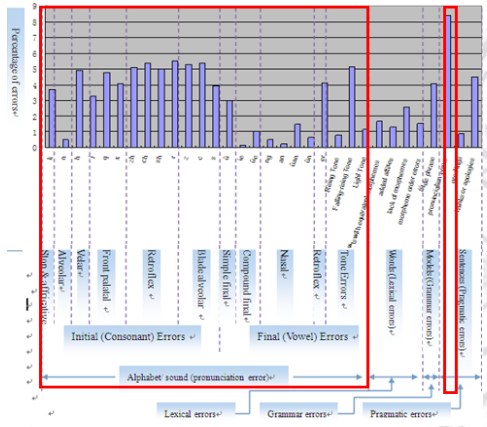
CHAPTER 3

RESEARCH METHODOLOGY

This chapter presents the theoretical overview and perspective for the research, as well as outlining the research process, along with the tools and techniques integrated to process, analyze and understand the corrected data. This chapter is split into three main parts. Part one is the thesis conceptual framework; part two is thesis sample selection; part three explains the experimental design to develop Chinese pronunciation incubator.

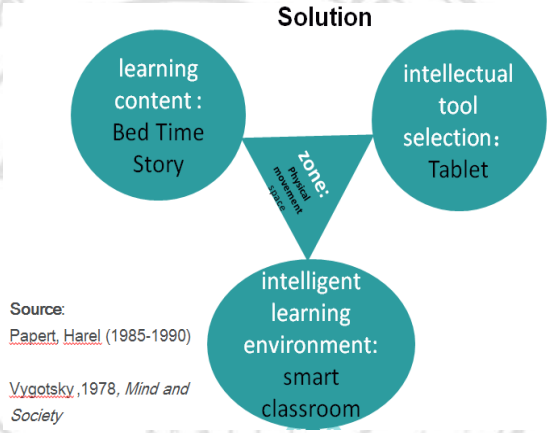
3.1 Conceptual framework

Problem



Domain K	D1	D2	D3	D4
Pronunciation ability	Alphabet (pronunciation)	Lexicon (simple words)	Grammar (models)	Pragmatic (sentences)

Solution



Output

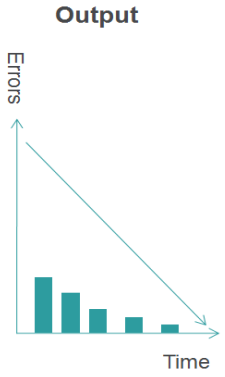


Figure 3.1 Thesis conceptual framework

This conceptual framework in figure 3.1 emphasizes three domains, including problem, solution, and output.

Problem captures the main Chinese language problems of 26 P2 students at Rattana Auewittaya School of Fang district. These problems are identified by pretest result of 26 students. The evaluation result based on error analysis shows that students have poor pronunciation skills, including alphabet, simple words, models and sentences. Students have already learned these Chinese alphabets, simple words, models and simple sentences of the pretest during Prathom 1 level and the first semester of Prathom 2. However, they are not yet able to pronounce partial alphabets or tones correctly or use simple expressions appropriately.

The solution to above-mentioned problems is utilizing constructionism, zone of proximal development and cone of experience to design Chinese pronunciation incubator for remediating students' errors or weakness. Constructionism and zone of proximal development enhance students' pronunciation skill via "play and learn" in the incubator. Cone of experience captures the effective teaching process and language activities for students to keep more knowledge retention. These 26 students will be taught in this incubator for 7 weeks during their second semester.

The expected output is to improve P2 students' Chinese pronunciation ability as well as their spoken Chinese, and the errors are expected to decrease with increasing time.

3.2 Sample selection

Samples in this paper are 26 Prathom 2 students at Rattana Auewittaya School of Fang district. They were studying Prathom 2 (Class 3 Grade 2) in the second semester in 2014 and enrolled in Chinese language subject จ12201. These participants' age was from 7 to 8 years old and they began to learn Chinese since kindergarten level. Ahead of this research, these students have already learned Chinese for about two years for two teaching hours per week. In addition, they were the experimental class of smart classroom pilot project, so each student used their tablet to learn Chinese in one of the three smart classrooms at Rattana Auewittaya School.

Table 3.1 Thesis experimental stages

Objectives	Stages	Activities	Theories / Tools	Output
O1: to analyze the problems in Chinese language study of P2 students	1. analyzing Chinese speaking level of target group	(1) designing assessment outline	-Basic education curriculum -Language acquisition -P2 students' textbook	Pretest paper
		(2) testing and evaluating	-Error analysis -sound recorder	Students' errors and weakness
	2. designing conceptual framework	(1) finding solutions for problems	-Constructionism -Zone of proximal development	Problem Solution output
O2: to promote Chinese pronunciation abilities	3. designing learning content for enhancing students' Chinese speaking skill	(1) interviewing experts	-Structure interview questions	Knowledge domains
		(2) analyzing data from experts	-Keyword annotation	To match solutions with key problems
		(3) designing teaching content	-Language acquisition -Storyboard	New arranged learning content
	4. designing learning model	(1) choosing learning tools	-Constructionism -Tablet	Chinese pronunciation incubator
		(2) designing learning environment	-Constructionism -Zone of proximal development -Smart classroom	
	5. Implementation	(1) Teaching (2) Group-collaborating (3) Share (4) Feedback	-Cone of experience	Improved Chinese pronunciation skill

Table 3.1 Thesis experimental stages (Continued)

Objectives	Stages	Activities	Theories / Tools	Output
O3: to evaluate P2 students' Chinese pronunciation abilities	6. evaluating Chinese pronunciation incubator	(1) posttest (2) retention test	-Errors analysis - Sound recorder	Knowledge retention

3.3 Experimental design

In this thesis, experimental design is composed of six main steps as shown in table 3.1. The first step is to analyze Chinese speaking level of target group, the second step is to design conceptual framework, the third step is to design learning content for enhancing students Chinese speaking skill, the fourth step is to design learning model, the fifth step is implementation of the learning model, the sixth step is evaluation of Chinese pronunciation incubator.

Combined with Knowledge Management (KM) research process, above-mentioned experimental stages are six main steps of this thesis KM process. Due to the evaluation outcome that P2 students at Rattana Auewittaya School have poor pronunciation ability, five theories including error analysis, language acquisition, constructionism, zone of proximal development, and cone of experience are applied in this paper. These five main theories are integrated to develop a KM process that aims to capture better knowledge in pronunciation ability, to construct learning content, to form application and pronunciation incubator, and to deliver better Chinese pronunciation knowledge to students by designing language activities. It will be explained as follows about how these theories are integrated to KM process as the research solution. And the whole KM process is divided into six steps, as shown in Figure 3.2.

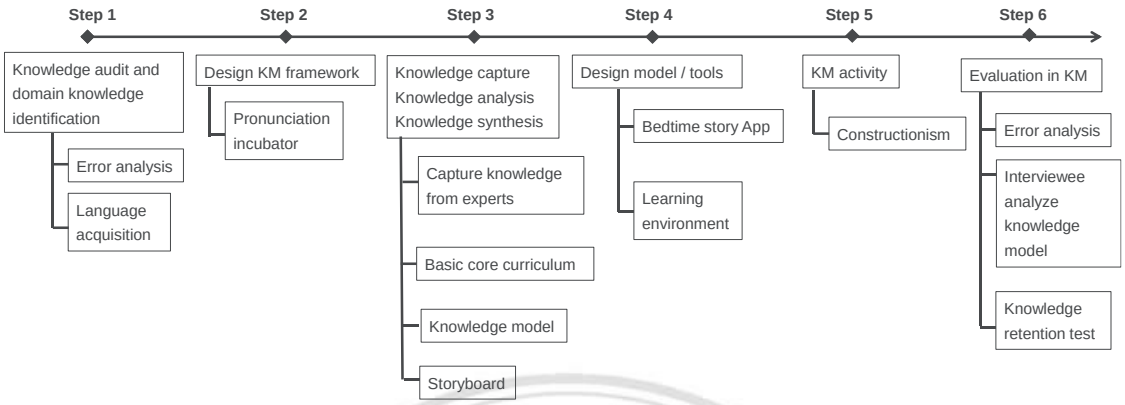


Figure 3.2 Pronunciation incubator design

Step 1: Analyze Chinese specking level of target group

(Knowledge audit and domain knowledge identification)

This step aims to evaluate the knowledge base level of knowledge workers, P2 students at Rattana Auewittaya School, and to identify the domain knowledge or the knowledge gap using error analysis and language acquisition. Assessment outline is designed based on Thai Basic Education Core Curriculum (2013) and language acquisition to test P2 students' Chinese speaking skill, and the raw data collected from testing is evaluated through error analysis. The evaluation result proves that P2 students at Rattana Auewittaya School have poor pronunciation ability so that they cannot achieve a required level (to specify and pronounce 47 Chinese alphabets, 50 -100 vocabularies, speak with simple words and sentences by following models) in Chinese speaking skill based on the Basic Education Core Curriculum.

Three steps are needed to identify the problems of students' spoken Chinese. Firstly, assessment outline is designed according to the minimum requirement of speaking skill in Basic Education Core Curriculum (2013); secondly, data collection procedure is applied to test P2 students, and their sound is recorded with a sound recorder; finally, the recorded sound is evaluated by three Chinese native speakers based on error analysis (Liu, 2012).

Design assessment outline

Three Chinese native speakers and one Thai teacher apply the assessment outline (Appendix B) to test the 26 P2 students' Spoken Chinese proficiency at Rattana

Auewittaya School, Fang, Thailand. This assessment outline is designed based on the Basic Education Core Curriculum (2013), which consists of 20 alphabets and tones, 14 words, 5 models, 6 sentences. And all the contents in assessment outline are chosen from the textbook of P1 students, as P2 students are in the fourth week of the second semester and they have passed the P1 level. After designation, this assessment outline is applied to test P2 students' Chinese speaking skill in data collection procedure.

Data collection: testing procedure

All alphabets and tones, words, models and sentences were tested one by one, and students' voice was recorded with a sound recorder. About the 20 alphabets and tones, each student read every item for three times; To test 14 words, each student read each item for 3 times, if they needed help, one Chinese language teacher spoke Thai meaning of the words to guide them; For testing the 5 models, each student read each item for 3 times, if they needed help, one Chinese language teacher spoke Thai to guide them; For the last part to test 6 sentences, one Chinese native speaker started the conversation with students, for example, the native speaker said sentence A, the student answered or responded sentence B for 3 times. (Students were not allowed to see the contents of conversations, they just answered or responded after listening to the native speaker). In order to assess the level of P2 students' Chinese speaking, the raw data collected from the test was evaluated based on error analysis (Liu, 2012).

Evaluation using error analysis

In order to avoid personal bias during evaluation period, three Chinese native speakers utilized the same evaluation form (Appendix C) based on error analysis (Liu, 2012) to assess the sound recording from each student. Each person listened to 26 students' sound and marked the correct and wrong sounds on the evaluation form. And the number of each error was the average number of three persons' mark result (N1, N2 and N3). The total error number (T) was sum of the average numbers of all-type errors. Finally, percentage of each error type (P) was acquired by this Figure 3.3.

$$P = \frac{(N1+N2+N3)/3}{T} \times 100\%$$

Figure 3.3 Percentage of each error type

As shown in Figure 3.4, this research problem is related to language hierarchy, as phonemes (alphabet) are the most basic knowledge in language hierarchy, and students cannot achieve an appropriate level in words, phrases and sentences without a solid foundation of phonemes (alphabet). This language acquisition sequence proves that improving P2 students' Chinese alphabet pronunciation ability is the critical path as it is the basement to improve a higher level of Chinese speaking skill.

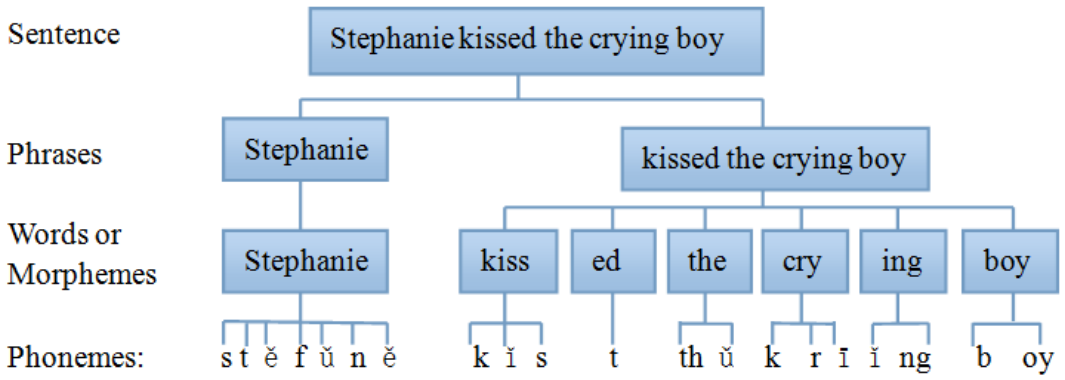


Figure 3.4 Language hierarchy from Nairne (2009)

In Figure 3.5, research problem is located in pronunciation ability, which includes alphabet, simple words, models and sentences. In order to improve students' pronunciation skill, a KM framework is designed to create a Chinese pronunciation incubator in step 2.

Domain K	D1	D2	D3	D4
Pronunciation ability	Alphabet (pronunciation)	Lexicon (simple words)	Grammar (models)	Pragmatic (sentences)

Figure 3.5 Domain knowledge identification

Step 2: Design conceptual framework (Design KM framework)

This step aims at designing a KM framework for creating a Chinese pronunciation incubator utilizing 2 main theories namely constructionism and zone of proximal development. According to Figure 3.7, constructionism aims to organize the learning content (Bedtime Story Application), the intelligent learning environment (smart classroom) and to utilize tablets as education tools; while Zone of proximal development provides the physical movement for students to show and share, to discuss their ideas with their classmates as well as teachers deliver language activities in smart classroom environment. KM language activities are converted from domain knowledge in Figure 3.6 to make full use of all above 3 elements (learning content, education tools, and intelligent learning environment), to attract students to participate in these activities in form of 'play and learn'.

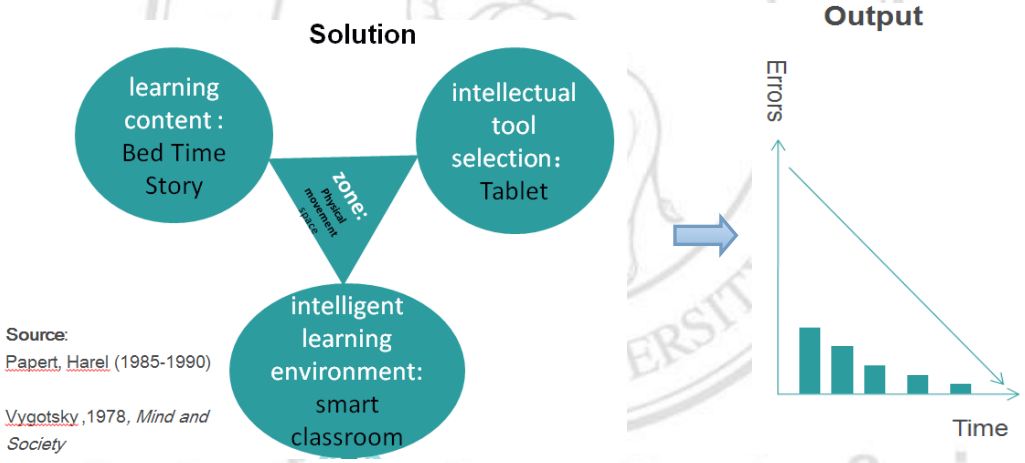


Figure 3.6 KM framework

The expected output is to improve P2 students' Chinese pronunciation ability as well as their spoken Chinese, and the errors are expected to decrease with increasing time.

In accordance with KM framework for creating Chinese pronunciation incubator, specific domain knowledge needs to be captured and analyzed in order to design the learning content, Bed Time Story.

Step 3: Design learning content for enhancing students' Chinese speaking skill (Knowledge capture, analysis and synthesis)

This step is designed with a purpose to capture and analyze the specific domain knowledge from Chinese language teaching expert, and to synthesize the knowledge to storyboards that is applied to make Bed Time Story Application.

Knowledge capture: To improve students' Chinese pronunciation ability, what teaching content should be used, and what teaching techniques would be utilized to design language activities, these specific knowledge domains (alphabet list, vocabulary list, sentence model list, conversation and techniques for activity design) are captured from a Chinese teaching expert by structured interview.

Knowledge analysis: The captured knowledge domains are categorized and analyzed through Keyword Annotation in the form of knowledge model. All the captured knowledge (recorded audio) from interview is converted to transcript. Keyword Annotation helps to select the keywords or semantics which match with the problem area from the transcript, while knowledge model contributes to analyze these keywords into a model including task, inference and domain.

Knowledge synthesis: In Figure 3.7**,** all four specific domain knowledge types (alphabet, vocabulary, sentence and conversation) are synthesized into storyboards. Alphabets include all 45 Chinese alphabets, but the high-error-rate alphabets in the pretest are highlighted; words are daily used vocabulary that are recommended by the Chinese teaching expert; models are frequently applied sentence patterns that are designed by expert; and all these words and sentence patterns are used to form daily conversations. Finally, Bed Time Story Application are made according to storyboards. This application are completed through efforts of several working teams, namely sound recording team, subtitle team, animation team, integration team, as well as revision team. The finished application are installed to tablets, which are used as learning tools.

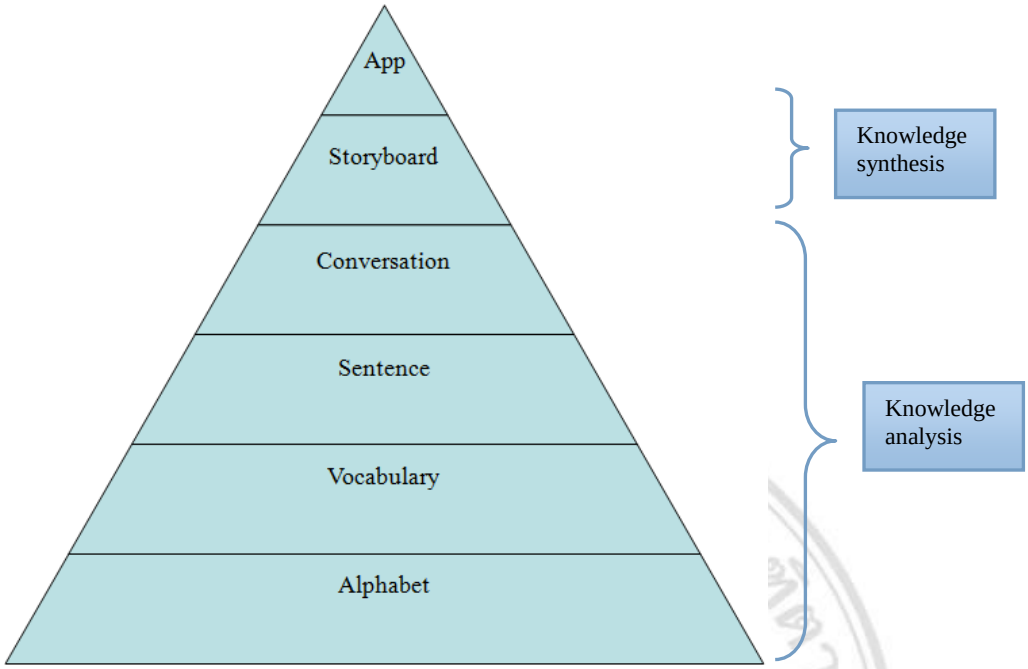


Figure 3.7 Knowledge synthesis

Though Bed Time Story Application is available to use as the learning content, it really functions only when it is combined with the intelligent learning environment, which will be explained in details in next step.

Step 4: Design learning model

This step was to design the learning model, Chinese pronunciation learning incubator, which consists of both intelligent learning environment and learning content in Application. This incubator was created for students to share, to discuss, to show their ideas with their classmates and teachers, to get assistance from their teachers and peers. Figure 3.8 shows the physical structure of this Chinese pronunciation learning incubator.

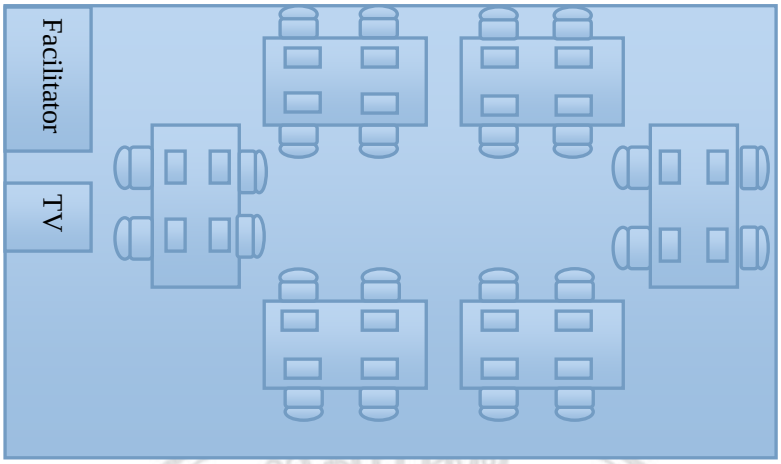


Figure 3.8 Chinese pronunciation learning incubator

In this incubator, Bed Time Story is the learning content that helps to improve students' pronunciation. In addition, tablets installed with Bed Time Story are used as learning tools, in which domain knowledge are converted into Chinese language activities. Students can use it to develop their own understanding and cognition towards Chinese language learning, especially Chinese pronunciation, not only in class but also any time after class. The newly arranged classroom creates a construction zone that supports students' physical movement to reinforce 'powerful ideas in the air' via Chinese language activities, to discuss, share and test their hypothesis among classmates. Chinese teachers are facilitators to design learning project that attracts students to participate in. As the theme of this pronunciation incubator is 'play and learn', teachers are expected to decrease lecturing time in order to increase students' time for self-learning, discussion and participation. Students' knowledge is constructed by themselves not transferred directly from teachers. Meanwhile, teachers can control each tablet through TV, and timely feedback is expected given by teachers to correct students' errors.

In this constructionist learning environment, students work primarily in groups and learning and knowledge are interactive and dynamic. There is a great emphasis on social communication, as well as collaboration and exchange of ideas. This is contrary to the traditional classroom in which students work primarily alone, learning is achieved through repetition.

Chinese pronunciation learning incubator is created as well as the construction zone, both of which support KM activities to help knowledge flow.

Step 5: Implementation (KM activities)

In this step, based on constructionist learning theory, task-based collaborative learning is designed as KM activities to guide students to 'play and learn'.

TASK: Students' learning task is to study all 47 Chinese alphabets with a focus on high error rate alphabets, which also combines with Chinese words, sentence models, and sentences for practicing in real world. According to Bed Time Story Application, about 3 Chinese alphabets, 5 Chinese words, 2 Chinese sentences are taught and practiced in each one-hour class. All the teaching contents are finished in 20 teaching hours, namely 7 weeks with 3 teaching hours per week.

DESIGN ACTIVITY: As it is shown in Figure 3.9, students are divided into groups, and leaning content as well as learning task will be assigned. Firstly, Chinese teacher teaches students via Bed Time Story for 15 minutes, and then group work is assigned to students. Secondly, students work in groups to discuss and complete the specific task through exchanging ideas or searching online. Thirdly, each group share their group work and learning outcome with other group members. Fourthly, the Chinese teacher gives students timely feedback, and corrects students' errors without delay if some errors exist.

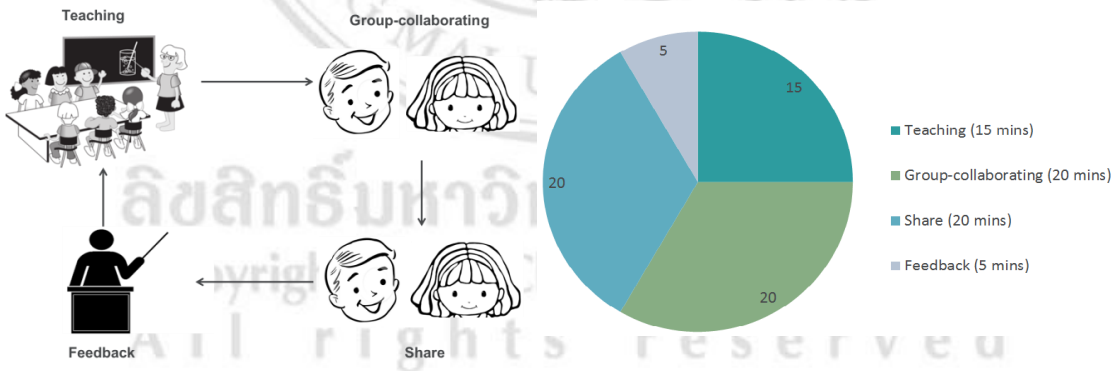


Figure 3.9 Task-based collaborative learning

About the time distribution of each learning stage, it was designed in accordance with Cone of experience concept from Edgar Dale (1946), which is explained in Figure 3.10. Educationist Edgar Dale illustrated this with research when he developed the "Cone of experience" - which stated that after two weeks we could remember only 10%

of what we read, but we could remember 90% of what we did. Dale's Cone emphasizes learning experiences that appeal to the different senses and the different ways in which we learn. According to Dale's research, the least effective method at the top, involves learning from information presented through verbal symbols, i.e., listening to spoken words. The most effective methods at the bottom, involves direct, purposeful learning experiences, such as hands-on or field experience. Direct and purposeful experience represents reality or the closet things to real, everyday life.

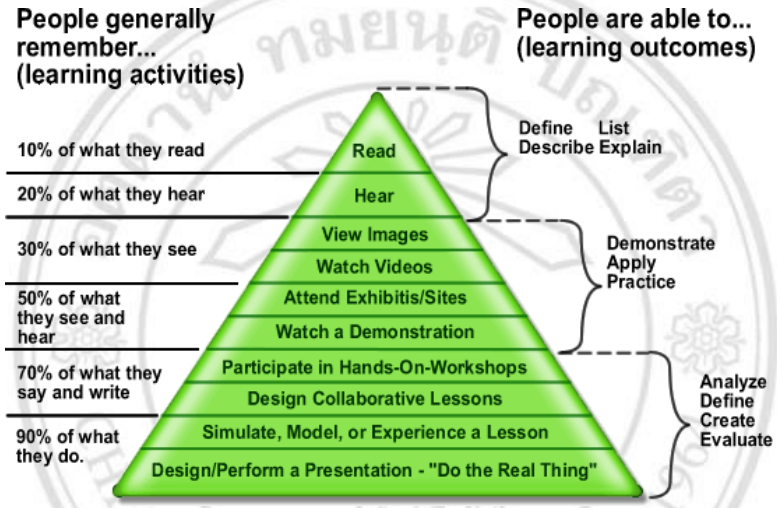


Figure 3.10 Cone of Learning adapted from Edgar Dale (1946)

In this research, as shown in Figure 3.11, the task-based collaborative learning process distributes more time for the more effective teaching methods. 15-minute teaching is designed for Chinese teachers to guide students to watch and listen to Bed Time Story that is presented in form of vivid animation, and then students pose their questions or confusions. In this way, students are excepted to remember 50% of learning content. 20-minute group collaborating is the collaborative lessons designed for students to complete their group work and to solve their questions and confusions through teamwork, in which it is expected that students can remember 70% of what they have learned. 20-minute sharing is a presentation period for students to show and share their group work, learning outcomes and experiences among groups, in which students are expected to keep 90% retention of what they have learned. Because of the high effectiveness of 'collaborative lessons' and 'perform a presentation', these two activities

occupy 67% of class time. Finally, 5-minute feedback comes from Chinese teachers in order to timely correct students' errors, or to strengthen students' weak points. In addition, the feedback will be the highlight learning content in next lesson or next learning loop.

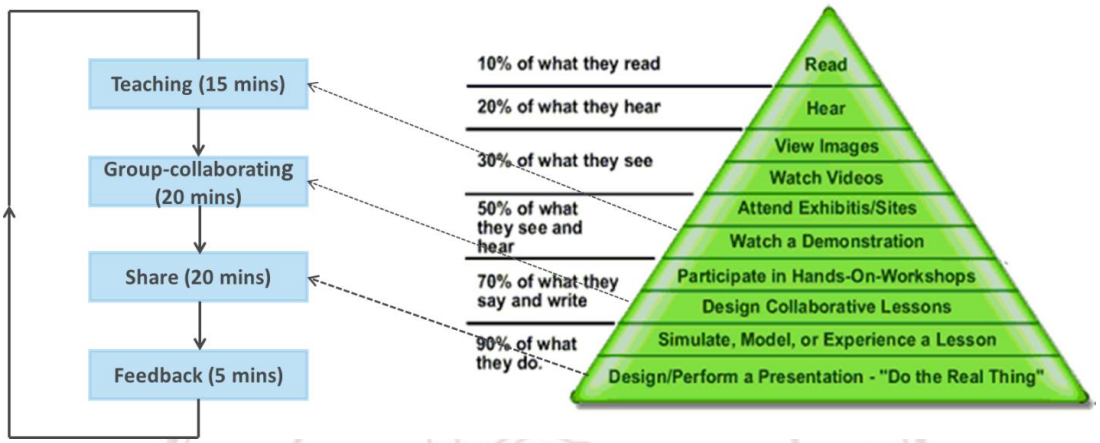


Figure 3.11 Task-based collaborative learning loop

In accordance with constructionism, this incubator is also a social community that provides students a physically moving zone to discuss, share, show and verify their questions and answers. Through interacting in such a social community， 'powerful ideas in the air' are reinforced and accumulated. As a result, the knowledge that students gain in this incubator is much more than that through individual learning.

After implementing this Chinese pronunciation incubator, evaluation is necessary to test its effectiveness, which will be explained as follows.

Step 6: Evaluate Chinese pronunciation incubator (Evaluation)

This step aimed to evaluate the effectiveness of Chinese pronunciation incubator. Evaluation in this research consists of two parts, namely posttest and retention test. A posttest was designed to test the students' spoken Chinese, especially their pronunciation ability; and the raw data from testing were evaluated through error analysis; and then this posttest outcome were compared with the pretest result. The knowledge retention test was the same one with the posttest, but tested two months later after students finished the 7-week course, which was to evaluate how much knowledge students could keep in retention.

The posttest paper (Appendix F) was designed based on the same standards of pretest, with the same level of difficulties, the same number of alphabets, words, models and sentences, but different contents.

The data of posttest and retention test is obtained by the same calculation method with that of pretest. The test data is evaluated through error analysis. To avoid personal bias during evaluation period, three Chinese native speakers utilized the same evaluation form based on error analysis (Liu, 2012) to assess the sound recording of each student. Each person listened to 26 students' sound and marked the correct and wrong sounds. And the number of each error type is the average number of three persons' mark result (N1, N2 and N3). Finally, the number of each error type (N) is acquired by this Figure 3.12. For example, N(k)={N(k1)+N(k2)+N(k3)}/3, N(h)={N(h1)+N(h2)+N(h3)}/3, etc.. The total error number (T) is sum of the average number of all error types. According to all N of all error types, T is acquired by Figure 3.13

$$N=(N1+N2+N3) / 3$$

Figure 3.12 Number of each error type

$$T=N(k)+N(n)+N(h)+\ldots+N(\text{thanks and apologies})$$

Figure 3.13 Number of total errors

$$\text{Forgetting rate} = \frac{T/26}{45}$$

Figure 3.14 Forgetting rate

For retention test, the average forgetting rate of 26 P2 students is acquired by Figure 3.14, '26' means 26 P2 students of the target group, '45' refers to the 45 items of the test paper. The evaluation result of posttest and retentions test is discussed in chapter 4.