

Taiwan EFL Learners' Pronunciation Strategies in Two Learning Contexts

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Abstract—The study investigate the nature of two learning contexts, computer-assisted pronunciation training (CAPT) and classroom-based pronunciation training (CBPT), and learners' strategies in them. 120 valid questionnaires were collected from college students who learned in CAPT and CBPT at one university in Taiwan. The results showed firstly, pronunciation learning activities are distributed differently in CAPT and CBPT. More learning activities are used in CBPT than in CAPT, and this may be related to teachers' help in the classroom. Students in CAPT used more activities related to suprasegments than segments (minimal pair drills). In CBPT, learners used activities related to both segments and suprasegments often. In both contexts, learners often relied on teachers' demonstration and their imitation, but seldom received explicit strategy teaching. These activities employed may affect learners' strategy choice. Secondly, learners in either CAPT or CBPT showed similar performance in strategy use. In both learning contexts, learners relied on memory and imitation very much, but rarely noticed different qualities of sounds. When learning in both contexts simultaneously, learners' use of strategies increased obviously. It is possible that this increase results from more opportunities for learners in both contexts to notice and practice. Implications are discussed in the paper.

Index Terms—pronunciation strategies, learning context, computer-assisted pronunciation training, EFL learners

I. INTRODUCTION

It is believed that strategic competence helps learners learn how to learn a language as well as raise their awareness of learning (Oxford, 1990). As a part of communicative competence, strategic competence in pronunciation facilitates learners' manipulation of their accent to reach eventual comprehensibility. However, even though researchers have studied learners' strategic awareness in writing (Victori, 1999; Schoonen et al., 2003), reading (Schoonen, Hulstijn, & Bossers, 1998), and listening (Goh, 1997; Vandergrift, Goh, Mareschal, & Tafaghodtari, 2006), scarce research can be found on learners' strategy use in pronunciation learning. Learners' strategic awareness in pronunciation may facilitate their acquisition of comprehensible pronunciation, and thus to decrease the opportunities of being placed unequally in L2 societies because of their strong foreign accents (Morley, 1991). Besides, with the help of their strategic awareness, learners can manipulate their pronunciation learning and find out the most appropriate way by themselves, especially when many pronunciation teachers lack sufficient knowledge about pronunciation teaching due to their little or no training (Breitkreutz, Derwing, & Rossiter, 2002).

Pronunciation learning at present is not confined within traditional classroom-based pronunciation training (CBPT); computer-assisted pronunciation training (CAPT) has provided learners another way to access it. Researchers have been comparing the effectiveness of language teaching and learning in traditional classroom and computer assisted language learning (CALL) environments (Engwall & Ba lter, 2007). These comparisons render a more integrated picture of language learning. Therefore, investigating learners' strategies use in CAPT and CBPT helps delineate learners' pronunciation learning process in different contexts and evaluate these two learning environments.

II. LITERATURE REVIEW

A. *Foci of Pronunciation Teaching*

As for pronunciation teaching, some common learning activities and foci are shared by teachers and learners, and reflect the nature of learning contexts. They include segmental teaching, pronunciation teaching beyond segmental, and pronunciation feedback.

Segmental Teaching

Based on Derwing and Rossiter (2002, p. 156), teachers initially "focused on L1-L2 segmental differences and the discrimination and articulation of individual sound segments in single-syllable words." This pronunciation teaching approach was mainly based on contrastive analysis of L1 and L2, and can still be found in many language textbooks

with the drills of minimal pairs, pictures, or teachers' demonstration. Learners can understand how a sound is pronounced by viewing the place or manner of articulation in pictures.

Pronunciation Teaching beyond Segmental

Many studies have shown the effectiveness of suprasegmental instruction (including intonation, stress, and rhythm) as a pronunciation learning activity and its superiority over segmental instruction (Derwing et al., 1998; Moyer, 1999; Munro, 1995; Pennington, 1989). Compared to focusing on segmentals, suprasegmental instruction is more context-based and function-orientation since different intonation or stress of target language leads to changes in meaning based on the needs of interlocutors in communication. In addition to prosodic features in pronunciation, researchers have expanded their view of what constitute the pronunciation we know, including voice quality and body language in oral communication (Morley, 1991).

Pronunciation Feedback

Another important focus in pronunciation teaching is the role of feedback or interaction. Pronunciation errors by learners take place very often, and teachers who attempt to correct their errors have to identify possible reasons for these errors (Mackey, 1965). Hammerly (1973, pp. 107-108) thus suggested that teachers should "isolate the error" and "differentiate the error" so that students know where and what their errors are. As for the correction of prosodic errors, visualization of gestures helps students' understanding of intonation pattern, stress, and rhythm. With these activities, whether students' mispronunciation results from their vague conception about the right form, or inability to pronounce relies on teachers' judgment. In this respect, teachers act like coaches who not so much teach as assist learners' pronunciation (Morley, 1991). The role of the coach is to give models, feedback, practice opportunities, and support.

These foci of pronunciation teaching not only promote learning activities relying on teachers (e.g. demonstration), but also on learners (e.g. imitation, two-way feedback or interaction, and segmental or suprasegmental recognition). Learners' awareness thus plays a role in pronunciation learning. Learners' no or few responsibility in pronunciation improvement has now been replaced by their self-monitoring, awareness, and strategies (Scarcella & Oxford, 1994).

B. Learners' Strategic Awareness in Pronunciation Learning

In order to raise learners' awareness and facilitate their strategy use, researchers have proposed multifarious strategies for pronunciation teaching (Scarcella & Oxford, 1994; Lin, Fan, & Chen, 1995), and identified pronunciation strategies (PSs) used by learners (Osborne, 2003). For example, Derwing and Rossiter (2002) investigated 100 ESL learners' perception of their pronunciation difficulties and possible strategies they use to compensate for their communication breakdown, through interviews and survey questions. When learners are misunderstood in communication, the top five common strategies employed are paraphrase, self-repetition, writing/ spelling, volume adjustment, speaking clearly, and slowing speech rate. Osborne (2003) also used oral protocols to investigate 50 adults learners' use of strategies in their pronunciation improvement. He identified eight PSs mostly used by advanced learners, which are global articulatory gesture; local articulatory or single sound; individual syllables; clusters below the syllable-level; prosodic structure; individual words; paralinguistic; memory or imitation. The result shows that learners use strategies to help their pronunciation, and the most common pronunciation learning strategies used by learners is imitation, followed by their focus on paralinguistic. On the other hand, strategies related to segmental phonology (such as syllable structures, consonant clusters, and individual sound) and suprasegmental phonology were seldom employed by learners.

From these studies, the image of learners is no longer passive knowledge recipients, but active practitioners who employ any possible ways to solve pronunciation problems with their cognitive and metacognitive abilities. Students' strategic awareness plays a role both for learners to facilitate their learning (Bransford, Brown, & Cocking, 1999; Hacker, Dunlosky, & Graesser, 1998), and for us to explain the process of their pronunciation learning (Joseph, 2010). As claimed by Osborne (2003), it is important to analyze learners' PSs for the following reasons. First, by investigating all facets of second language phonology, such as PS, researchers can construct a sound linguistic theory with the information provided by second language phonology, and assist learners' learning. Second, in response to pronunciation instruction, researchers need to study learners' PSs, which may assist the development of effective techniques. Studies of PS in second language acquisition, therefore, have both theoretical and pedagogical implications.

C. Computer-assisted Pronunciation Training

It was found that learning context may determine learners' PS use (Haslam, 2010). Computer-assisted pronunciation training (CAPT) provides another different context from traditional classroom-based pronunciation training (CBPT), and some studies agree that CAPT has its place in oral training (Pennington, 1999; Neri, Mich, Gerosa, & Giuliani, 2008).

There have been legions of studies investigating the effectiveness of CAPT in language learning (Johnson, Dunkel, & Rekart, 1991; Schwart, Markoff, & Jain, 1991; Stenson, Downing, Smith, & Smith, 1992; Neri, et al., 2008). Pennington (1999) claims that in terms of capacities, CAPT is faster than CBPT in analyzing learners' output and providing immediate feedback, and the analysis from CAPT is also repeatable, so as to increase its reliability. Besides, CAPT is also beneficial to students by its multi-modal presentation and individualization. Based on these capacities in CAPT, the positive potentials include increasing learning motivation, and students' effort on pronunciation, raising learners' awareness, understanding, and skills on the varieties of phonological feature in different languages, and improving their learnability of phonology. Therefore, learners may reach automaticity of pronunciation after practice

and their confidence may be built in the process of individualized and private practice.

Despite these advantages, CAPT also have some limitations in language teaching and its application (Pennington, 1999). One of the main limitations for CAPT is that certain features of pronunciation are restricted by showing visual representations only, and its individualization makes it difficult for the whole class instruction. CAPT is also criticized by its decontextualized learning environment when giving certain bottom-up pronunciation mechanics. Besides, students can not have an integration of their learning or monitor their progress since available programs seldom contain curriculum. Moreover, the most urgent requirement for CAPT is to have pedagogical foundations and support. Neri et al. (2008) suggest that much available pronunciation software is the product of a technology push that may impress the users firstly by its fancy looking, but has weak pedagogical theories to support.

III. RESEARCH QUESTIONS

Recognizing the foci or learning activities in CAPT and CBPT and comparing learners' strategy use in them allow us to understand better the nature of these two contexts. It also reveals how contexts work with learners' strategic awareness and knowledge. For pronunciation teaching teachers and software designers, this comparison further helps them make appropriate decisions for learners. The research questions for the present study are as follows:

1. What are learning activities in CAPT and CBPT? Is there any significant correlation between learners' pronunciation activities employed in CAPT and CBPT?
2. Are there any significant differences in learners' strategies between learning contexts of CAPT and CBPT?
3. Are there any significant differences in strategy use between learners studying in either context (i.e. CAPT or CBPT) and learners studying in both contexts (i.e. CAPT and CBPT)?

IV. METHOD

A. Participants

The study was administrated from fall 2010 to spring 2011 (i.e. two semesters). One hundred and twenty valid questionnaires were collected from college students who attended pronunciation training classes and who used the computer-assisted pronunciation training program at one university in Taiwan. These 120 questionnaires were derived from participants of four groups, including CAPT (n=30), CBPT (n=30), Both-A (n=30), and Both-B (n=30). Participants in CAPT only learned pronunciation by using the software in the lab at least two hours per week; participants in CBPT only learned pronunciation by attending the weekly classes; participants in Both-A used both trainings, but only their responses to pronunciation training program were collected; participants in Both-B also used both trainings, but only their responses to pronunciation classes were collected. These four groups consisted of students from different disciplines. In order to measure and level participants' English proficiency, a pre-test was conducted in the beginning of the first semester. Based on participants' English scores and their percentile rank, only students before 25% were chosen for this study. In other words, participants in these four groups are advanced learners or high achievers in English.

B. Instruments

Pronunciation Training Classes

The pronunciation training classes are only available and required to English majors and minors. Students in these classes are taught and guided by professors from English department for two semesters, two hours a week. In the classroom, teachers would follow teaching materials and the textbook to guide students in pronunciation learning (Focus on Pronunciation 3 by Lane, L. 2005. New York: Longman). These courses are to help students improve their pronunciation of the English language as they speak it. With a brief introduction to the nature of English consonant and vowel production, as well as the peculiar characteristics of the suprasegmental features of the language, these courses provide students with various kinds of listening and speaking practice. Special focus of the oral/aural practice will be placed on pairs/groups of potentially confusing sounds, linking of sounds across syllable/word boundaries, stress, intonation, rhythm, etc. It is hoped that through the intensive drills students may develop their sound awareness, become conscious of their pronunciation problems, and further adopt the most efficient way to solve the problems and improve their pronunciation.

Computer-Assisted Pronunciation Training Programs

As for computer-assisted pronunciation training programs, the pronunciation learning software is applied in this study. Different English learning programs can be used freely in the computer labs by the students, including college students and postgraduates. Some of these programs are developed to promote students' oral skills, including Tell Me More, Traci Talk, and My ET (My English Tutor). This study focuses on the students who use My ET to promote their pronunciation skills, because this is the program best known to and used most by learners in Taiwan. The automatic speech recognition and analysis technology of My ET can analyze learners' pronunciation, pitch, timing (fluency), intonation and volume as well as indicate their pronunciation problems of a particular sound. After using microphone to record and imitate the sentences from models of native speakers, students receive a total score and four sub-scores for each utterance. The score and feedback are offered according to the criteria composed of pronunciation (50%),

timing/fluency (20%), intonation (20%), and volume (10%). Some features of My ET include its design for learners' individual differences by providing a range of lessons for different language proficiency levels. Learners can choose the lesson and task that best suit their needs and interest, and low proficiency learners can even slow down the delivery speed of the audio files. Also, the program provides learning strategies to help learners build a step-by-step process to improve their pronunciation. Finally, both norm-referenced and criterion-referenced grades are offered to learners so that they can monitor their own learning progress.

Pronunciation Strategies Survey (PSS)

Pronunciation Strategies Survey (PSS) is a questionnaire of 5-point Likert scales, containing eight most commonly used PSs found in Osburne's (2003) study, including PS1 *Local articulatory or single sound*

PS2 *Focus on sounds below the syllable-level*

PS3 *Focus on individual syllables*

PS4 *Focus on prosodic structure*

PS5 *Global articulatory gesture (the quality of pronunciation, overall mouth posture, such as the emphasis on the quality of [i] and [ɪ], rather than on their length difference)*

PS6 *Focus on paralinguistic (attention to the speed, volume, and clarity of the speech)*

PS7 *Focus on individual words*

PS8 *Focus on memory or imitation*

Osburne's (2003) eight PS categories were used in the current survey study because they are generalized and identified from observations of learners' actual use, rather than invented to conform to certain learning model or construct. This survey aims to identify the frequency of each strategy employed by participants from always to never use it. The researcher used responses from participants in the pilot study, which yielded a Cronbach alpha value of .86.

List of Pronunciation Learning Activities Identification

The List of pronunciation learning activities identification is designed for students to identify the pronunciation learning activities they had from a list. The purpose of this survey is to analyze how often certain pronunciation activities appear in different learning environments. The nine common pronunciation activities (see Table 1 for the activities included) in the list were chosen based on previous studies (Derwing et al., 1998; Moyer, 1999; Munro, 1995; Pennington, 1989), observation on pronunciation courses, and interviews with pronunciation teachers in colleges. The results in the pilot study shows that these activities are sufficient enough for participants to choose from.

C. Procedures

In the beginning of the first semester, an English test was conducted to the students in the study to level their English proficiency. This pre-test includes vocabulary, grammar, reading comprehension, and writing test. Since only English majors and minors were able to attend pronunciation classes and their English proficiency is within top 25%, the researcher only chose participants within top 25% in this study to ensure their equal proficiency level. The participants were then divided into four groups (i.e. CAPT, CBPT, Both-A, and Both-B) based on their learning contexts and responses to the survey.

Students in CAPT learned the software in the lab in the first week and then used the learning program freely based on their needs two hours a week. Tutors in the lab would check their attendance. Students in CBPT were instructed by teachers in the classroom according to the weekly schedule. Students in Both-A and Both-B attended weekly pronunciation classes and used the learning program in the lab altogether. In addition to following weekly teaching schedule, the teacher in Both-A and Both-B also introduced students the learning program in the beginning of the first semester. These students were expected to use the software two hours a week outside the classroom.

The current study is a one cross-sectional design, and data were collected through the survey. Near the end of the second semester, these participants were invited to answer PSS and list of pronunciation activities identification in class or lab. At first, the researcher explained the purpose of the study and helped students understand that their answers would not affect their grades. These participants were explained how to fill out these questionnaires and meaning of certain items. For students in CAPT and CBPT, they answered the questionnaire according to their learning experience in each context. Students in Both-A were asked by the researcher to answer based on their pronunciation program learning experience in the lab, and students in Both-B were told to recall their pronunciation learning in the classroom for the survey. If learners have any question about the terms in the surveys, they are free to ask the researcher for clarity by raising their hands. With statistics tools like SPSS, responses from participants of different learning contexts were compared to see whether any significant difference exists.

V. RESULTS

A. Pronunciation Activities in CAPT and CBPT

To begin with, Frequency count and percentage of pronunciation learning activities in each context was calculated to answer the first research question. In Table 1, detailed information about the distribution and percentage of learning activities in CAPT and CBPT was provided. The results show that almost all pronunciation activities were used more frequently by students in CBPT than in CAPT.

TABLE 1.
FREQUENCY COUNT AND PERCENTAGE OF PRONUNCIATION ACTIVITIES IN CAPT AND CBPT

Pronunciation Activities		Learning Context of Pronunciation		Total
		CAPT	CBPT	
1. Pictures or videos showing how to pronounce	Count	19	38	57
	% within context	6.9%	9.1%	8.2%
	% within activity	33.3%	66.7%	100.0%
2. Teacher's demonstration	Count	55	54	109
	% within context	19.9%	12.9%	15.7%
	% within activity	50.5%	49.5%	100.0%
3. Imitation	Count	43	51	94
	% within context	15.5%	12.2%	13.5%
	% within activity	45.7%	54.3%	100.0%
4. Minimal-pair drills	Count	12	55	67
	% within context	4.3%	13.1%	9.6%
	% within activity	17.9%	82.1%	100.0%
5. Intonation, stress, or rhythm practice	Count	40	58	98
	% within context	14.4%	13.8%	14.1%
	% within activity	40.8%	59.2%	100.0%
6. Pronunciation activities based on different levels	Count	22	36	58
	% within context	7.9%	8.6%	8.3%
	% within activity	37.9%	62.1%	100.0%
7. Pronunciation activities based on different topics	Count	39	49	88
	% within context	14.1%	11.7%	12.6%
	% within activity	44.3%	55.7%	100.0%
8. One on one oral interaction and feedback from teachers	Count	30	43	73
	% within context	10.8%	10.3%	10.5%
	% within activity	41.1%	58.9%	100.0%
9. Pronunciation strategies given by teachers	Count	17	35	52
	% within context	6.1%	8.4%	7.5%
	% within activity	32.7%	67.3%	100.0%
Total	Count	277	419	696
	% within context	100.0%	100.0%	100.0%
	% within activity	39.8%	60.2%	100.0%

Firstly, we can see from this Table the different weight of activities in each learning context. In CAPT, Teacher's demonstration (19.9%) is the learning activity used the most by students, while other four activities were relatively seldom used, including Pronunciation activities based on different levels (7.9%), Pictures or videos showing how to pronounce (6.9%), Pronunciation strategies given by teachers (6.1%), and especially Minimal-pair drills (4.3%). On the other hand, in CBPT, the activity used the most by teachers and learners is Intonation, stress, or rhythm practice (13.8%). Three other activities were relatively seldom used, including Pictures or videos showing how to pronounce (9.1%), Pronunciation activities based on different levels (8.6%), and Pronunciation strategies given by teachers (8.4%).

In the comparison of the number and percentage of learning activities between CAPT and CBPT, some findings were discovered. Firstly, the total number and percentage of learning activities in CBPT (60.2%) are generally higher than those in CAPT (39.8%). Secondly, both CAPT and CBPT have low number and percentage on Pronunciation strategies given by teachers. Besides, a sharp contrast is observed between learners' use of Minimal-pair drills in CAPT (17.9%) and CBPT (82.1%), and the frequency count of Minimal-pair drills is also the least in CAPT. Teacher's demonstration is the activity highly favored by both CAPT (50.5%) and CBPT (49.5%) with almost equal number and percentage. A Chi-square test was conducted to investigate the relationship between pronunciation activities used in CAPT and CBPT, as shown in Table 2.

TABLE 2.
CHI-SQUARE TESTS FOR PRONUNCIATION ACTIVITIES IN CAPT AND CBPT

	Value	df	Asymp.Sig.(2-sided)
Pearson Chi-Square	22.973	8	.003*
Likelihood Ratio	24.434	8	.002
Linear-by-Linear Association	0.467	1	.494
N of Valid Cases	696		

* $p < .05$

Table 2 presents the results of Chi-square test for the correlation between pronunciation activities employment and different pronunciation training environments. As shown in Table 2, there exists significant difference between pronunciation activities in CAPT and CBPT at the .05 level ($p < .05$). It means that firstly, the distribution of pronunciation activities between CAPT and CBPT are different; secondly, learning context and pronunciation activities are related.

B. Learners' Strategy Use in Different Learning Contexts

The current study also investigates the participants' PSs scores in different learning environments of CAPT, CBPT, Both-A, and Both-B. The results were showed in Table 3. The result of one way ANOVA indicated that learners used

different PSs in different groups, since significant differences were observed ($F(3, 116) = 5.38, p = 0.00$).

TABLE 3.
DESCRIPTIVE STATISTICS OF THE PRONUNCIATION STRATEGY SCORES

Group	Mean	SD
CAPT ($n=30$)	3.62	.69
CBPT ($n=30$)	3.55	.81
Both-A ($n=30$)	4.08	.59
Both-B ($n=30$)	4.08	.56
Total ($N=120$)	3.83	.71

To address the influence of learning contexts on learners' strategy use, a post-hoc test was used to compare the results obtained by the subjects exposed to the different contexts. Results show that no significant difference was found at the $p < .05$ level between the CAPT and CBPT groups. In contrast, there were significant differences between the CAPT and Both-A groups ($p = .01$), and between CBPT and Both-B groups ($p = .00$).

Strategy Use between CAPT and CBPT

Though no significance was found between the CAPT and CBPT groups in their strategy use, the study further analyzed the mean scores of each PS to discover some shared similarities. Firstly, PSs with high mean scores were identified. The results show that the mean scores of PS4 Focus on prosodic structure (3.73), PS6 Focus on paralinguistic (3.77), and PS8 Focus on memory or imitation (3.70) are the highest in CAPT. Besides, the mean score of PS8 (3.80) is also the highest in CBPT, followed by PS7 Focus on individual words (3.67) and PS6 Focus on paralinguistic (3.60). Thus, PS8 was used highly often by both groups. As for the PSs with low mean scores, PS5 Global articulatory gesture (3.37) has the lowest score in CAPT. In CBPT, the lowest score is PS2 Focus on sounds below the syllable-level (3.43) and also PS5 Global articulatory gesture (3.43). Based on the results, PS5 was considered the least used pronunciation learning strategies by both groups.

Strategy Use between CAPT and Both-A

Significance differences were observed between the CAPT and Both-A groups. Compared with the mean scores of PSs from learners who used CAPT only, all the mean scores of each item from learners who used both CAPT and CBPT are much higher. Mean scores of six items (PS2, PS3, PS4, PS6, PS7, and PS8) are above 4.00. The results showed that the highest scores in Both-A include PS4 (4.50) and PS6 (4.50), and the lowest score is PS5 (3.47). Generally speaking, PS4, PS6, and PS8 were highly used by both groups, and both groups show the lowest score in PS5 (3.37 in CAPT; 3.47 in Both-A). In both CAPT and Both-A, scores in PS4 (3.73/ 4.50) were higher than PS1 (3.50/ 3.67), indicating learners' more focus on prosodic than segmental features.

Strategy Use between CBPT and Both-B

Significance differences were also found observed between the CBPT and Both-B groups. Both-B also showed obviously higher mean scores than learners who used CBPT only, with six items (PS1, PS2, PS3, PS4, PS6, and PS8) showing mean scores above 4.00. The results indicate that the highest scores in Both-B include PS2 (4.27) and PS8 (4.27), and the lowest is PS5 (3.70). Thus, PS8 was highly used by CBPT and Both-B, and both groups show the lowest score in PS5 (3.43 in CBPT; 3.70 in Both-B). It was also observed that CBPT and Both-B showed similar scores in PS1 (3.47/ 4.10) and PS4 (3.47/ 4.13), showing learners gave equal weights on segmental and prosodic features.

VI. DISCUSSION

A. Comparison of Learning Activities between CAPT and CBPT

According to the earlier results, students use pronunciation activities in CAPT and CBPT with different numbers and percentage, suggesting that learning context and pronunciation activities may be correlated. Although all these pronunciation learning activities were used in both CAPT and CBPT, their distributions are significantly different. Generally speaking, teachers or students employ more and versatile pronunciation learning activities in the traditional classroom, rather than in CAPT. One possible explanation is that it may be easier for learners to notice these learning activities in the classroom with the help of teachers. Learners may have more opportunities to notice different learning activities in the classroom with the teacher's introduction. In CAPT, however, learners usually use computer software for pronunciation training alone. They need to rely on their own judgment to decide learning activities available to them. In other words, learners have to resort to their capabilities to set their goals, select their preferable or suitable learning activities, and monitor their own learning. With so much working load, therefore, learners may not be able to notice these activities easily without the help of teachers, except some salient ones. Learners may choose the activity more suitable or appropriate for them, and thus ignore other available learning activities. Teachers' guide in the classroom might be the reason why more learning activities were employed in CBPT rather than CAPT.

In the further detailed analysis of learning activities in each context of CAPT and CBPT, it shows different distributions of pronunciation activities exist within each learning context. Learners in CAPT often seek demonstration from tutors on the screen and imitate their pronunciation. This is probably because learners in CAPT can actively manipulate the frequency of the model's demonstration for the convenience of their imitation. One of the advantages of demonstration and imitation is to help learners notice the gap and compare their own pronunciation with the model.

Besides, with automatic speech recognition, learners' pronunciation is recorded and analyzed. Learners could further modify their pronunciation until they are able to produce their own desirable output based on the feedback given. The pronunciation activity students used the least in CAPT is minimal pair drills, and they used more activities focusing on prosodic features such as intonation, stress, and rhythm in CAPT. This unequal preference and distribution may reflect the activity design of the software, and the need of the students who see suprasegmental feature learning as the priority. Learners in CAPT also seldom receive certain strategies instructions in pronunciation learning from the computer. This may suggest that pronunciation learning strategies are not taught explicitly, but taught implicitly in the form of different learning activities, or not taught at all. When students use CAPT alone, it might be difficult for them to build strategic competence well without the facilitation of explicit strategy instruction. The importance of explicit strategy instruction was proposed by Chamot (2004), who evaluated three models of strategy instructions in language learning. Such explicit strategy instructions were rarely employed in CAPT, and this may explain why learners received few explicit PSs from the computer.

In CBPT, students employed activities focusing on prosodic features the most. However, it does not mean that learners ignore segmental features of language. In fact, from the results, the percentage of minimal drills use is almost equal to that of the intonation, stress, and rhythm tasks in the classroom. In other words, students and teachers in the classroom emphasize the importance of both segmental and suprasegmental features of pronunciation. A systematic strategy instruction on pronunciation from teachers also seems unavailable in the classroom.

B. Learners' Strategy Use between CAPT and CBPT

Based on the analysis of learners' learning strategy use in pronunciation between CAPT and CBPT, there is no significant difference. The average scores of learners' PSs are around 3.60. These results suggest that learners' strategy use score in pronunciation is slightly higher than the average score as a whole. Although learners did use strategies to solve difficulties in pronunciation learning, they did not use them to a very high degree in CAPT and CBPT. This phenomenon could be explained from the earlier investigation of learning activities in pronunciation that teachers or software designers seldom provide strategy-based instruction in pronunciation teaching, or pinpoint certain strategies for use. Besides, learners' similar behaviors and strategy use between CAPT and CBPT suggest that the computer pronunciation learning software could simulate the learning context of traditional classroom instruction at least in terms of learners' strategic competence. However, it also suggests that though such a simulation is obvious, both CAPT and CBPT do not emphasize learners' building of strategic competence in their learning contexts.

In both CAPT and CBPT, firstly, learners use memory and imitation to learn pronunciation to a very high degree. This suggests that learners consider teachers' demonstration and imitation the most effective way in pronunciation learning. This also reflects the earlier results that activities of demonstration and imitation are favored in overall pronunciation learning. Secondly, learners pay little attention to the quality of pronunciation, and that is what makes a foreign accent. For example, ESL or EFL learners usually perceive that the difference between two vowels [i] and [ɪ] simply lies in their length, rather than the nuance of their qualities (Bohn, 1995). However, for native speakers, they can perceive this qualitative difference and recognize the accent (Hillenbrand & Clark, 2000). It indicates that learners in CAPT and CBPT are not aware of this issue when learning pronunciation. These two findings altogether suggest that when learners imitate teachers' pronunciation, they do not notice its qualitative features. Possible reasons could be that teachers do not give appropriate feedback when demonstrating, or they are even not able to recognize the qualitative differences themselves. Wang and Munro (2004) mentioned about the latter possibility, suggesting such a pedagogical misdirection could reinforce learners' impression on the false pronunciation and thus leads to fossilization.

In the micro-view of each PS use, some preferences were also discovered in each learning context. As mentioned earlier, learners' more focus on paralinguistic and prosodic features of language than on a single sound or syllable in CAPT reflects the general design of the software. It may imply traditional minimal pair drills could no longer satisfy those who wish to learn suprasegmental features of language. CAPT provides practice of intonation, stress, and rhythm of sentences and words, and it also requires learners to focus on speed, volume, and clarity when recording their own speech. In CBPT, learners also have lots of emphasis on paralinguistic. Learners in both learning contexts highly evaluate the importance of the speed, volume, and clarity of the speech in order to make themselves understood and comprehensible. Compared with other strategies making a speaker sound more like native (e.g. sounds below the syllable-level and the quality of sounds), learners' attention to paralinguistic seems to imply that comprehensible pronunciation as the goal is more prevalent nowadays than native like pronunciation nowadays.

C. Learners' Strategy Use in Both CAPT and CBPT

Significant differences were observed in strategy use between learners studying in either CAPT or CBPT, and learners in both contexts (Both-A, Both-B). This comparison aims to investigate the effectiveness of pronunciation learning in both contexts simultaneously.

The results indicated that learners studying pronunciation in both CAPT and CBPT showed higher frequency in their strategy use than learners studying in either one. Though there is a general increase in strategy use for learners who had learned pronunciation in both contexts, exceptions were also observed. In context of CAPT, receiving both trainings did not increase the use of strategies focusing on the articulation of a single sound (PS1) and on sound qualities (PS5) very much. This may reflect the less use of minimal pair drills in CAPT, and learning activities in pronunciation training thus

possibly serve as one factor determining the frequency of certain PS use by learners. In other words, although learners receiving both trainings showed obvious increase in PS use, such an influence is constrained by the nature of the learning context, such as learning activities. On the other hand, in CBPT context, although minimal pair drills were used often and they helped learners focus on articulation of a single sound, they did not promote learners' use of strategy focusing on sound quality (PS5). It seems that, teachers in minimal pair drills seldom pinpoint the importance of sound quality in pronunciation teaching, and learners also often overlook this fundamental difference in pronunciation learning. Teacher thus needs to provide appropriate guidance along with these drills.

These results bring one important question. Why did the frequency of PS use increase from learners who had learned in both contexts? One possible explanation is that when learning in both contexts, students are more aware of specific needs for each learning context, and have opportunities to compare their learning strategies. This comparison may promote learners' ability to notice the effectiveness of PSs, and employ the strategies they had used in the earlier context to the context where they are. In other words, with the prior experience of pronunciation learning, learners can take advantage of the schema in strategy use, especially those effective ones. Besides, involvement of more learning contexts implies more opportunities for learners to practice. In Anderson's (1983) ACT Model, practice is believed one important factor helping language learners achieve proceduralization. O'Malley and Chamot (1990) further adapted Anderson's theory to explain language strategy from a process-based perspective. They see strategies as "special ways of processing information that enhance comprehension, learning or retention of the information" (p. 1), and strategy use also requires proceduralization. This proceduralization may be facilitated by learning pronunciation in both contexts.

VII. CONCLUSION

A. *Summaries of the Findings in the Current Study*

This current study investigated the effectiveness and nature of pronunciation learning in CAPT and CBPT. Firstly, the main findings suggest pronunciation learning activities are distributed differently in CAPT and CBPT. More learning activities are used in CBPT than in CAPT, and this may be related to teachers' help in the classroom. Students in CAPT used more activities related to suprasegments than segments (minimal pair drills). In CBPT, learners used activities related to both segments and suprasegments often. In both CAPT and CBPT, learners often relied on teachers' demonstration and their imitation, but seldom received explicit strategy teaching. These activities employed may affect learners' strategy choice.

Learners in either CAPT or CBPT showed similar performance in strategy use. In both learning contexts, learners relied on memory and imitation very much, but rarely noticed different qualities of sounds. When learning in both contexts simultaneously, learners' use of PSs increased obviously. It is possible that this increase results from more opportunities for learners in both contexts to notice and practice.

B. *Pedagogical and Theoretical Implications*

Based on the findings derived from the current study, some pedagogical and theoretical implications are proposed for pronunciation teaching and learning.

Firstly, according to the findings, CAPT can simulate traditional pronunciation classroom teaching in terms of strategic awareness and knowledge. This may help those who cannot learn from pronunciation classes plan, monitor, and evaluate their own pronunciation learning as well as construct autonomy outside the classroom. Besides, learning activities revealed in each context reflect the focus and belief of teaching materials and syllabi. Teachers and researchers could be more aware of them, and make appropriate decisions in pronunciation teaching.

Secondly, teachers or program designers need to raise learners' strategic awareness in pronunciation more effectively. One way to do so is through the use of both CAPT and CBPT altogether. That learners' focus more on segments in CBPT and suprasegments in CAPT may be related to activities in each learning context suggests the need to keep balance of both trainings. Learning in both contexts simultaneously may effectively raise learners' awareness of learning strategy use, help transfer their problem solving abilities from one context to the other, and provide more opportunities to practice for the final autonomous stage, as claimed by Anderson (1983). Another way is to develop learners' strategic competence embedded in the teaching curriculum or materials through different models of strategy instruction. In this way, teachers really teach learners how to pronounce in a desirable way, rather than simply test or check their pronunciation based on demonstration and imitation.

Moreover, teachers and learners should emphasize more on qualitative features of language, which might have been ignored in both CAPT and CBPT. Our earlier analysis shows that the role of teacher is important in helping learners to notice such nuance. Even though in CAPT where no particular human teachers are available to learners, the system needs to be well organized to facilitate learners' recognition of some blind spots in pronunciation learning.

Learners of different levels may apply different strategies in language learning, reflecting their general stage of second language development (Ellis, 1994). In this current study where participants are high achievers in English, learners' pronunciation learning strategies revealed may reflect their current stage of second language acquisition. This finding can help researchers to have a clearer picture of parallel between language learning strategy and second language development. It also helps teachers explore strategies that are appropriate for their students according to their proficiency.

C. Limitations and Suggestions for Future Research

Some limitations can still be noted on the design of the current study. First of all, these participants are mainly English high achievers, and thus may have some effects on the final results. Second, we have limited sample size for the reason of availability, which could be improved in the future research. Also, the effectiveness of different pronunciation training programs can be analyzed to generate a more representative model for CAPT. Finally, researchers can investigate learners' strategic knowledge more deeply through face-to-face interviews. In this way, researchers can have a better understanding of the actual process of how and when learners utilize these knowledge and strategies.

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