory of letter **o** replacing letter **u** do not appear in stage one, the possible reasons are given as follows: First, for the fifth pattern (digraph **ea/ee** replacing letter **a**, letter **e**, and **i**), the main reason is that the subjects in stage two are beginning to notice that digraph **ea** can be pronounced differently, /e/, /ɛ/, and /ɪ/ as mentioned above. Second, for the sixth pattern (substitute letter **u**), the seventh pattern (substitute digraph **ow/ou**), and the subcategory of letter **o** replacing letter **u**, the main reason is that in stage two the spelling test is conducted in a way of dictation, in which the subjects hear from the tape the pronunciations of the target words, while in stage one the subjects can only count on their own pronunciation. On the other hand, there are some subcategories present in stage one but absent in stage two: (1) letter **a** replacing **ea**, (2) letter **e**

six subjects have taken so many tests in stage two.

replacing **ea**, (3) letter **o** replacing letter **a** (pronounced as /ɑ/). The reason for the absence of (1) and (2) is that there are no target words containing digraph **ea**. The reason for the absence of (3) is that there are no test items with target letter **a** pronounced as /ɑ/. That is why the three subcategories are absent in stage two.

From the above mentioned seven patterns, the substitution of vowel letters in stage two exhibits a more complete set of error patterns to further support the findings in stage one. In addition, the data are also examined from the respective of the reasons given in stage one:

- (1) Due to the confusion of front vowels /e/, /ɛ/, and /æ/, there are substitutions of letter **a** replacing letter **e**, letter **e** replacing letter **a**, and digraph **ea/ee** replacing letter **a** and letter **e**.
- (2) Due to the confusion of central and back vowels /ʌ/ and /ɑ/, there are substitutions of letter **o** replacing letter **u** and letter **u** replacing letter **o**.
- (3) Due to the confusion of /ɪ/ and /ɛ/ or along with the confusion of front vowels /e/, /ɛ/, and /æ/, there are substitutions of letter **i** replacing letter **a** and replacing letter **e** and letter **a** replacing letter **i**.
- (4) Due to the confusion of diphthong /aʊ/ and simple vowels /ʌ/ and /ɑ/, there are letter **o** and digraph **ou/ow** replacing each other and letter **u** and digraph **ou/ow** replacing each other.
- (5) Due to the confusion of /i/ and /ɪ/, there is substitution of digraph **ea** replacing letter **i**.
- (6) Due to the confusion of the form of letter **a** and phonetic symbol [ɑ], there are substitutions of letter **a** replacing letter **o** and letter **u**.

(7) Due to the confusion of letter name **a** and the letter sound of letter **e**, there is letter **a** replacing letter **e**.

(8) Due to the confusion of letter name **e** and the letter sound of letter **i**, there is substitution of letter **e** replacing letter **i**.

All the error patterns mentioned in stage two can be explained with the three reasons indicated in the previous stage, except for 2 exceptions, which are marked with sign “*” in Appendix F. The reasons for confusions (1), (2), (4), (5) can be attributed to the confusion of vowels with nearby tongue positions or to L1 transfer. The reason for confusion (3) lies in the confusion of nearby tongue positions. The reasons for confusions (6), (7), and (8) are attributed to the confusion of different representing systems. Most of the errors can be explained by the three reasons found in stage one: confusion of similar sounds, L1 transfer, and confusion of different presenting systems. The results of stage two fully support the findings in stage one; pronunciation does play a significant role in subjects’ vowel substitution. And the errors of subjects’ vowel letter substitution are not groundless and irrelevant. On the contrary, they are logical and make sense phonetically. Therefore according to the experiments in the two stages, it is reasonable to conclude that subjects’ pronunciation of vowels play a crucial role in their errors of vowel letter substitution. Though errors may seemingly random and chaotic, they are actually plausible and logical from a phonetic point of view. Besides, the differences of Chinese and English phonetic systems also attribute to the error patterns of vowel substitution.

The results of this study are consistent with previous research which indicates that inaccurate pronunciation plays a significant role in spelling errors. However, this study is the first to provide a detailed analysis on the causes on vowel letter substitution. Unlike other studies, this study conducts a more comprehensive

investigation to explore the relationship between pronunciation and spelling, not just attributing spelling errors to a general cause of inaccurate pronunciation. Three major reasons are found to explain spelling errors. One is confusion of similar sounds, another is L1 transfer, and the other is confusion of different representing systems. One difference between our findings and previous findings is that letter name strategy is found to be one cause of the spelling errors by Chinese speakers. And this explains a large portion of spelling errors (letter **a** replacing letter **e**). In short, this study offers a more complete and satisfactory answer to spelling errors, especially on vowel letter substitution.