

On the Learning of Chinese Aspect Markers through Multimedia

Program*

多媒體課程對華語時貌標記學習成效之研究

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Abstract

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The purpose of this study is to develop a multimedia program and examine its effects on learning Chinese aspect markers *le*, *zai*, and *zhe*. The materials in the program were based on linguistic studies of *le*, *zai*, and *zhe* (Li & Thompson, 2005; Lin, 2002; Liu, 1997; Pan, 1996; Smith, 1997; Wu & Kuo, 2003; Wu, 2003, 2005, 2007; Xiao & McEnery, 2004; Yeh, 1993). We predicted that this multimedia program with animation presenting the target sentences can significantly improve Chinese as a Foreign Language (for short, CFL) learners' acquisition of these aspect markers. The participants were totally 35 CFL beginners. Nineteen of them in the experimental group received the interactive multimedia program and sixteen of them in the control group took the computer-based grammar program. The teaching experiment is a section of twenty minutes per day for 3 days. We conduct a pretest, immediate posttest, and one-month delayed posttest, and the performances between the two groups were compared using the independent T-test. Findings indicated that the experimental group showed a significant advantage over the control group both in the immediate posttest and the delayed posttest.

摘要

本研究基於語言學對於華語時貌標記之研究，製作多媒體動畫課程，透過動畫來呈現時貌標記的語態，幫助華語為外語學習者對「了」、「在」、「著」的習得。三十五位華語初級學習者參與實驗，其中十九位為實驗組，用多媒體動畫課程自學；十六位為控制組，用電腦輔助文法翻譯課程學習時貌標記，經過連續三天，每天二十分鐘的學習，以T-test來檢驗，結果顯示實驗組在後測以及延宕後測的表現，比控制組來得有顯著的進步。

Keywords: Chinese Aspect Markers, Interactive Multimedia Program, Chinese as a Foreign Language, Animation

關鍵詞：時貌標記，多媒體動畫課程，華語為外語學習

1. Introduction

The Chinese aspect markers¹ have considered difficult for Chinese as a Foreign Language learners (Chao, 2002; Kao, 2006). Kao (2006) analyze the errors of the usage of the perfective *le* and of the imperfective *zhe* based on the corpus consisting of inter-language of Chinese produced by Chinese as a Foreign Language (for short, CFL) students abroad. Based on his study, he suggests that the interaction between aspect markers and different types of events, the comparison of the similar aspect markers and their individual characteristics should be introduced and emphasized in CFL instruction.

In this study, we develop a curriculum for three Chinese aspect markers: the perfective *le*, the progressive *zai* and the durative *zhe*. In order to eliminate the negative effect of grammar translation and possibly insufficiency of pedagogical grammar, we use the generalizations

¹ Chinese aspect markers include the perfective aspect markers *le*, the imperfective markers *zai* and *zhe*, the experiential *guo*, and verbal reduplication (Li & Thompson, 1981). In this study, we focus on the perfective marker *le*, and the imperfective markers *zai* and *zhe*.

from linguistic research on these three aspect markers, e.g. Li & Thompson, 1981; Lin, 2002; Liu, 1997; Pan, 1996; Smith, 1997; Wu & Kuo, 2003; Wu, 2003, 2005, 2007; Xiao & McEnery, 2004; Yeh, 1993, and implement the generalizations with computer animations, an instruction method along the lines proposed in Form Focused Instruction (Ellis, 1985).

According to Wu (2003, 2007), *zai* as a progressive marker goes with an event ongoing at an instant and *le* as a perfective marker presents a completed event or a terminated event. Both of *zai* and *le* can go with accomplishment² and activity³ events. Thus, the comparison between them in terms of accomplishment events is stated as the following sentences (1).

- (1) a. Tā **zài** xiě yì fēng xìn.
 she PROG write one CL letter
 “She is writing a letter.”
 b. Tā xiě (wán) **le** yì fēng xìn.
 she write (finish) PFV one CL letter
 “She finished writing a letter.”

In (1), we can tell the difference between *zai* and *le* in terms of interacting with Accomplishment. For example, *xiě yì fēng xìn* ‘to write a letter’ gets an ongoing reading with *zai* in (1a) while it receives a completed meaning with *le* in (1b). As for Activity, the comparison between *zai* and *le* was presented in (2). As we can see, *pǎobù* ‘running’ gets an ongoing reading with *zai* in (2a) while it acquires a completed meaning with *le* in (2b).

- (2) a. Tā **zài** pǎobù.
 he PROG running
 “He is running.”
 b. Tā pǎo **le** yí ge xiǎoshí de bù.
 he run PFV one CL hour of steps.
 “He ran for one hour.”

Also, in our curriculum, we included the contrast between *zhe* and *le*. *zhe* as the durative aspect marker signals the durative nature of a situation (e.g. Xiao & McEnery, 2004). When it comes to Activity such as the positional verb,⁴ *zhe* selects the stative reading to signal its durative posture (e.g. Li & Thompson, 2005; Xia & McEnery, 2004). For example, *dai* ‘to put on; to wear’ receives a stative meaning with *zhe* in (3a). In contrast, it gets a completed meaning with *le* in (3b).

² According to Smith (1997), accomplishment events include a process and a change of state, an accomplishment event is compatible with both durational phrases and completive phrases. For example, *xiě zhe wu fēng xìn* ‘to write these five letters’ is classified as Accomplishment because it contains both a process and a natural final endpoint.

³ Smith (1997) proposed that activity events only include a process but without a change of state; that is, they have no natural final points. Since it has no natural final endpoint, Activity requires a durational phrase to signal the final endpoint. For example, *Tā kàn le yí ge xiǎoshí de diǎn yǐng* ‘He saw a movie for one hour.’ *yí ge xiǎoshí* ‘one hour’ terminates the activity event *kàn diǎnyǐng* ‘to see the movie.’

⁴ Positional verbs like *chuan/dai* ‘to put on; wear’, *na* ‘take; hold’, *fang* ‘put’ and *gua* ‘hang’ refer to verbs that indicate where something has been put or placed (e.g. Xiao & McEnery, 2004).

- (3) a. Tā dài **zhe** yì dǐng màozi.
 she wear DUR one CL hat
 “She is wearing a hat.”
- b. Tā dài **le** yì dǐng màozi.
 she wear PFV one CL hat.
 “She wore a hat.”

On the other hand, *zhe* can go with posture verbs⁵ in addition to positional verbs and receive a stative reading as shown in (4). In (4a), the posture verb such as *zuo* ‘to sit’ acquires a stative meaning from the durative marker *zhe*. In addition, the V *zhe* such as that in (4a) can be used to provide a temporal background in the V *zhe* V construction (Wu & Kuo, 2003). For example, *zuo* ‘to sit’ in (4b) serves as a background of the main event *he kafei* ‘to drink coffee’.

- (4) a. Tā zuò **zhe**.
 she sit DUR
 “She is sitting.”
- b. Tā zuò **zhe** hē kāfēi.
 she sit DUR drink coffee
 “She is drinking coffee, while sitting.”

Furthermore, locative inversion in Chinese can take either *le* or *zhe*. However, the semantics of *zhe* differs from that of *le*. (5a), a locative inversion sentence with *zhe*, focuses on the lasting of the state part of the positional verb *fang* ‘to put’, while (5b), with *le*, focuses on the completion of the dynamic part of the same verb.

- (5) a. Zhuōshàng fang **zhe** yì pán cài.
 table put DUR one CL dish
 “A dish of vegetables is on the table.”
- b. Zhuōshàng fang **le** yì pán cài.
 table put PFV one CL dish
 “A dish of vegetables was put on the table.”

We also include in our curriculum the comparison among the three aspect markers *zhe*, *zai*, and *le*. Take the positional verb *chaun* ‘to put on; to wear’ as the example, shown in (6). *zhe* signifies the stative meaning in (6a), *zai* the progressive (ongoing) meaning in (6b) and *le* the completed meaning in (6c).

- (6) a. Tā chuān **zhe** wàitào.
 she wear DUR coat
 “She is wearing a coat.”
- b. Tā **zài** chuān wàitào.

⁵ Posture verbs refer to verbs indicating posture or physical disposition at a location such as *zhan* ‘stand’, *zuo* ‘sit’, *tang* ‘lie’, *dun* ‘squat’, *pa* ‘crouch’ and *ting* ‘stop; park (a car)’ and they either denote an activity or the state resulting from the activity, refer to verbs indicating posture or physical disposition at a location.

- she PROG wear coat
 “She is putting on a coat.”
 c. Tā chuān le wàitào.
 she wear PFV coat
 “She wore a coat.”

So far, we have addressed the interactions of the aspect markers *le*, *zai*, and *zhe* with event types. As far as second language learning is concerned, there have been studies devoted to computer-based L2 grammar instruction, such as McEnery, Baker & Wilson, 1995; Nagata, 1996; Rachel, 1995; etc. These studies show that computer-based L2 grammar instruction is more effective than traditional instruction. Ragan, Boyce, Redwine, Savenye, and McMichael (1993) also find that multimedia instruction reduces learning time by 30% compared to traditional instruction.

In the study, we focus on CFL learners’ acquisition of aspect markers *le*, *zai*, and *zhe*. These aspect markers are too abstract to comprehend for CFL learners, even expressed in English translation. For example, *Ta dai zhe maozhi* “She is wearing a hat” and *Ta zai dai maozhi* “She is putting on a hat.” CFL beginners may be confused why *zai* changed the verb from ‘to wear’ to ‘to put on,’ and have difficulty in distinguishing these two expressions. We predict that the animation can present the slight difference among the interaction of these aspect markers with event types and then improve CFL beginners’ comprehension of the aspect markers.

However, few studies, if any, investigate the effect on the computer-based grammar instruction with animation representing the semantics of the target sentences. Hence, we address the following issue in this paper: Is a computer-based multimedia program of grammar instruction (hereafter the interactive multimedia program) more effective than a Chinese computer-based grammar translation program (hereafter the computer-based grammar program) on CFL beginners’ learning of aspect markers *le*, *zai*, and *zhe*?

The remainder of the paper is organized as follows. In Section 2, we present methodology including participants, instruments, data collection and data analysis. In Section 3 we report results and discussion. Results are presented with various analyses following each of these descriptive sections. Discussion included the effect of the interactive multimedia program vs. the computer-based grammar program. Finally, Section 4 concluded this study.

2. Methodology

This study chose a quantitative method to investigate the effect of interactive multimedia program on Chinese Aspect Marker *le*, *zai*, and *zhe* learning. Based on the purpose of the study, we examined if the interactive multimedia program is more efficient and effective than the computer-based grammar program on the learning of Chinese aspect markers.

The participants were 35 CFL beginners and they were divided into two groups. One is the control group and the other the experimental group. The control group studied *le*, *zai*, and *zhe*

through the computer-based grammar program and the experimental group learned through the interactive multimedia program. Both of the interactive multimedia program and the computer-based grammar program were digitalized based on our designed curriculum which included seven lessons and exercises for each lesson. The major difference between the interactive multimedia program and the computer-based grammar program lies in the presentation of the semantics of *le*, *zai*, and *zhe* with events. The interactive multimedia program presented the semantics of the target sentences with animation while the computer-based grammar program with English corresponding sentences. The following Figure 1 shows the research design.

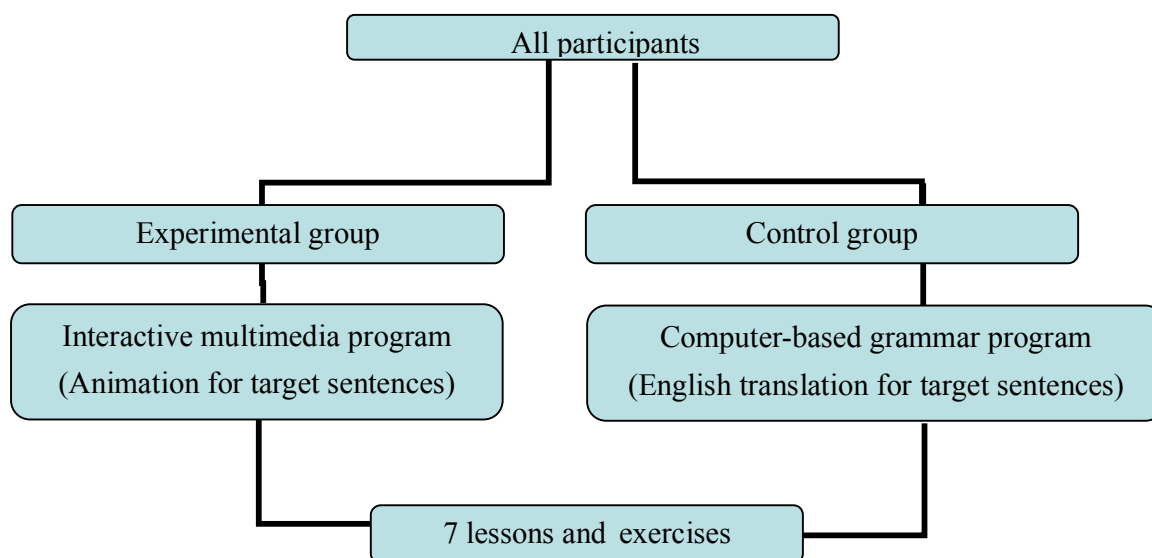


Figure 1. The research design

In addition to these two programs, a pretest, an immediate posttest, and a delayed posttest were used in the study. Performance of the experimental group who used the interactive multimedia program was compared with that of the control group who learned through the computer-based grammar program after learning an average twenty minutes of a three-day period learning. The result of the pre-test, immediate posttest, and the one-month delayed posttest were analyzed, using T-test to determine the effect of the interactive multimedia program.

2.1 Participants

Thirty-five participants for this study were selected respectively from the population of CFL beginners in National Chiayi University, National Chung-Cheng University, Chung-Yuan University and Feng-Chia University.⁶ Twenty-one of them were female and fourteen were male. Their ages ranged from eighteen to fifty-five year-old. They came from various countries. As the following Table 1, eight of them come from Indonesia, seven from Korea,

⁶ Among these 35 CFL beginners, four of them is from National Chiayi University, six from Chung-Yuan University, eight from National Chung-Cheng University, and seventeen from Feng-Chia University.

seven from Viet Nam, three from U.S.A, two from Mongolia, two from Russia, two from Thailand, one from Guatemala, one from India, one from Philippines, and one from Switzerland. The amount of time that the participants studied Mandarin Chinese is from half a year to one and half a year. All of them learned the perfective *le* and the progressive *zai* and half of them learned the durative *zhe*.

Table 1. Nationality of the participants in the study

Nationality	numbers of CFL beginners	Nationality	numbers of CFL beginners
Indonesia	8	Thailand	2
Korea	7	Guatemala	1
Viet Nam	7	India	1
U.S.A.	3	Philippines	1
Mongolia	2	Switzerland	1
Russia	2		

We divided these participants into two groups based on their English proficiency⁷ because the control group learned the target sentences through English corresponding sentences. Participants from English speaking countries such as the U. S. A., India and Philippine and other countries Indonesia, Thailand and Switzerland were assigned to the control group. Thus, the control group and the experimental group consisted of 16 students and 19 students respectively. The homogeneity between these two groups was established by the pretest.⁸ We calculated the average scores of the pretest of these two groups respectively out of a maximum score of 100 and get the mean score of the control group 68.75, and that of the experimental group 76.00, as shown in Table 2.

Table 2. Independent T-test between the two groups in the pretest

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>
Control	16	68.75	15.75	1.557n.s.
Experimental	19	76.00	11.78	

Note: Maximum score =100, n. s. $p > .05$

Results of the independent T-test in Table 2 indicate no significant differences ($t=1.557$, $p=0.129$) between the control group and the experimental group. Therefore, these two groups are roughly the same in terms of their comprehension of Chinese aspect markers *le*, *zai*, and *zhe* before learning through our program.

2.2 Materials and Instruments

The experiment involved two parts. One is the CFL program of the perfective *le* and the imperfective *zai* and *zhe*, i.e. the interactive multimedia program and the computer-based

⁷ Their English proficiency was investigated through the questionnaire about English background, also the interview with their CFL teachers.

⁸ As to the details about the pretest, please see Section 2.2.2.

grammar program in our study. The other one is the test including the pretest, and the posttest. In Section 2.2.1, we indicated the design of the CFL program, and its content validity; the interactive multimedia program, and the computer-based grammar program. Then in Section 2.2.2, the pretest and the posttest were introduced. Also, their item difficulty (P) and discrimination (D) indexes and reliability were examined through a pilot study.

2.2.1 The CFL program of the perfective *le* and the imperfective *zai* and *zhe*

The CFL curriculum or program in our study shows the comparison of the interaction of *le*, *zai*, and *zhe* with event types they can go with and aims to make CFL beginners comprehend these three aspect markers in terms of syntactic structures and semantics. There are ten sentences for each lesson, and totally seven lessons. We present the comparison of *zai* and *le* from Lesson 1 to Lesson 4, that of *zhe* and *le* in Lesson 5, V_1 *zhe* V_2 structure in Lesson 6 and the comparison among *zhe*, *zai*, and *le* in Lesson 7, see Appendix I. The patterns of target sentences in every unit were based on the representative literature (Li & Thompson, 2005; Lin, 2002; Liu, 1997; Pan, 1996; Smith, 1997; Wu & Kuo, 2003; Wu, 2003, 2007; Xiao & McEnery, 2004; Yeh, 1993). Words in the CFL program came from the Mandarin 800 Words for Beginner provided by the Steering Committee for the Test of Proficiency-Hanyu (SC-TOP).⁹ In order to establish content validity of the CFL program designed in our study, we invited two linguistics scholars and two senior Mandarin teachers whose inputs and feedback were useful. They were invited to review the CFL program, including the following interactive multimedia program and the computer-based grammar program. They judged the appropriateness of target sentences and their presentation. Thanks to their help, the content validity of the CFL program can be built.

2.2.1.1 The Interactive Multimedia Program

We digitalized the CFL program as above mentioned as the interactive multimedia program based on Concise Narrated Animation¹⁰ (Mayer, 2001). In the program, the semantics of the target sentences were expressed by animation¹¹ and their syntactic structures were visual and audio narrated.¹² For example, in terms of the comparison between *zai*, and *le* of Lesson one, the animation expressed the progressing meaning of *zai* sentences and the complete meaning of *le* sentences; the words and voices showed their syntactic structure in Chinese Traditional Character and Hanyu Pinyin, and their pronunciation.

Besides, each lesson was followed by an interactive exercise which offered learners to do the drills. Each interactive exercise contained five to six items and most of these items were from

⁹ According to The Steering Committee for the Test of Proficiency-Huayu (SC-TOP), those who have learned Chinese more than half a year are familiar with these 800 words, shown on the following website http://www.sc-top.org.tw/download/800Words_Beginners.pdf.

¹⁰ Concise Narrated Animation (CNA), a simple principle to present multimedia, ignores the unneeded materials and shows the most important part of ready-to-learn knowledge.

¹¹ All of the animation in the program is designed by the graduate and undergraduates in Department of E-learning Design and Management in National Chiayi University.

¹² Please see the website http://web.ncyu.edu.tw/~wujs/le_zhe_zai/index.swf for the interactive multimedia program.

the target sentences of the program and they were designed based on two content objectives: (i) Users are able to comprehend the interpretation of the interaction of *zai*, *zhe*, and *le* with their compatible events. (ii) Users are able to know the collocation of these three aspect markers with events. For example, through doing the exercise ‘Look at the animation and move *zai* and *le*’, the users are expected to comprehend the semantics and the syntactic structure of *zai* and *le*, shown as Figure 2.



Figure 2. An example of the exercise in the interactive multimedia program.

2.2.1.2 The Computer-Based Grammar Program

Comparing to the interactive multimedia program, the computer-based grammar program¹³ was also digitalized based on our designed CFL program. The difference between them lies in the presentation of semantics of the target sentences. In the interactive multimedia program, the semantics of target sentences were presented with animation as Figure 3. On the contrary, the computer-based grammar program expressed the meaning of the target sentences by English translation as Figure 4.

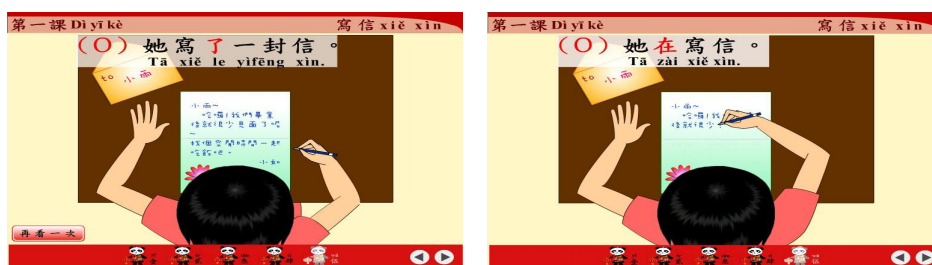


Figure 3. An example of animation in the interactive multimedia program

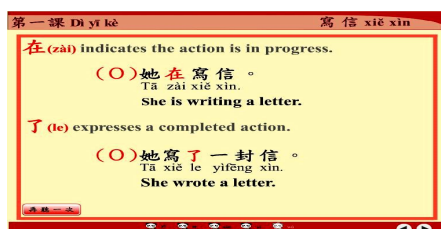


Figure 4. An example of English corresponding sentences in the grammar program

Figure 3 indicates the animation to present the semantics of *zai* and that of *le* with the event *xie xin* ‘to write a letter’ in the interactive multimedia program. Figure 4 shows the meaning of the target sentences expressed by their English corresponding sentences in the

¹³ Please see the website http://web.nccu.edu.tw/~wujs/le_zhe_zai_grammar/index1.swf for the computer-based grammar program.

computer-based grammar program. For example, ‘She is writing letter’ for *Ta zai xie xin* and ‘She wrote a letter’ for *Ta xie le yifeng xin*. Moreover, the computer-based grammar program offered the interactive exercise as the interactive multimedia program did. The interactive exercises in the computer-based grammar program are different from those in the interactive multimedia program in the presentation of the semantics of the target test items. As the following Figure 5, the meaning of the target test item was expressed by their English corresponding sentences.



Figure 5. An example of the exercise in the grammar program

2.2.2 Pretest and Posttest

The pretest consisted of three parts for 25 questions, as shown in Appendix II. Most of these questions came from the target sentences in our CFL program and the content validity was established as a result of the review of the scholars and senior teaching CFL teachers as previously mentioned. Regarding the first part including 10 questions, the participants put words in an appropriate order. Its purpose was to test CFL beginners’ comprehension of the syntactic structures of *le*, *zai*, and *zhe*. As to the second part of 10 questions, the participants choose a sentence that can best describe the clip¹⁴ given for each question. It was to assess their understanding of the semantics of the target aspect markers *le*, *zai*, and *zhe*. In the third part including 5 questions, the participants produce a sentence by using the words provided based on the given clip. Through their production, we evaluated their comprehension of target aspect markers.

Concerning the posttest, it was formed by shifting the questions in the pretest. In order to ensure item analyses and reliability of the pretest and the posttest, we conducted a pilot study. The pilot study was given to 21 CFL learners who study Mandarin in Taiwan. They are 16 females and 5 males. The amount of time they have studied Mandarin ranged from three months to one and half a year. Their age is from 19 to 35 year-old. Most of them learned *le* and *zai* while a few of them learned *zhe*. They were asked to spend 20 minutes on our pretest without any discussion based on what they saw on the computer screen which showed questions one by one.

¹⁴ Some of the clips were directed and performed by us, and the others were retrieved from the website <http://www.youtube.com/>.

After the test, the score of each participant was calculated by the percentage of correct answer out of a maximum score of 100. Then, item difficulty (P) and item discrimination (D) indexes were examined. The mean item difficulty¹⁵ 0.63 and the mean item discrimination¹⁶ 0.36 indicate both the pretest and the posttest are moderate for difficulty and good for discrimination. Regarding the reliability of the pretest, it was established by the Cronbach's alpha.¹⁷ The Cronbach's alpha 0.77 of the test showed that both of the pretest and the posttest are reliable of testing comprehension of the target aspect markers *le*, *zai* and *zhe*.

2.3 Procedure

Before the experiment, all participants were given the pretest online¹⁸ for 20 minutes. The participants were tested on their knowledge of *le*, *zai* and *zhe* in terms of their semantics and syntactic behavior. All of them were informed to do the questions without any discussion. After the pretest, participants were divided into two groups randomly. The experimental group consisted of 19 participants and the control group 16. For an average twenty minutes of a three-day period, the experimental group studied *le*, *zai* and *zhe* through the multimedia program and the control group learned these markers through the computer-based grammar program. After a three-day learning period, all participants were informed to take the 20-minute immediate posttest online¹⁹ and a questionnaire that surveyed learner perceptions and perceived effects as well. Also, the one-month delayed posttest online was given to all of the participants.²⁰

2.4 Data analysis

After the data collection, the pretest was calculated, using the percentage of correct answers out of a maximum 100. Moreover, an independent T-test was used to establish the homogeneity between the control group and the experimental group before the experiment. The result showed that there was no significant difference between these two groups before using their programs as a self-learning tool. As to the immediate posttest and the delayed posttest after the experiment, it was also computed by using the percentage of correct answers out of a maximum 100.

For Research Question, we examined if the multimedia program involved in the experimental group is more effective than the computer-based grammar program in the control group in terms of the semantics and the syntactic behavior of the target aspect markers *le*, *zai* and *zhe*. We used independent T-test to examine if any significant difference between these two groups.

¹⁵ In practice, item difficulty is classified as "easy" if the index is 85% or above; "moderate" if it is between 51% and 84%; and "hard" if it is 50% or below.

¹⁶ Generally speaking, item discrimination is identified as "good" if the index is above 30%; "fair" if it is between 10% and 30%; "poor" if it is below 10%.

¹⁷ The reliability of a test refers to the extent to which the test is likely to produce consistent scores. In practice, the acceptable range is from 0.70 to 0.80.

¹⁸ Please go to the website <http://web.ncyu.edu.tw/~wujs/pretest.html> for the pretest.

¹⁹ As to the immediate posttest online, please click on <http://web.ncyu.edu.tw/~wujs/posttest.html>.

²⁰ The questions in the one-month delayed posttest are the same as those in the immediate posttest.

Further, in order to increase the precision of group mean estimate and built a convincing result for this study, Analysis of Covariance (ANCOVA) was used to reanalyze the data.²¹ In addition, the questionnaires collected from the participants showed their perceptions and perceived effects toward the programs.

3. Results and Discussion

In this section, we answered Research Question: In contrast with the computer-based grammar program, is the interactive multimedia program designed in the study more effective on helping CFL beginners with comprehension of the aspect markers *le*, *zai* and *zhe* ? First, an independent T-test was performed to compare performances between the interactive multimedia group and the computer-based grammar group. There was a detailed descriptive statistics in Table 3.

Table 3. Independent T-test results between two groups

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>
Experimental	19	91.79	9.84	3.326**
Control	16	78.25	14.16	

Note. Maximum score = 100, ** $p < .01$

In Table 3, the figure indicated that there was a significant difference between the mean scores of 19 experimental subjects ($M = 91.79$) and 16 control subjects ($M=78.25$, $t=3.326$, $p=.002$). The result revealed that the interactive multimedia group as a self-learning tool on 19 experimental subjects significantly outperformed the computer-based grammar program on 16 control subjects. That is to say, the answer to Research Question is positive. The multimedia program with animation for presenting the target sentences is more effective than the computer-based grammar program with English explanation.

Then, a paired T-test was used to examine performances of members within each group. The paired T-test results of 19 experimental subjects in Table 4 indicated that there was a significant difference ($t=-7.414$, $p=.000$) between the mean scores of the pretest ($M=76.00$) and the posttest ($M=91.79$).

Table 4. Paired T-test results of 19 experimental subjects

Task	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>
pretest	19	76.00	11.78	-7.414***
posttest	19	91.79	9.84	

Note. Maximum score = 100, *** $p < .001$

Also, those of 16 control subjects in Table 5 showed there was a significant difference

²¹ Although there was no significant difference in the performance of these target aspect markers between the experimental group and the control group before they learned through our designed program, we found the experimental group showed higher mean and lower individual difference among 19 subjects. In order to avoid the performance in the pretest as the variable of the result, ANCOVA was used to verify.

($t=-2.449$, $p=.027$) between the mean scores of the pretest ($M=68.75$) and the posttest ($M=78.25$).

Table 5. Paired T-test results of 16 control subjects

Task	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>
pretest	16	68.75	15.75	-2.449*
posttest	16	78.25	14.16	

Note. Maximum score = 100, * $p < .05$

In simple terms, these results showed both of the interactive multimedia program and the computer-based grammar program are effective as a self-learning tool on the learning of the aspect markers *le*, *zai* and *zhe*.

Next, the paired T-test was employed to examine the retention phenomenon within each group. We compared the mean scores of the posttest to that of the delayed posttest within each group. The following Table 6 indicated there was no significant difference ($t=-1.099$, $p=.286$) between the posttest and the delayed posttest in the experimental group. As for the control group, Table 7 also showed no significant difference ($t=-1.013$, $p=.327$) between the posttest and the delayed posttest. As above suggested, the retention phenomenon existed in the two groups.

Table 6. Results of 19 experimental subjects between two posttests

Task	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>
posttest	19	91.79	9.84	-1.099 n.s.
delayed posttest	19	93.26	8.85	

Note. Maximum score = 100, n.s. $p > .05$

Table 7. Results of 16 control subjects between two posttests

Task	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>
posttest	16	78.25	14.16	-1.013 n.s.
delayed posttest	16	80.50	13.92	

Note. Maximum score = 100, n.s. $p > .05$

Next, in order to increase the result power for our Research Question, we laid out its results in the form of an ANCOVA summary table as Table 8, in which we considered the mean pretest the covariance. As we can see from the Table 8, the calculated value of $F=7.83$ is significant ($p < .05$). The figure indicated that there was a significant difference between the multimedia group and the computer-based grammar group. As a result of the adjusted mean ($M = 72.69$) score of the pretest, the mean score of the posttest was changed to 90.24 from 91.79 in the experimental group and to 80.09 from 78.25 in the control group based on Table 9 for the mean scores of the posttest evaluated at the covariate and Table 10 for the mean scores of the posttest. More specifically, in case of ANOVA, the significant difference existed between the experimental group and the control group.

Table 8. An ANCOVA Summary Table of these two groups.

Dependent Variable: posttest

Source	SS(Type III)	df	MS	F
covariance	1354.11	1	1354.11	12.76*
adjusted means(between-groups)	834.47	1	834.47	7.83*
adjusted error	3396.05	32	106.13	
adjusted total	6342.40	34		

Note. * $p < .05$

Table 9. Estimates of the Mean Scores of the Posttest

Dependent Variable: posttest

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	90.24 ^a	2.40	85.35	95.14
Control	80.09 ^a	2.63	74.74	85.44

a. Evaluated at covariates appeared in the model: pretest = 72.69.

Table 10. Descriptive Statistics of the Mean Scores of the Posttest

Dependent Variable: posttest

Group	Mean	Std. Deviation	N
Experimental	91.79	9.84	19
Control	78.25	14.16	16

On the other hand, we looked into learner perceptions and perceived effects toward these two programs from their questionnaires. For the interactive multimedia program, most students including the older participants were satisfied with it and expressed their interest in learning the abstract aspect markers through the animation expressing the semantics of the target sentences. For example, they are looking forward to the next program for the intermediate level CFL learners. Also, they identified that the comparison among *le*, *zai*, and *zhe* interacting with events helped them to comprehend their usage. One suggested that adding more target sentences interacting with *le*, *zai*, and *zhe* to the multimedia program and more test items to the interactive exercises can make them learn more about aspect markers.

On the contrary, as to the computer-based program, a few of the learners got benefit from it as a result of the curriculum comparing the usage of the target aspect markers interacting with events. However, some of them claimed that the animation or picture if adding to the English

corresponding sentences of the target sentences increase their understanding of these aspect markers.

3. Conclusion

The results of the present study were summarized by pointing out that the significant effectiveness on the learning of three aspect markers *le*, *zai*, and *zhe* through the interactive multimedia program in contrast with the computer-based grammar program. The animation presenting the semantics of the target aspect markers interacting with events in the interactive multimedia program is the key point that makes the experimental group outperformed significantly the control group, in which the meaning of target sentences were expressed by English translation. The animation can express the abstract concept of aspect markers instead of English grammar translation or explanation which exist in most of the CFL textbooks. For pedagogical implication, the study provides contribution to the computer-based assisted teaching or learning tool in the classroom.

Nevertheless, the present study is not without limitations, as discussed below. The first limitation concerns the assessment of participants' language level. Only acquiring their language background from questionnaire or their CFL teachers cannot assess their actual level. The amount of time that the participants studied Chinese varies, also the familiarity with these three aspect markers. In addition, participants from 3 different institutes may receive different input and teaching methods which provide participants various bases in acquiring these three aspect markers, In this case, the generalization of the results is limited.

Next, the target sentences in the program adopted from the representative literature is limited. Learners using the program may learn small parts of target sentences with *le*, *zai*, and *zhe* which may not be proved very practical in our daily conversation although they learned their different usage. Therefore, the content of the program in our study is limited to cover all kinds of usages concerning about target aspect markers.

Regarding the future studies, we look forward to the multimedia program of aspect markers for intermediate-level CFL learners and predict its effectiveness. In order to include more practical usage of aspect markers, we will refer corpus data for the target sentences. Further, the CFL learners' proficiency will be assessed based on the approved proficiency test, such as Test of Proficiency-Huayu in Taiwan.

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