Jenny Yichun Kuo

Cognition-based multimedia classifier learning

Abstract: In a classifier language like Chinese, all the noun phrases with numerals or demonstratives must go with classifiers, for example, *liǎng zhī bǐ* 兩枝筆 'two CL pen.' Classifiers vary depending on the nouns. This poses a big challenge for learners of Chinese as second language. Cognition-based multimedia and paper materials for Chinese material classifiers were developed and proved to be effective for learners of Chinese as a second language. The experimental group ($N = 15$) used the multimedia program and the control group ($N = 20$) received the same information on paper. Both groups made significant progress after a 10-week treatment. The results suggest cognitive principles are helpful for classifier learning in either multimedia or paper format.

Keywords: Mandarin, classifier, Chinese as a second language, multimedia

DOI 10.1515/caslar-2015-0002

1 Introduction

Learning Chinese has become a trend in the world due to the large Chinese population. One of the major difficulties in learning Chinese for nonnative speakers is classifiers. Classifiers are morphemes that denote some salient perceived or imputed characteristic of the referents of the associated nouns (Allan 1977). In Chinese, all the noun phrases with numerals or demonstratives must go with classifiers, for example, *liǎng zhāng zhuōzi* 兩張桌子 'two CL table' or *zhè zhī bǐ* 'this CL pen.' They behave like "mass nouns" in English such as *a glass of water*. There are about 500 classifiers used in daily life (Huang et al. 1997) though *ge* is sometimes used as a general classifier.[1] Classifiers vary with

1 Whether *ge* is a general classifier is controversial, which is beyond the scope of this paper. Please see Loke (1996). Is GE merely a general classifier? *Journal of the Chinese Language Teachers Association*, 29(3), 35–50.

Jenny Yichun Kuo, Department of Foreign Languages, National Chiayi University, Chiayi, Republic of China, E-mail: jennykuo@mail.ncyu.edu.tw

nouns. Some nouns can collocate with more than one classifier. For example, *gǒu* 狗 can take the shape classifier *tiáo* 條 for long entities or the material classifier *zhī* 隻 for animals. Memorizing the collocations of nouns and classifiers poses a big challenge for learners of Chinese as second language.

1.1 Cognitive bases of classifiers

The collocations between nouns and classifiers are not arbitrary. After studying classifiers in more than fifty languages, Allan (1977) concluded seven bases for classification: material, shape, consistency, size, location, arrangement and quanta. The material category includes: animacy, inanimacy, abstract and verbal nouns. Shape consists of three subtypes: saliently one-dimensional, saliently two-dimensional, and saliently three-dimensional. Consistency is divided into flexible, hard or rigid and non-discrete. Size means big or small. Location refers to the place where the object exists. Arrangement refers to the relation among members that a collective noun denotes. Quanta refer to the function of quantification. According to Tai (1994), material, shape, consistency, size along with attributes of parts (Tversky and Hemenway 1984) are relevant cognitive categories in Chinese classifiers. For example, the classifier *tiáo* 條 in Mandarin Chinese classifies long objects into one category (Tai and Wang 1990), while the classifier *zhāng* 張 groups flat objects into another category (Tai and Chao 1994). Shape interacts with other cognitive bases such as size. For example, three three-dimensional classifiers *ge* 個, *kē* 顆, *lì* 粒 differ in size. Thus, we say *yí ge xīguā* 一個西瓜, *yì kē píngguǒ*一顆蘋果, *yí lì mǐ* 一粒米. There are also two other flat classifiers 面 *miàn* and 片 *piàn* for flat objects. 面 *miàn* 'face' is categorized by function used for objects with a salient front side such as 一面黑板 *yí miàn hēibǎn*. 片 *piàn* is actually a partitive measure referring to a saliently two-dimensional piece of any material, such as *yi pian mianbao* 'a piece of bread.' It is extended to be a rough measure for a mass with two-dimensional image (Kuo 2010). They are summarized in Table 1.

The cognitive bases of classifiers have been shown to be psychologically real by Tien, Tzeng and Hung (2002). They combined data independently collected from a noun-feature rating task and a noun classifier collocation judgment task. In the noun-feature rating task, participants were asked to assign shape characteristics such as long, flat, round to objects. In the noun classifier collocation judgment task, they were asked to judge the appropriateness of a classifier-noun phrase such as *yī tiáo shéngzi* 一條繩子 one CL rope.' The results of a multiple regression show that participants used noun feature as a valid cue in acceptability judgments of classifiers. For example, participants rated *shéngzi* 繩子 'rope' to be long and accepted *shéngzi* 繩子 'rope' to go with the long

Table 1: Cognitive bases of Mandarin classifiers.

Cognitive bases	Mandarin	English gloss
1. Shape		
1D	tiáo	branch
	gēn	root
	zhī	branch
2D	zhāng	sheet
3D	Lì	grain
	Kē	
	Ge	
2. Material	zhī	animal
	Kē	plant
	Pī	horse
	duǒ	flower
3. Consistency	tiáo	
	gēn	
	zhī	
4. Size	Lì	grain
	Kē	
	Ge	
5. Attributes of parts	tóu	head
	Bǎ	handle
	dǐng	top

Notes: 1D refers to saliently-one-dimensional. 2D refers to saliently-two-dimensional. 3D refers to saliently-three-dimensional.

classifier *tiáo* 條. In the classifier elicitation, they found that production of classifiers shifted from the original category to another with the manipulation of the salience of noun features. These results suggest that the semantic bases for noun classifier collocations do have psychological reality for Mandarin speakers. Native speakers of Mandarin agreed that entities denoted by nouns collocating with *tiáo* 條 were long and those with *zhāng* 張 were flat. This object shape perception was also agreed by nonnative speakers (Kuo 2005); therefore, could be useful for second language learners.

1.2 Acquisition of classifiers in a second language

There are few studies on acquiring classifiers in a second language. Chen (1996) found corrective feedback to be facilitative in the acquisition of Chinese classifiers by 38 American college students. Therefore, the proposed study offers feedback with explicit correction and explanations in the self-study materials.

Polio (1994) found that using a classifier in an obligatory context did not pose a problem for second language learners. There was little omission of classifiers. Most speakers overused them where they do not belong. Loke (1996) attempted to establish the norms of Mandarin shape classifiers for Chinese language teaching and learning. Shape has also been found to be a useful strategy for CSL learners (Kuo 2000) and play an influential role in the acquisition of classifiers (Liang 2008). These classifier studies indicate that cognitive bases may be helpful for learners; therefore a cognition-based learning program is developed in this study

Although Langacker (1987) indicated that cognitive grammar is an interpretative grammar, which explains grammatical phenomena rather than projects possible linguistic productions, there have been attempts to apply cognitive linguistics in language teaching (e.g. Boers and Lindstromberg 2008). Learning cognitive bases of classifiers can allow second language learners to invest cognitive effort and engage in elaborative processing, thus results in better retention (Cermak and Craik 1979). One way for elaborative processing is dual coding (Paivio 1986), which involves the linking of verbal and non-verbal stimuli. For example, learners can associate words with sounds and pictures in multimedia. In addition to multimedia presentation, Computer-Assisted Language Learning also has the advantage in providing practices and immediate feedback and promoting learner autonomy. Learning classifiers involves learning the collocations between classifiers and nouns. It requires repeated exposure, which is hard to offer in class due to the time constraint. Computer can provide drills and feedback with animation in interactive games without boring students. Student can also have more control of their own learning than in the class setting, thus promote learner autonomy. It is a lifelong tool. Therefore, a computer-assisted language learning program is developed in the present study.

Computer-Assisted Language Learning (CALL) has a long history, but application in Chinese learning is still limited. According to Zhang (1998), Chinese CALL program rarely addressed grammar. Those which include grammar such as *ABC Interactive Chinese*, *Hyper China*, and *Professional Interactive Chinese* just gave grammatical explanations as textbooks. Zhang thus suggested the creativity and abstractness of grammar require real ingenuity when designing exercise for it. Kuo, Wu and Chung (2011) have developed a multimedia classifier learning program based on shape. Although participants did not improve after using the program, their errors patterns fell in a correct shape but wrong material category. For example, they used *zhī* 枝 instead of *tiáo* 條 for *lù* 路 'road.' Both classifiers are used for long objects, *zhī* 枝 for hard or rigid objects while *tiáo* 條 for flexible ones. Even though a road is physically rigid, the winding property made it considered flexible in Chinese. Therefore, the goal of this study is to

investigate the effectiveness of cognition-based multimedia learning program for Chinese material classifiers. Cognition-based refers learning the classifiers with cognitive bases such as shape, material, consistency, size and attributes of parts (Tai 1994). This study focuses on material. The research question is: Does multimedia facilitate learning of Chinese material classifiers more than paper?

2 Methodology

The present study investigated the effect of cognition-based multimedia and paper material on learning Chinese material classifiers.

2.1 Participants

The participants were thirty-five learners of Chinese as a second language in Taiwan, where Mandarin is the official language. Fifteen were in the experimental group, who used the multimedia program, and twenty in the control group, who received the same information on paper. They were not randomly assigned, because I would like to balance their first language found to be a factor (Kuo et al. 2011). They found that learners with non-classifier L1 improved after using the multimedia shape classifier learning program while learners with classifier L1 relapsed. Learners' L1 was considered in group assignment. There are equal number of learners with classifier and nonclassifier L1 in each group. The information of the participants' native languages is given in Table 2.

Table 2: The participants' native languages.

L1	Classifier language	Multimedia	Paper	Total
English	no	0	1	1
French	no	3	1	4
German	no	0	1	1
Indonesian	yes	2	5	7
Mongolian	no	1	3	4
Russian	no	2	0	2
Spanish	no	1	0	1
Thai	yes	5	7	12
Vietnamese	yes	1	2	3
sum		15	20	35

There were originally twenty in each group, but five didn't take the posttests. They were university students enrolled in degree programs taking Chinese as a required course for international students. They have three-hour Chinese lecture classes and two-hour tutoring a week. The mean age of starting to learn Chinese is 25.4. On average, the participants had learned Chinese for 13.8 months before the treatment. They have been in Taiwan for a year or so.

An independent *t*-test was conducted between the pretest scores of the two groups. There is no significant difference ($t(33) = 1.737$, $p > 0.05$) as given in Table 3. Therefore, the two groups were homogeneous in terms of their understanding of classifiers.

Table 3: Independent *t*-test between experimental group and control group on the pretest.

Groups	*N*	*M*	SD	*t*	df	*p*
Multimedia	15	62.33	26.98	1.737	33	0.923
Paper	20	42.75	25.71			

2.2 Materials

The materials consisting of learning materials, and posttest, and background and learning questionnaires are described in the following.

Learning materials. Two kinds of learning materials were developed, multimedia for the experimental group and written text for the control group. In both types of learning materials, there are ten lessons introducing ten material classifiers including *zhī* 隻 for animals, *pī* 匹 for horses, *kē* 棵 for plant, *duǒ* 朵 for flowers, *tái* 台 for machines, *liàng* 輛 for vehicles, *jià* 架 for airplanes, *běn* 本 for books, *jiàn* 件 for clothes and *jiān* 間 for buildings. They were selected from *A dictionary of Chinese measures and collocations* (Huang et al. 1997). The Mandarin dictionary has 427 measure words, 120 of which appear in the standard Chinese textbook used in elementary schools in Taiwan. The other 370 measure words were selected based on their high frequency in the Sinica Corpus. The Sinica Corpus is a database of modern Mandarin Chinese maintained by Academia Sinica in Taiwan. The language samples were collected from newspapers, TV programs, and talk shows in Taiwan. They are examples broadly accepted by the public rather than used just by a particular group.

The co-occurring nouns were selected from the Mandarin 8,000 words offered by the Steering Committee for the Test of Proficiency-Huayu (SC-TOP) divided into three levels: basic, intermediate, and advanced based on the frequency.

The content of the two learning materials was similar. The major difference is the presentation of the materials. The learning material for the multimedia group is presented in the form of Flash with pictures and animations while the learning material for the paper group is presented in the form of paper-based textbook with text only.

In Flash, we first introduce the semantic characteristics of the classifiers with prototypical collocating nouns, which bear most salient features of the members. The example sentences (e.g., *Zhè shì yì zhī māo* 這是一隻貓 'this is a cat') were presented with pictured objects and learners needed to choose the correct characteristics by observing the similarities among those nouns. For example, in Lesson 1, *zhī* 隻 was presented with pictures of a cat, a dog, a goat, a pig, and a duck. Then, learners were asked to choose 'animal' as the common characteristic of *zhī* 隻 among the choices of shape, consistency, size and attributes of parts by observing the pictures. In Part Two, learners applied the characteristics of the specific classifier to pick the collocating nouns by shooting or catching in games. For example, they were asked to shoot the items conventionally co-occurring with the classifier *zhi*. In the third section, learners practiced the application of the classifier under simulated real-life situations. Based on Situational Language Learning, the program provides a generative situation to encourage the use of classifiers. For example, we first showed them a short animation to present the context such as shopping or putting the products in order. After that, they need to follow our instruction to buy specific items with specific classifiers to get discount or to put the products in correct order. Each lesson contains at least three contexts for learners to practice. Immediate feedback was provided for learners' responses in all three sections.

In the paper-based textbook, we used only one context in the third section in Flash as the text for each lesson in the first section. In the second section, we introduce the characteristics of the classifier in the similar way as in Flash. The only difference is that collocating nouns were presented without pictures. In the third section, collocations between nouns and classifiers were practiced in a multiple choice format. Answers were provided for learners to check by themselves.

Pretest and Posttest. A pretest and a posttest were designed to examine the improvement of the students using different learning materials. Both pretest and posttest were multiple choice written tests containing two tasks. The first task is that given a classifier participants need to choose a correct noun that matches the classifier and the second task is that given a noun participants need to choose a correct classifier that could collocate with the noun. Each task consists of ten questions. There are a total of 20 questions in each test. Pictures were

provided for nouns so that character or noun recognition would not affect classifier comprehension as shown in Appendices A and B.

The tests were piloted with twenty learners of Chinese as a second language in Taiwan. The participants were asked to finish both pretest and posttest on the same day and also complete a background questionnaire. Slit-half reliability was conducted with Cronbach's alpha 0.803 for the pretest and 0.782 for the posttest. In addition, a paired *t*-test was conducted to see if there is significant difference between pretest and posttest. As shown in Table 4, the scores of pretest and posttest do not significantly differ from each other in our pilot study ($p > 0.05$). So, the difficulty of pretest and posttest is the same.

Table 4: Results of paired *t*-test on pretest and posttest in the pilot study.

	M	*N*	SD	*p*
Pretest	91	20	6.78	0.397
Posttest	89	20	17.44	

Questionnaires. Questionnaires were given to students along with the pretest and posttest. The questionnaire with the pretest is the background questionnaire, including their general background and language background. The general background includes age and gender and language background includes native language and Chinese learning experience such as length and environment of learning as shown in Appendix C. The questionnaire with the posttest is about the participants' use of our material. We asked how much time they spent on our material and what they think about our material (see Appendix D).

2.3 Procedures

Participants took the pretest and completed the background questionnaire at the beginning of the semester. The reading material for the experimental group is flash on the internet. For those from the control group, their reading material is a paper-based textbook. They spent 30 minutes a week on the material with the guidance of a tutor. After ten weeks, when they should have finished our materials, the posttest was then conducted. In the posttest, participants needed to complete another questionnaire about their use of the material.

2.4 Data analysis

A repeated measure two-way ANOVA with material (i.e. multimedia vs paper) as the between-subject factor and treatment (i.e. pretest vs posttest) as the within-subject factor was conducted to investigate if there is significant difference between pretest and posttest within the participants and between the multimedia and paper groups.

3 Results and discussion

3.1 General results

Unlike Kuo et al. (2011), both the multimedia and the paper groups improved significantly after the treatment ($F(1)14.556$, $p < 0.01$). The mean of the multimedia group is 62.33 in the pretest and 68 in the posttest. The mean of the paper group is 46.75 in the pretest and 65.75 in the posttest. In Kuo et al. (2011), participants with nonclassifier L1 improved while participants with classifier L1 relapsed. In the present study, participants' first languages were counter balanced in terms of classifiers. Also, the participants in Kuo et al. (2011) failed to improve due to the failure of reading Chinese in the posttest. Pictures were provided in the tests in the present study to overcome the reading difficulty. Finally, tutors' guidance ensured participants' use of the materials. The descriptive statistics of two groups were shown in Table 5. The results of within- subjects contrasts were given in Table 6.

Table 5: Descriptive statistics of multimedia and paper group in pretest and posttest.

			Descriptive Statistics	
	Material	**Mean**	**Std. Deviation**	***N***
Pretest	Multimedia	**62.3333**	26.98324	15
	Paper	**46.7500**	25.71478	20
	Total	53.4286	27.02862	35
Posttest	Multimedia	**68.0000**	27.17667	15
	Paper	**65.7500**	20.34408	20
	Total	66.7143	23.16637	35

Table 6: Contrasts between pretest and posttest.

Tests of Within-Subjects Contrasts						
Measure: MEASURE_1						
Source	**Treatment**	**Type III Sum of Squares**	**df**	**Mean Square**	***F***	**Sig.**
Treatment	Linear	2,607.619	1	2,607.619	**14.556**	**0.001**
Treatment * material	Linear	761.905	1	761.905	4.253	0.047
Error (treatment)	Linear	5,911.667	33	179.141		

Table 7: Contrasts between the multimedia and the paper group.

Tests of Between-Subjects Effects					
Measure: MEASURE_1 Transformed Variable: Average					
Source	**Type III Sum of Squares**	**Df**	**Mean Square**	***F***	**Sig.**
Intercept	252,720.119	1	252,720.119	237.945	0.000
Material	1,362.976	1	1,362.976	**1.283**	**0.265**
Error	35,049.167	33	1,062.096		

Although the multimedia group seems to perform better than the paper group, the difference did not reach significance ($F(1) = 1.283$, $p > 0.05$) as indicated in Table 7.

3.2 Analysis by items

We then analyze learners' performance by items. In the pretest, the classifier that has the highest accuracy rate is *jiàn* 件 for *dàyī* 大衣 'coat' (66%). The noun that gets the highest accuracy rate is *xiàngbù* 相簿 'album' (66%), which goes with the classifier *běn* 本. The most difficult classifier is *jià* 架. It has the lowest accuracy rate when going with *zhíshēngjī* 直升機 'helicopter' (11%). The noun that gets the lowest accuracy rate is *xiàngjī* 相機 'camera' (27%), which also goes with *jià* 架.

In the posttest, the classifier that has the highest accuracy rate is *zhī* for *tùzi* 兔子 'rabbit' (66%). The noun that gets the highest accuracy rate is *méihuā* 梅花 'plum blossom' (66%) going with *duǒ* 朵 and *jīngyú* 鯨魚 'whale' going with

zhī 隻. The most difficult classifier is still *jià* 架. It still has the lowest accuracy rate when going with *zhíshēngjī* 直升機 'helicopter' (30%). The noun that gets the lowest accuracy rate is *tàikōngsuō* 太空梭 'space shuttle' (23%), which also goes with *jià* 架.

The difficulty of *jià* 架 may be caused by the opaque semantic features. It is hard to identify a common feature for its group members. In addition, it is also confusing with two *jian*s with close pronunciation. For example, in the pretest, 52% of the participants chose *jià* 架 for a house while *jiān* 間 is the appropriate classifier. In the posttest, some participants were still confused by *jiān* 間 and *jiàn* 件 differing only in tone. For example, seven (15%) participants used *jiān* 間 for clothes. The tone contrast between *jiā* 間 and *jiàn* 件 should be emphasized in class.

3.3 Analysis by learners' L1

We further investigate learners' performance by their native languages. In both experimental and control groups, learners of all L1s improved after using the material except the Indonesians relapsed a little bit ($M = 59.29 \rightarrow 58.27$). However, because of the small sample size, only the improvement of Thai speakers reached statistic significance ($M = 66.67 \rightarrow 77.50$, $p < 0.05$) (see Table 8).

Table 8: Pretest and posttest of Thai speakers.

Test	*N*	*M*	SD	*t*	df	*p*
Pretest	12	66.67	22.597	5.982	11	0.012
Posttest	12	77.50	20.835			

We had 12 Thai participants and seven Indonesian participants, but not enough representatives for other L1s. Both Thai and Indonesian are classifier languages like Chinese. However, while these classifiers are always used in Thai, they may not always be used in informal conversation in Indonesian ("Thai language" 2011; "Indonesian language" 2011). Both of them use material for categorization. For example, the Thai classifier *tua* classifies nouns denoting animals, and furniture or clothing with body-like shape such as 'table' and 'trousers' (Car-Carpenter 1991). Indonesian uses *ekor* for animals, *buah* for non-living things ("Indonesian language" 2011). The Thai participants had high accuracy rate in the pretest in *běn* 本 for *bǐjìběn* 筆記本 'notebook' (100%) and *xiàngbù* 相簿 'album' (92%), *jiàn* 件 for *dàyī* 大衣 'coat' and *chènshān* 襯衫 'shirt', *zhi* 1 隻 for

Table 9: Accuracy rate by items by Thai and Indonesian in the pretest.

#	Classifier	Pinyin	Noun	English gloss	Thai	Indonesian
1	匹	Pī	斑馬	zebra	5%	44%
15	匹	Pī	駱駝	camel	75%	56%
5	台	Tái	機車	motorcycle	58%	11%
20	台	Tái	電動玩具	video games	58%	44%
3	本	Běn	相簿	album	92%	100%
14	本	Běn	筆記本	note book	100%	78%
8	件	Jiàn	襯衫	shirt	83%	67%
11	件	Jiàn	大衣	coat	92%	67%
9	朵	Duǒ	玫瑰	rose	50%	67%
17	朵	Duǒ	花	flower	75%	67%
10	架	Jià	直昇機	helicopter	8%	33%
18	架	Jià	照相機	camera	25%	44%
4	隻	Zhī	鳥	bird	75%	56%
13	隻	Zhī	獅子	lion	83%	56%
7	棵	Kē	竹子	bamboo	33%	33%
12	棵	Kē	樹木	tree	75%	44%
6	間	Jiān	國中	junior high school	67%	67%
19	間	Jiān	健身房	gym	58%	56%
2	輛	Liàng	計程車	taxi	83%	78%
16	輛	Liàng	巴士	bus	83%	89%

shīzī 獅子 'lion' (83%) and *liàng 輛* for *jìchéngchē 計程車* 'taxi' (83%) and *bāshì 巴士* 'bus' (83%) (see Table 9 for correction rate by items in the pretest). In the posttest, they have acquired new classifiers including *pī 匹* for *mǎ 馬* 'horse' (83%) and *bānmǎ 斑馬* 'zebra' (83%), *tái 台* for *shōuyīnjī 收音機* 'radio' (83%), *duǒ 朵* for *liánh uā 蓮花* 'lotus' (100%) and *méihuā 梅花* 'plum blossom' (83%). They also extended the use of *běn* for *xiǎoshuō 小說* 'novel' (83%), *zhī 隻* for *jīngyú 鯨魚* 'whale' (92%), *jiàn 件* for *qúnzi 裙子* 'skirt' and *nèiyī 內衣* 'underwear' and *liàng 輛* for *chìchē 汽車* 'car' (92%). There were large individual differences in error patterns. None of the errors were made by more than half of the Thai speakers (see Table 10 for accuracy rate by items in the posttest).

Without the knowledge of classifiers in L1, the Indonesian participants had little agreement in the pretest. As shown in Table 8, the only two that reached high agreement were *běn 本* for *xiàngbù 相簿* 'album' (100%) and *liàng 輛* for *bāshì 巴士* 'bus'(89%). They were both correct usages. They might have come across these usages in their study. After the treatment, the agreement rate was still low as in Table 9. The items with over 50% correction rate were *běn 本* for *zìdiǎn 字典* 'dictionary' (67%), *jiàn 件* for *qúnzi 裙子* 'skirt'(67%), *jiān 間* for *cāntīng 餐廳* 'restaurant'(56%) and *liàng 輛* for *qìchē 汽車* 'car' (67%) and

Table 10: Accuracy rate by items by Thai and Indonesian in the posttest.

#	Classifier	Pinyin	Noun	English gloss	Thai	Indonesian
9	匹	Pī	馬	horse	83%	33%
17	匹	Pī	斑馬	zebra	83%	56%
4	台	Tái	收音機	radio	83%	56%
11	台	Tái	腳踏車	bicycle	83%	56%
10	本	Běn	小說	novel	83%	56%
16	本	Běn	辭典	dictionary	92%	67%
5	件	Jiàn	裙子	skirt	83%	67%
14	件	Jiàn	內衣	underwear	92%	33%
13	朵	Duǒ	蓮花	lotus	100%	44%
3	朵	Duǒ	梅花	plum blossom	83%	44%
2	架	Jià	太空梭	space shuttle	25%	11%
19	架	Jià	直昇機	helicopter	42%	22%
6	隻	Zhī	鯨魚	whale	92%	44%
20	隻	Zhī	兔子	rabbit	0%	11%
7	棵	Kē	樹	tree	75	33%
15	棵	Kē	白菜	cabbage	75%	22%
1	間	Jiān	浴室	bathroom	58%	44%
18	間	Jiān	餐廳	restaurant	75%	56%
8	輛	Liàng	腳踏車	bicycle	68%	56%
12	輛	Liàng	汽車	car	92%	67%

jiǎotàchē 腳踏車 'bicycle' (56%). The errors varied a lot from person to person. There were no common errors among Indonesian speakers. It seems that speakers of different languages have different conceptualization of object shape, which has influenced their acquisition of shape classifiers (Kuo et al. 2011). In contrast, the learning of material classifiers seems to vary from person to person. It is hard to make a generalization.

3.4 Analysis of questionnaires

We can know participants' opinions about using the learning material according to the questionnaires. Both groups agreed the learning materials are helpful for their classifier learning. Eighty-four percent of the multimedia group thinks the material is helpful, and 90% of the paper group thinks the material is helpful. Sixty-six percent of the multimedia group reported that they can understand the program, and 85% of the paper group claimed that they can understand the textbook. However, while only 13% of the multimedia group reported having

difficulties using the program, 45% the paper group reporting troubles reading the textbook. Since learners have diverse L1s, translation was not provided. The multimedia program is easier to understand with pictures. The paper group has suggested using more English, which was not found in the multimedia group. The multimedia group has suggested giving more exact explanation of classifiers and support for typing Chinese.

4 Conclusion

The present study developed multimedia and paper-based learning materials based on material principle to enhance the learning of Chinese classifiers. Both of them are found to facilitate classifier learning. Both groups improved significantly after using the material. No significant differences were observed between the two kinds of materials. Multimedia and paper-based materials may have equal effects on second language learning.

Although both multimedia and paper-based materials are both effective in facilitating classifier learning with the help of tutors, learners reported more difficulties in using the textbook. The multimedia program is more user friendly for independent learning hence promotes learner autonomy. Due to the limit of class time, multimedia program is a promising self-learning supplemental material. All the practices in the program are comprehension-based practice relying on recognition. Productive practices could be included to develop all four skills of language proficiency in the future research. There are usages which cannot be accounted by these perceptual principles, such as 封 *fēng* for letter. Learners have to learn these usages from other categorization basis such as function. Classifiers with other categorization bases such as function or attribute of parts need to be included for a more comprehensive classifier learning program in the future. Although speakers of different languages can perceive and conceptualize the world from different perspectives, we cannot deny that common human cognition can help people who are learning a second language. Materials based on cognitive linguistics research can be helpful for teaching Chinese as a second language regardless of format.

Acknowledgments: I am grateful for the valuable comments from the anonymous reviewers and feedback from participants at the 2011 annual meeting of American Association for Applied Linguistics, where an earlier version was presented. Thanks also go to Taiwan's Ministry of Science and Technology for research grant NSC 98-2631-S-415-004.

Appendix A: Pretest

華語量詞測驗 CSL Classifier Test

一、Multiple Choice (dānxuǎntí)

Please choose the correct noun for the classifier in each question
選擇正確名詞搭配量詞 (xuǎnzé zhèngquè míngcí dāpèi liàngcí)

1.	這是一匹 _____。 Zhè shì yì pī _____ **This is one CL _____.**	**(a) 斑馬** (a) bānmǎ **zebra**		**(b) 派出所** (b) pàichūsuǒ **police station**	
		(c) 樹苗 (c) shùmiáo **sapling**		**(d) 電腦** (d) diànnǎo **computer**	
2.	這是一輛 _____。 Zhèshì yí liàng _____ **This is one CL _____.**	**(a) 螞蟻** (a) mǎyǐ **ant**		**(b) 計程車** (b) jìchéngchē **taxi**	
		(c) 洗衣機 (c) xǐyījī **washing machine**		**(d) 護照** (d) hùzhào **passport**	
3.	這是一本 _____。 Zhèshì yì běn _____ **This is this CL _____.**	花瓣 (a) huābàn **(a) petal**		貓 (b) māo **(b) cat**	
		樹木 (c) shùmù **(c) tree**		相簿 (d) xiàngbù **(d) photo album**	
4.	這是一隻 _____。 Zhèshì yì zhī _____ **This is this CL _____.**	**(a)** 洗衣機 (a) xǐyījī **washing machine**		**(b)** 武器 (b) wǔqì **weapon**	
		(c) 電視 (c) diànshì **television**		**(d)** 鳥 (d) niǎo **bird**	
5.	這是一台 _____。 Zhè shì yì tái _____ **This is this CL _____.**	**(a)** 旗袍 (a) qípáo **cheongsam**		**(b)** 機車 (b) jīchē **motorcycle**	
		(c) 蟲 (c) chóng **bug**		**(d)** 廁所 (d) cèsuǒ **toilet**	

6. 這是一間 _____。
Zhèshì yì jiān _____
This is one CL _____.

(a) 狼
(a) láng
Wolf

(b) 國中
(b) guózhōng
junior high school

(c) 手冊
(c) shǒucè
handbook

(d) 雲
(d) yún
cloud

7. 這是一棵 _____。
Zhè shì yī kē _____
This is one CL _____.

(a) 服飾
(a) fúshì
dress

(b) 電梯
(b) diàntī
elevator

(c) 竹子
(c) zhúzi
bamboo

(d) 乒乓球
(d) pīngpāngqiú
table-tennis ball

8. 這是一件 _____。
Zhèshì yí jiàn _____
This is one CL _____

(a) 襯衫
(a) chènshān
Shirt

(b) 鋼琴
(b) gāngqín
piano

(c) 飛機
(c) fēijī
airplane

(d) 廁所
(d) cèsuǒ
toilet

9. 這是一朵 _____。
Zhè shì yī duǒ _____
This is one CL _____.

(a) 賭場
(a) dǔchǎng
casino

(b) 圍巾
(b) wéijīn
scarf

(c) 玫瑰
(c) méiguī
rose

(d) 蝴蝶
(d) húdié
butterfly

10. 這是一架 _____。
Zhèshì yí jià _____
This is one CL _____.

(a) 房子
(a) fángzǐ
house

(b) 校車
(b) xiàochē
school bus

(c) 直昇機
(c) zhíshēngjī
helicopter

(d) 小麥
(d) xiǎomài
wheat

二、Multiple Choice (dānxuǎntí)

Please choose the correct classifier in each question.
選擇正確量詞 (xuǎnzé zhèngquè liàngcí)

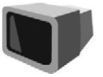
1.	這是一 _____ 大衣。 Zhèshì yī _____ dày **This is one _____overcoat.**		**(a)** 隻 **(b)** 件 **(c)** 朵 **(d)** 間 (a) zhī (b) jiàn (c) duǒ (d) jiān
2.	這是一 _____ 樹木。 Zhèshì yī _____ shùmù **This is one_____tree.**		**(a)** 棵 **(b)** 本 **(c)** 匹 **(d)** 架 (a) kē (b) běn (c) pī (d) jià
3.	這是一 _____ 獅子。 Zhèshì yī _____ shīzi **This is one _____lion.**		**(a)** 朵 **(b)** 本 **(c)** 隻 **(d)** 件 (a) duǒ (b) běn (c) zhī (d) jiàn
4.	這是一 _____ 筆記本。 Zhèshì yī _____ bǐjìběn **This is one _____notebook.**		**(a)** 輛 **(b)** 件 **(c)** 台 **(d)** 本 (a) liàng (b) jiàn (c) tái (d) běn
5.	這是一 _____ 駱駝。 Zhèshì yī _____ luòtuó **This is one _____camel.**		**(a)** 架 **(b)** 台 **(c)** 間 **(d)** 匹 (a) jià (b) tái (c) jiān (d) pī
6.	這是一 _____ 巴士。 Zhèshì yī _____ bāshì **This is one _____bus.**		**(a)** 輛 **(b)** 匹 **(c)** 間 **(d)** 棵 (a) liàng (b) pī (c) jiān (d) kē
7.	這是一 _____ 花。 Zhèshì yī _____ huā **This is one _____flower.**		**(a)** 台 **(b)** 件 **(c)** 朵 **(d)** 隻 (a) tái (b) jiàn (c) duǒ (d) zhī
8.	這是一 _____ 照相機。 Zhèshì yī _____ zhàoxiàngjī **This is one _____camera.**		**(a)** 件 **(b)** 隻 **(c)** 架 **(d)** 本 (a) jiàn (b) zhī (c) jià (d) běn
9.	這是一 _____ 健身房。 Zhèshì yī _____ jiànshēnfang **This is one _____gymnasium.**		**(a)** 間 **(b)** 棵 **(c)** 台 **(d)** 件 (a) jiān (b) kē (c) tái (d) jiàn
10.	這是一 _____ 電動玩具。 Zhèshì yī _____ diàndòngwánjù **This is one _____video game.**		**(a)** 棵 **(b)** 台 **(c)** 朵 **(d)** 隻 (a) kē (b) tái (c) duǒ (d) zhī

Appendix B: Posttest

華語量詞測驗 CSL Classifier Test

一、Multiple Choice 單選題 (dānxuǎntí)

Please choose the correct noun for a classifier in each question.
選擇正確名詞搭配量詞 (xuǎnzé zhèngquè míngcí dāpèi liàngcí)

1.	這是一間 _____。 Zhè shì yì jiān _____ **This is one CL** _____	**(a)** 浴室 (a) yùshì **bathroom**		**(b)** 公園 (b) gōngyuán **park**	
		(c) 圍巾 (c) wéijīn **scarf**		**(d)** 旗袍 (d) qípáo **cheongsam**	
2.	這是一架 _____。 Zhè shì yí jià _____ **This is one CL** _____	**(a)** 鬱金香 (a) yùjīnxiāng **tulip**		**(b)** 電話 (b) diànhuà **telephone**	
		(c) 樹 (c) shù **tree**		**(d)** 太空梭 (d) tàikōngsuō **space shuttle**	
3.	這是一朵 _____。 Zhè shì yī duǒ _____ **This is one CL** _____	**(a)** 鯨魚 (a) jīngyú **whale**		**(b)** 梅花 (b) méihuā **plum blossom**	
		(c) 狼 (c) láng **wolf**		**(d)** 電視 (d) diànshì **television**	
4.	這是一台 _____。 Zhè shì yì tái _____ **This is one CL** _____	**(a)** 收音機 (a) shōuyīnjī **radio**		**(b)** 靴子 (b) xuēzi **boot**	
		(c) 竹子 (c) zhúzi **bamboo**		**(d)** 電影院 (d) diànyǐngyuàn **cinema**	
5.	這是一件 _____。 Zhè shì yí jiàn _____ **This is one CL** _____	**(a)** 手錶 (a) shǒubiǎo **watch**		**(b)** 金魚 (b) jīnyú **goldfish**	
		(c) 裙子 (c) qúnzi **skirt**		**(d)** 雜誌 (d) zázhì **magazine**	

6.	這是一隻 _____。 Zhè shì yì zhī _____ **This is one CL** _____	**(a)** 樂器 (a) yuèqì **instrument**		**(b)** 鑽石 (b) zuànshí **diamond**	
		(c) 國中 (c) guózhōng **junior high school**		**(d)** 鯨魚 (d) jīngyú **whale**	
7.	這是一棵 _____。 Zhè shì yī kē _____ **This is one CL** _____	**(a)** 電話 (a) diànhuà **telephone**		**(b)** 樹 (b) shù **tree**	
		(c) 酒館 (c) jiúguǎn **bar**		**(d)** 漫畫 (d) mànhuà **comic**	
8.	這是一輛 _____。 Zhè shì yí liàng _____ **This is one CL** _____	**(a)** 影印機 (a) yǐngyìnjī **copy machine**		**(b)** 火車站 (b) huǒchēzhàn **train station**	
		(c) 腳踏車 (c) jiǎotàchē **bicycle**		**(d)** 褲子 (d) kùzi **pants**	
9.	這是一匹 _____。 zhè shì yì pī _____ **This is one CL** _____	**(a)** 烏龜 (a) wūguī **turtle**		**(b)** 博物館 (b) bówùguǎn **museum**	
		(c) 馬 (c) mǎ **horse**		**(d)** 公寓 (d) gōngyù **apartment**	
10.	這是一本 _____。 Zhè shì yì běn _____ **This is one CL** _____	**(a)** 情書 (a) qíngshū **love letter**		**(b)** 小說 (b) xiǎoshuō **novel**	
		(c) 校車 (c) xiàochē **school bus**		**(d)** 圖畫 (d) túhuà **painting**	

二、Multiple Choice (dānxuǎntí)

Please choose the correct classifier in each question.
選擇正確量詞 (xuǎnzé zhèngquè liàngcí)

1.	這是一 _____ 腳踏車。 Zhèshì yī _____ jiǎotàchē **This is one _____bicycle.**		**(a)** 匹 **(b)** 本 **(c)** 朵 **(d)** 台 (a) pī (b) běn (c) duǒ (d) tái
2.	這是一 _____ 汽車。 Zhèshì yī _____ qìchē **This is one _____car.**		**(a)** 件 **(b)** 匹 **(c)** 輛 **(d)** 本 (a) jiàn (b) pī (c) liàng (d) běn
3.	這是一 _____ 蓮花。 Zhèshì yī _____ liánhuā **This is one _____lotus.**		**(a)** 本 **(b)** 朵 **(c)** 匹 **(d)** 台 (a) běn (b) duǒ (c) pī (d) tái
4.	這是一 _____ 內衣。 Zhèshì yī _____ nèiyī **This is one _____ underwear.**		**(a)** 件 **(b)** 間 **(c)** 台 **(d)** 輛 (a) jiàn (b) jiān (c) tái (d) liàng
5.	這是一 _____ 白菜。 Zhèshì yī _____ báicài **This is one _____Chinese cabbage.**		**(a)** 匹 **(b)** 隻 **(c)** 架 **(d)** 棵 (a) pī (b) zhī (c) jià (d) kē
6.	這是一 _____ 辭典。 Zhèshì yī _____ cídiǎn **This is one _____ dictionary.**		**(a)** 隻 **(b)** 本 **(c)** 棵 **(d)** 朵 (a) zhī (b) běn (c) kē (d) duǒ
7.	這是一 _____ 斑馬。 Zhèshì yī _____ bānmǎ **This is one _____zebra.**		**(a)** 架 **(b)** 間 **(c)** 匹 **(d)** 台 (a) jià (b) jiān (c) pī (d) tái
8.	這是一 _____ 餐廳。 Zhèshì yī _____ cāntīng **This is one _____ restaurant.**		**(a)** 台 **(b)** 匹 **(c)** 架 **(d)** 間 (a) tái (b) pī (c) jià (d) jiān
9.	這是一 _____ 直升機。 Zhèshì yī _____ zhíshēngjī **This is one _____ helicopter.**		**(a)** 隻 **(b)** 架 **(c)** 本 **(d)** 間 (a) zhī (b) jià (c) běn (d) jiān
10.	這是一 _____ 兔子。 Zhèshì yī _____ tùzi **This is one _____rabbit.**		**(c)** 本 **(b)** 朵 **(a)** 隻 **(d)** 架 (c) běn (b) duǒ (a) zhī (d) jià

Appendix C: Background questionnaire

Background Questionnaire
Name : _____

1. Age:
   (Note. Please subtract your birth year from 2008)
2. Gender: ☐ Male ☐ Female

Language background:

1. What is your native language
   _____
2. How long have you been learning Chinese?
   _____
3. When did you start to learn Chinese? (How old were you?)
   _____
4. Where did you learn Chinese?
   ☐ school ☐ daily life
5. How long have you been in Taiwan?
6. What is your Chinese proficiency?
   ☐ Native-like ☐ Excellent ☐ Good ☐ Limited

Appendix D: Questionnaire about material use

Post Questionnaire

1. How much time a week did you spend on the program of Chinese Classifiers? (Please tick one)
   ☐ None ☐ < 30 minutes ☐ 30 minutes to 1 hours ☐ 1 to 2 hours ☐ More than 3 hours
2. Is the program of Chinese Classifiers clear for you in terms of presentation?
   ☐ Very clear ☐ Clear ☐ Fair ☐ Not clear ☐ I don't understand the content at all
3. How much do you think the program improved your understanding of Chinese Classifiers?
   ☐ Very helpful ☐ Helpful ☐ Fair ☐ Not very helpful ☐ Not helpful at all
4. Is there any difficulty in using our program?
   _____
5. Do you have any suggestions for our program?
   _____

6. Are you used to using a computer and reading on the computer?
   ☐ I am not used to using a computer
   ☐ I am used to using a computer, but do not read on the computer
   ☐ I am used to using a computer, and reading on the computer
7. In case we need any further help from you, please leave your contact information.
   Phone:
   Email:

References

Allan, Keith. 1977. Classifiers. *Language* 53. 285–311.

Boers, Frank and Seth Lindstromberg 2008. *Cognitive linguistic approaches to teaching vocabulary and phraseology*. Berlin: De Gruyter Mouton.

Carpenter, Kathie. 1991. Later than sooner: Extralinguistic categories in the acquisition of Thai classifiers. *Journal of Child Language* 18. 93–113.

Cermak, Laird S. and Fergus I. M. Craik. 1979. *Levels of processing in human memory*. Hillsdale, NJ: Lawrence Erlbaum.

Chen, Hao-Jan. 1996. *A study of the effect of corrective feedback on foreign Language learning: American students learning Chinese classifiers*. Ph. D. Dissertation. University of Pennsylvania.

Huang, Chu-Ren, Keh-Jiann Chen & Lai Ching-Xiung (eds.) 1997. *A dictionary of Chinese measures and collocations*. Taipei: Chinese Daily News.

Indonesian language. 2011. In *Wikipedia*, *The Free Encyclopedia*. http://en.wikipedia.org/w/index.php?title=Indonesian_language%26oldid=160950588 (Retrieved 26 August 2011).

Kuo, Jenny Yi-chun. 2000. Strategies for learning classifiers. In Bonnie Swierzbin, Fran Morris, Michael E. Anderson, Carol A. Klee & Elaine Tarone (eds.), *Social and cognitive factors in second language acquisition*, 424–442. Somerville, MA: Cascadilla Press.

Kuo, Yi-chun. 2005. Representation of shape by English and Chinese speakers. In Adam Makkai, William Sullivan and Arle R. Lommel (eds.), *LACUS Forum XXXI: Interconnections*, 253–262. Houston, TX: LACUS.

Kuo, Jenny Yi-chun. 2010. *Classifier effects on categorization and conceptualization*. Saarbrücken: Verlag Dr. Müller Aktiengesellschaft & Co. KG.

Kuo, Jenny Yi-chun, Jiun-Shiung Wu & Shu-chuan Chung. 2011. Computer assisted learning of Chinese shape classifiers. *Journal of Chinese Language Teaching* 8(2). 97–120.

Langacker, Ronald W. 1987. *Foundations of Cognitive Grammar*. Volume 1. Theoretical Prerequisites. Stanford: Stanford University Press.

Liang, Neal Szu-Yen. 2008. The acquisition of Chinese shape classifiers by L2 adult learners. In Marjorie K. M.Chan and Hana Kang (eds.), Proceedings of the *20th North American Conference on Chinese Linguistics, Volume 1*, 309–326. Columbus, OH: Ohio State University.

Loke, Kit-Ken. 1996. Norms and realities of Mandarin shape classifiers. *Journal of the Chinese Language Teachers Association* 31(2). 1–22.

Paivio, Allan. 1986. *Mental representation: A dual coding approach*. Oxford: Oxford University Press.

Polio, Charlene. 1994. Non-native speakers' use of nominal Classifiers in Mandarin Chinese. *Journal of the Chinese Language Teachers Association* 29(3). 51–56.
Tai, James Hao-Yi & Lian-qing Wang. 1990. A semantic study of the classifier *tiao* 條. *Journal of the Chinese Language Teachers Association* 15. 35–56.
Tai, James. 1994. Chinese classifier systems and human categorization. In Matthew Chen and Ovid Tzeng (eds.), *In honor of Professor William S-Y. Wang: Interdisciplinary studies on language and language change*, 479–494. Taipei: Pyramid.
Tai, Hao-Yi & Fang-Yi Chao. 1994. A semantic study of the classifier *zhang*. *Journal of the Chinese Language Teachers Association* 29(3). 67–78.
Thai language. 2011. In *Wikipedia*, *The Free Encyclopedia*. http://en.wikipedia.org/w/index.php?title=Thai_language%26oldid=160841568 (Retrieved 26 August 2011).
Tien, Yi-Min, Ovid Jr- Lang. Tzeng & Daisy L Hung. 2002. Semantic and cognitive basis of Chinese classifiers: a functional approach. *Language and Linguistics* 3(1). 101–132.
Tversky, Barbara and Kathleen Hemenway. 1984. Objects, parts and categories. *Journal of Experimental Psychology* 113. 169–193.
Zhang, Zheng-sheng. 1998. CALL for Chinese-issues and practice. *Journal of Chinese Language Teachers Association* 33(1). 51–82.

Bionote

Jenny Yichun Kuo

Jenny Yichun Kuo is an associate professor in the Department of Foreign Languages at National Chiayi University. She received a PhD in linguistics from the University of Minnesota in 2003. Her research interests include first and second language acquisition, language and cognition, especially classifiers. She has the other journal paper and a book chapter on learning Chinese classifiers.