Quantitative Corpus Analyses of Character Errors in Primary School Students' Chinese Writings in Taiwan

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ABSTRACT

This paper quantitatively describes differences of character error patterns in terms of the psychological effects of form (F), sound (S), and meaning (M) on primary school students' substituting wrong characters for right ones. The corpora from which the character errors were collected consisted of 2,104 and 1,998 compositions written respectively by 357 second, third, and fourth grade and 301 fifth and sixth grade students in the first semester of the 1993 academic year. The error patterns were partitioned into 7 categories: F, S, M, FS, FM, SM, and FSM, the first three of which formed one significance test group and the second three of which composed another. The one-factor repeated measures ANOVA model was used in the significance tests. The results of this study showed significant differences at the level of .01 in the effects between sound and form and also between sound and meaning. There were also significant discrepancies between form-sound and form-meaning, between form-sound and sound-meaning, and between sound-meaning and form-meaning as well. When we separated the character errors into the second, third, and fourth grade corpus and the fifth and sixth grade corpus and conducted a significance test for each, both of the tests rendered the same results as that for the entire corpus composed of the two groups. This indicated that the grade factor did not significantly contribute to the differences in the effects of character features.

INTRODUCTION

In Taiwan, character errors are prevalent in primary school students' Chinese writings. It is of significance to analyze character errors so that findings about them can be applied to avoid students writing characters incorrectly. Although researchers such as Chen (1978) and Lin (1983) usually divide error types on the basis of form (F), sound (S), and meaning (M), not much research has been performed to classify error patterns statistically as well as psychologically. Moreover, until recently researchers such as Tseng and Hoosain have laid their emphases on language recognition and comprehension, neglecting language production (陳, 1993, p. 27). Therefore, it is of great importance to collect students' writings and analyze character errors in them quantitatively.

We randomly selected 2,104 and 1,998 pieces of composition written respectively by 357 second, third, and fourth grade students and 301 fifth and

sixth students in the first semester of the 1993 academic year. The items under examination were the characters in the students' compositions written in the first semester of the 1993 academic year.

According to Tang (1989, p. 20), "character" is an orthographic unit that can take up a square in a piece of draft paper and may or may not have meaning. For example, 樹 "shu4" is meaningful while 徘 "pai2" has to be used together with 徊"huai2" to form a complete meaning. "Morph" is a semantic unit that must have meaning but may or may not be used independently, and "word" is a syntactic unit that functions meaningfully and may contain only one or more than one character. In this study, tabulation of character errors was conducted based on the unit of character.

Significance of the Study

Character errors may unpleasantly hinder written communication. For example, Emperor Kang Si wrongly substituted 近年 "jin4 nian2" (recent years) for 今年 "jin1 nian2" (this year) (劉, 1992, p. 29), which was sure to greatly distort his actual meaning conveyed to his subjects. They may also prevent students from adequately acquiring Chinese, since characters composing words play an essential part in the acquisition of the four language skills: listening, speaking, reading and writing.

Research Questions and Hypotheses

This study will answer the following two questions:

1. Are the effects of Chinese character features different in influencing students in making character errors in their writings?
2. Does the grade factor contribute to differences in psychological effects of Chinese features?

These questions are raised on the basis of the following hypotheses:

1. There will be significant differences in the psychological effects of the Chinese character features.
2. The grade factor will significantly influence the psychological effects.

Research Design

To test the hypotheses postulated above, frequencies of character errors based on character features were tabulated respectively for the STFG and FSG students and for the entire corpus. The inappropriately substituted characters were partitioned into seven categories: form (F), sound (S), meaning (M), form-sound (FS), form-meaning (FM), sound-meaning (SM), and form-sound-meaning (FSM). The categorization was based on the relation between the substituted character and the replaced counterpart in terms of character features

and also the context in which the character appeared. For instance, since the character 以 in 以經 was produced with sound interference, it was therefore listed under the category of S. What is more, the character 輝 in 輝棒落空 belonged to the category of FS because 輝 and 揮 were related in both form and sound.

After the partitioning of the errors and calculation of them in each category were completed, the one-factor repeated measures ANOVA model was applied to examine the discrepancy between effects of character features on character errors for the one-feature group of F, S, and M and the two-feature one of FS, FM, and SM. Since there was a significant difference among the means both in the entire corpus and in each of the separate corpora, six Scheffe post hoc multiple comparisons of means were conducted to examine which pair or pairs of means were significantly different from each other.

RESEARCH RESULTS AND DISCUSSION

Character Error Distributions

The character error frequencies were computed respectively for the entire corpus and for each of the separate corpora. Table 1 presents frequency distributions derived from calculation of the inappropriately substituted characters based on character features. The figures indicate that the feature of sound in the single-feature group and that of form-sound in the double-feature group might exert the highest interference with students' character production in their writings. However, significance tests had to be conducted to see if the effects of character features were significantly different in interfering with students' character production.

Table 1
Frequency Distributions and Percentages for the Character Errors in the Entire Corpus

Features	STFG	Percentage	FSG	Percentage	Total	Percentage
F	238	8.756	216	10.390	454	9.464
S	1,653	60.817	804	38.672	2,457	51.220
M	126	4.636	153	7.360	279	5.816
FS	531	19.536	616	29.630	1,147	23.911
FM	13	0.478	7	0.337	20	0.417
SM	105	3.863	162	7.792	267	5.566
FSM	52	1.913	121	5.820	173	3.606
Total	2,718	100.00*	2,079	100.00*	4,797	100.000*

*The total percentage was rounded.

Errors Existing in Both Groups of Students' Writings

There were 1,166 different pair patterns of character errors in the STFG school students' compositions, of which 322 pairs occurred in the FSG students'. That is to say, 27.616 (322/1,166) percent of the same patterns of errors found in the STFG students' compositions were made again by the FSG students. If we regard each character error as individual, there were 2,718 errors by the STFG students and 2,079 errors by the FSG students. Among the 2,718 errors, 340 appeared two times or more, in which 171 (50.294 percent) reappeared in the FSG students' writings; 178 occurred three times or more, in which 117 (65.730 percent) reoccurred; and 111 took place four times or more, in which 83 (74.775 percent) took place again.

Inferential Statistics

Since the numbers of compositions collected from each class differed, we converted the raw scores into adjusted scores by dividing each error score by the total error score of its character feature group in that class and multiplying the decimal by 100. For example, the raw score 26 in class CS 2-8 would become 10.788 (26/241x100) after it was converted since the total error score of the single-feature group was 241. Then the one-factor repeated measures ANOVA model was applied to test the first hypothesis, using the adjusted scores. When a significant difference was found, the Scheffe post hoc procedure was conducted to examine which pair or pairs of means were significantly different. And the second hypothesis was tested by comparing the significance test results for the STFG and FSG corpora.

In this section, inferential statistics will be presented. Character features were used as predictor of error scores in the one-factor repeated measures ANOVA model and the multiple comparison procedures (Lomax, 1992, pp. 221-232 and pp. 143-144; 林, 1988, pp. 283-287). These significance tests were performed to find whether different types of character features contributed to significantly different interference with students' character errors in their writings.

Results of ANOVAs and the Scheffe Procedure

Tables 2 through 5 illustrate the results of the ANOVAs and the Scheffe procedure for the tests of significant differences among the features of form, sound, and meaning and those of form-sound, form-meaning, and sound-meaning. There were significant results for both the single-feature group and the double-feature group. In order to find out which pair or pairs of means contributed significantly to the variation, the Scheffe procedure was implemented. From Table 3, we can find that there were significant differences

Table 2
ANOVA for the Single-Feature Group in the Entire Corpus

Source	df	Sum of Squares	Mean Squares	F-test	p value
Between classes	19				
Within classes	40	54809.795			
treatments	2	52353.676	26176.838	404.997*	.0001
residuals	38	2456.119	64.635		
Total	59	54809.795			

*p < .01

Table 3
Scheffe Procedure for Mean Differences Based on Single Features in the Entire Corpus

	$\bar{Y}.1$ (meaning)**	$\bar{Y}.2$ (form)**	$\bar{Y}.3$ (sound)**
$\bar{Y}.1 = 9.415$	--	6.216	65.538*
$\bar{Y}.2 = 15.631$		--	59.322*
$\bar{Y}.3 = 74.954$			--

*p < .01 **$\bar{Y}.1$, $\bar{Y}.2$, and $\bar{Y}.3$ stand for the means.

between sound and form and between sound and meaning, but not between form and meaning, with the feature of sound offering the highest effect. Table 5 shows that there were significant differences between all the three pairs of means for the double-feature group, with the feature of form-sound exerting the biggest influence.

Table 4
ANOVA for the Double-Feature Group in the Entire Corpus

Source	df	Sum of Squares	Mean Squares	F-test	p value
Between classes	19				
Within classes	40	70395.914			
treatments	2	67558.885	33779.442	452.452*	.0001
residuals	38	2837.029	74.659		
Total	59	70395.914			

*p < .01

Table 5
Scheffe Procedure for Mean Differences Based on Double Features in the Entire Corpus

	$\bar{Y}.1$ (FM)	$\bar{Y}.2$ (SM)	$\bar{Y}.3$ (FS)
$\bar{Y}.1 = 1.500$	--	17.271*	78.229*
$\bar{Y}.2 = 18.771$		--	60.957*
$\bar{Y}.3 = 79.729$			--

*$p < .01$

Discrepancies in Effects of Character Features in Terms of Grade Differences

In order to see whether the grade factor contributed significantly to the discrepancies in effects of character features on character errors, we separated the entire corpus into two sets of data. One of them consisted of the character errors made by the STFG students and the other was composed of those found in the FSG students' compositions. The one-factor repeated measures ANOVA model and the Scheffe procedure were conducted again for each of the two grade levels. Tables 6 through 13 indicate the same results for both the STFG corpus and the FSG data as those for the entire corpus. That is to say, it was not the grade factor that caused character features to significantly function differently in interfering with students' character errors.

Table 6
ANOVA for the Single-Feature Group in the STFG Corpus

Source	df	Sum of Squares	Mean Squares	F-test	p value
Between classes	9				
Within classes	20	35539.018			
treatments	2	35203.995	17601.997	945.713*	.0001
residuals	18	335.023	18.612		
Total	29	35539.018			

*$p < .01$

Table 7
Scheffe Procedure for Mean Differences Based on Single Features in the STFG Corpus

	$\bar{Y}.1$ (meaning)	$\bar{Y}.2$ (form)	$\bar{Y}.3$ (sound)
$\bar{Y}.1 = 6.452$	--	5.418	75.225*
$\bar{Y}.2 = 11.870$		--	69.807*
$\bar{Y}.3 = 81.677$			--

*p < .01

Table 8
ANOVA for the Double-Feature Group in the STFG Corpus

Source	df	Sum of Squares	Mean Squares	F-test	p value
Between classes	9				
Within classes	20	35847.397			
treatments	2	34622.052	17311.026	254.295*	.0001
residuals	18	1225.345	68.075		
Total	29	35847.397			

*p < .01

Table 9
Scheffe Procedure for Mean Differences Based on Double Features in the STFG Corpus

	$\bar{Y}.1$ (FM)	$\bar{Y}.2$ (SM)	$\bar{Y}.3$ (FS)
$\bar{Y}.1 = 1.844$	--	15.810*	78.657*
$\bar{Y}.2 = 17.654$		--	62.847*
$\bar{Y}.3 = 80.501$			--

*p < .01

Table 10
ANOVA for the Single-Feature Group in the FSG Corpus

Source	df	Sum of Squares	Mean Squares	F-test	p value
Between classes	9				
Within classes	20	19270.777			
treatments	2	18512.348	9256.174	219.679*	.0001
residuals	18	758.429	42.135		
Total	29	19270.777			

*p < .01

Table 11
Scheffe Procedure for Mean Differences Based on Single Features in the FSG Corpus

	$\bar{Y}.1$ (form)	$\bar{Y}.2$ (meaning)	$\bar{Y}.3$ (sound)
$\bar{Y}.1 = 12.378$	--	7.014	55.851*
$\bar{Y}.2 = 19.392$		--	48.838*
$\bar{Y}.3 = 68.230$			--

*p < .01

Table 12
ANOVA for the Double-Feature Group in the FSG Corpus

Source	df	Sum of Squares	Mean Squares	F-test	p value
Between classes	9				
Within classes	20	34548.517			
treatments	2	32976.107	16488.053	188.745*	.0001
residuals	18	1572.411	87.356		
Total	29	34548.517			

*p < .01

Table 13
Scheffe Procedure for Mean Differences Based on Double Features in the FSG Corpus

	$\bar{Y}.1$ (FM)	$\bar{Y}.2$ (SM)	$\bar{Y}.3$ (FS)
$\bar{Y}.1 = 1.155$	--	18.733*	77.801*
$\bar{Y}.2 = 19.889$		--	59.067*
$\bar{Y}.3 = 78.956$			--

*$p < .01$

CONCLUSION

Chinese character features were analyzed in this study. There were three sets of character error data collected for significance tests to see how character features functioned in influencing the students in making errors in Chinese characters. The tests were performed for the two hypotheses posited at the beginning of this study. Not both hypotheses were justified by the significance test results.

First, the results of this study found significant differences in the effects between sound and form and between sound and meaning. There were also significant differences between form-sound and form-meaning, between form-sound and sound-meaning, and also between sound-meaning and form-meaning.

The second hypothesis asked for an examination of differences in effects of character features in terms of grade differences. The significance tests respectively for the STFG and FSG corpora were implemented. From the viewpoint of significance, the results for character features were consistent for each of the two grade levels and the two levels combined. That is to say, the grade factor did not affect the students' character errors significantly. Therefore, the hypothesis was rejected.

It is expected that this study will contribute to the unraveling of mystery behind Chinese character errors and offer useful information for language researchers, curriculum developers and textbook editors, with which they can better understand the nature of Chinese character errors and therefore prepare more effective Chinese teaching materials and methods for students who learn Chinese as their mother tongue. It is also hoped that the findings may contribute to the design of more effective learning materials for learners of Chinese as a foreign or second language and in turn to the improvement of the students' Chinese acquisition.

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