

CHAPTER 5

THE SECOND CYCLE

Before the second cycle, I revised the program based on suggestion given in 4.8. Another cohort of student participants was invited. Three pairs of 8th graders spent one hour each working on the program during the summer vacation of the year 2006. Students in the second cycle had similar grades in the English class as those in the first cycle. Below is what was found on the participants' interaction with the program in the second cycle.

5.1 Scene 1: Comprehension of the Detective Story

As explained before, Scene 1 was embedded with several comprehension checks. The participants were expected to obtain information by clicking the items.

In the first cycle, the participants had complained about the quality of the sound clip. They felt that the volume was not loud enough and that the voice was not clear enough. However, they still managed to catch the general contents through repeatedly listening to the clips. The cause of trouble was that the participants were not familiar with the authentic L2 narration instead of problems with the sound quality. Thus I decided not to adjust the sound clip for the second cycle.

Participants of the second cycle still were not used to the authenticity of the sound clip. For example, Pair No. 4 listened to the sound clip three times. Lee of this pair was able to comprehend the main idea and tried to translate it for her partner, but Lee did say that she was not quite sure about specific details. Lee thought that the narrator had a low pitched voice which made it difficult to understand (Fieldnote

4-3-5). Pair No. 6 listened to the clip several times and complained to the researcher that the clip was not clear enough (Fieldnote 6-4-8). Interestingly, though the participants were not used to the sound clip, they still could gradually obtain the main idea by trying many times. This result was the same as that in the first cycle. Thus it could be inferred that the participants had the ability to capture the meaning of the authentic sound clip through many listening attempts. This echoed with Vygotsky's (1978) notion of zone of proximal development, in which the moving of the actual development level to the potential level plays an important role in learning. Therefore, it was decided that the sound clip would not be adjusted for the third cycle.

Also, in the first cycle, the participants were confused as to what to do after listening to the sound clip in Scene 1 in which a man knocked on the door and asked for help (Figure 3.8, p.38). Thus Suggestion No.1 was to add the instruction of "go to the next page" at the bottom of the screen in order to avoid confusion (Figure 5.1). In the second cycle, pairs did not have the behaviors of lingering on the screen. Instead, they all managed to click to the next page without hesitation. Thus, the "go to the next page" instruction worked well for the participants in the second cycle.

5.2 Task 1, 3, 4: Speaking Tasks

As described before, in Task 1, the participants are asked to engage in a role play. In Task 4, they have to report to Holmes what they have found and what they suspect based on clues in Task 3. In the first cycle, the participants' reactions to the speaking task included skipping the speaking tasks, struggling to speak, and first writing down each line on a piece of paper. The suggested solution was to prepare the participants psychologically at the beginning of the program; also, suggestion No.2



Figure 5.1. Scene 1

was to discourage the participants from writing down every line in order to achieve the learning object of fluency. In this section, the participants' reactions and their performance are discussed.

5.2.1 *The Participants' Reactions*

The participants' reactions can be discussed in two aspects: (1) Less temptation to skip the speaking task, and (2) Less temptation to write down lines.

(1) *Less temptation to skip the speaking task.* Based on the suggestion from the first cycle, I informed the participants about the following points before they worked on the program: (1) The pedagogical reasons of designing this program, (2) The story line of this program, and (3) How many recording tasks there were in order to lower participants' anxiety. In addition, I also encouraged the participants by saying that they were high achievers. These preparations seemed to work for the participants in

the second cycle. When doing the speaking task, only Pair No. 5 skipped the recording task. When entering the task, Du of Pair No.5 read the instructions and then asked his partner Gou to go to next page. Then Du again made Gou to click back to the menu page and jumped to the matching task (F5-4-3). As for other pairs, they were not observed to have the skipping behaviors at all. However, it could not be concluded quickly that it was because of the researcher's encouragement.

(2) *Less temptation to write down lines.* In the second cycle, the participants were encouraged at the beginning of the program and also on the screen when encountering the speaking task that it would be better if they didn't write each line down. Still, the participants had their choice to follow the advice or not. Paper and pens were provided as in the first cycle. The participants in the second cycle were observed to restrain themselves from writing down lines before recording. For example, Pair No. 4 in the first speaking task spent time discussing their lines orally for a long time (F4-4-7). After the discussion, Lee of this pair started to write lines on paper. Her partner, Shen, reminded Lee, "Teacher said that it would be better not to write lines down." Lee said, "I am not going to write down every line but just a few (F4-4-8)." Then she wrote a paragraph of 16 words for their last line of the recording task. A similar situation of "discuss first, write down last" took place in the other recording tasks (F4-8-5). As for Pair No. 5, they wrote down each line only for the first recording task (F5-4-6). In the second recording task, Gou of Pair No.5 only wrote short key words on the paper. Then he fluently spoke complete sentences in the formal recording (F5-8-18). For Pair No. 6, they quickly figured out what to say without writing down the lines on the paper in the first recording task (F6-4-9). In the second recording task, Anne, of this pair, first asked her partner if she could write some lines down. After writing down the first line, she decided to skip writing but

used the “pause” function on the machine to record line by line with self rehearsals in between (F6-8-11).

From previous descriptions, it could be observed that the participants tried their best to avoid using the strategy of writing down lines immediately. Instead, they used other strategies such as delaying the behavior of writing down lines until the very end of the discussion (Pair No. 4), only writing down key words (Pair No. 5), and using the “pause” function on the voice recorder to record line by line with rehearsals in between (Pair No. 6). Each strategy used in the second cycle has been evaluated as better than the strategy of writing down lines immediately. First, using the strategy of delayed writing, though participants still read to the machine in the very end, at least learners gave themselves more chances to do fluency practice during their discussion. That is to say, moment-to-moment adjustment during their rehearsals functioned well in the process of fluency practice. Second, the strategy of taking down key words could not only lower participants’ cognitive loading and anxiety to a certain degree but also leave enough space for fluency practice. Third, the strategy of using “pause” button with rehearsals in between was another possible way to lower cognitive loading and anxiety. Though it might limit the fluency practice within one single sentence, still learners might gain some sense of security from the rehearsals in between. Among the three strategies, writing down the key words seemed to leave the most space for fluency practice, because it allows learners to fill in contents as they go. However, this practice also contains the greatest uncertainty for learners. This uncertainty might especially be unfamiliar to learners in the Taiwanese classroom context which emphasizes accuracy through using daily paper and pencil tests (Wu, 2005). Thus, to ponder on the kind of adjustment necessary for the third cycle, though I could limit the participants within the strategy of key-word writing in

order to enhance the fluency practice, it is also necessary to take the participants' individual differences into account. Therefore, for the third cycle, I would keep the reminding tone of "try your best not to write down lines" in the instruction in order to give the participants free choice of strategy-use. Based on the participants' positive reactions, in the second cycle, I believed that once learners feel comfortable, they would try not to depend on texts for the fluency practice.

5.2.2 The Participants' Performance.

This section discusses the quality of the participants' performance. In the first cycle, it was found that participants tended to make limited dialogues in the open-ended dialogue making task. Thus Suggestion No. 3 included that (1) contents clues should be provided for Task 1 in order to stimulate richer recording quality, and (2) sentence pattern clues could be removed from Task 1 in order to avoid limiting participant's use to only a few sentence structures. As for Task 4, the sentence pattern clues could be kept in order to help the participants improve their performance more.

In the second cycle, the contents that the participants created for the dialogue-making Task 1 were richer than that in the first cycle. Excerpt 5.1 shows the dialogue that the participants created.

Excerpt 5.1

●(Pair No.4)

Shen: Who is dead?

Lee: A man is dead.

Shen: When?

Lee: A raining afternoon.

Shen: Where?

Lee: In Holmes' home.

Shen: What happened?

Lee: It was a raining afternoon. Holmes and Watson was drank their tea.

Suddenly, a man knocked on the door. He said two sentences and dead.

●(Pair No.5)

Q1: Who's dead?

A1: A man.

Q2: When?

A2: Ten minute ago?

Q3: Where?

A3: Here?

Q4: What happened?

A4: A man want's our help? [based on notes, *sic*]

●(Pair No.6)

Jin: Hello, this is police office. What happened?

Anne: Hello, there was a man die.

Jin: where?

Anne: In my house.

Jin: when?

Anne: This afternoon. About 5 minutes ago.

Jin: Who is dead?

Anne: I don't know his name, but I know he is a man.

Task 1 asked pairs to design a role-play, reporting to the police what had happened in Holmes' house. Different from the first cycle, in the second cycle this task provided four "WH" questions in order to stimulate richer contents. Those are: "Who is dead?", "When?", "Where", and "What happened?" Also, the original clue "there is" was taken off in order to enhance sentence variety. From the excerpt, it is possible to analyze: accuracy, complexity, and fluency. In terms of accuracy, only minor grammatical errors could be found. Lines like "Holmes and Watson was drank their tea", "ten minute", "want's" and "there was a man die" were all wrong usages. Compared with the first cycle, it was interesting to find that the sentence "there was a man die" appeared in both two cycles. This wrong usage seemed to be prevalent, whether the clue "there is" was provided (in the first cycle) or not (in the second cycle).

Second, on complexity, the turns participants made were more than those in the first cycle. All pairs in the second cycle made 4 turns in their dialogues, but

participants in the first cycle only made 1.5 turns in average. Also, the content of the dialogues were richer than that in the first cycle. For the police role, all 3 pairs used the 4 WH questions as their lines, while in the first cycle, the police only gave an opening remark (e.g., This is the police station) and an ending remark (e.g., I am coming). However, it should be noted that all three pairs used the 4WH clues as one-word questions, (e.g., when? Where?). I interpreted the reasons to be that since the four WH clues were in English, it was very convenient for participants to directly use them as their police officer's lines. A possible way to improve this would be that presenting the four WH words in Chinese (L1). In Chinese, the four WH words are equivalent to the English words: agent, things, time, and places. Presenting these clues in L1 is expected to help learners understand in a short time. This can also leave space for learners to think about how to ask the questions in English. As for the reporter's line, all 3 pairs in this cycle used details which appeared in the previous scenes to answer the police's 4 WH questions. What they said had richer content than that of the first cycle, in which participants only expressed the fact that a man died. Participants in the second cycle clicked back to previous scenes in order to get details of the answers. This behavior did not take place in the first cycle. Thus the decision of adding the 4WH clues was considered useful and successful.

Third, on fluency, the speaking task moderately achieved fluency. It could be the reasons that participants used strategies (discussed in the previous sections) to deal with the recording task. Though a more ideal way to achieve fluency was to avoid dependence on texts and to provide the real-time pressure, still it could be understood that participants would feel more comfortable to rely on their strategies, especially when it was participants' first time to do this kind of recording task. Thus in the next cycle, I would still allow participants to use their own strategies to achieve the task.

Task 4 in the second cycle maintained the same design as that in the first cycle. It was found in the first cycle that the participants performed well by using provided sentence patterns and content clues. Thus in this cycle, it was expected to result in similar performances as in the first cycle. Excerpt 5.2 is the fieldnote of participants' performance for Task 4 in the second cycle.

Excerpt 5.2

●(Pair No.4)

There is a pen in the right pocket. It is a [*sic*] noble clothes and his boots are dirty. So we think he is a right handed. He is wealthy. He walked a long way. We guess he needs a help because he walked a long way to Holmes' home.

●(Pair No.5)

There is a pen in his right pocket, so we think he is right-handed. We guess he is a businessman because his clothes is [*sic*] noble.

●(Pair No.6)

I guess his last words are he needs help and he think [*sic*] he's innocent. I guess he's a right-handed, because there is a pen in his right pocket.(stopped the recorder and did the rehearsal quietly to herself for the next sentence). I guess he walked for a long way and he doesn't take if off because he weared [*sic*] dirty boots.

Again, the three elements of accuracy, complexity, and fluency were used for analysis. First, on accuracy, only minor grammatical errors appeared in the participants' dialogues. For example, participants tended to take the word "clothes" as a single noun; and "right-handed" as a noun. These mistakes also appeared in the first cycle. Besides this, the sentence pattern use of Pair No. 4 for most of their sentences did not use the grammar pattern clue of "there is...so" or "I guess...because..." but instead stated their evidence first and then made their predictions. This kind of statement is lacking of links between sentences to make a more free flowing statement. Pair No.5 correctly used the pattern clues to make their predictions. As for Pair No. 6, they correctly used the sentence pattern clue "I

guess...because...” in two of their predictions; however, their first sentence “I guess his last words are he needs help” contained two verbs. Second, on complexity, Pair No. 4 and 6 used three pieces of evidence to support their inferences. Pair No.4 mentioned the significance of the pen, the clothes, and the boots; Pair No.6 used the evidence of the last words, the pen, and the boots. As for Pair No.5, they only mentioned two pieces, the pen and the clothes. Third, with regard to fluency, all three pairs could fluently record their contents onto the tape recorder, though Pair No.4 used the strategy of jotting down the line and Pair No.6 made use of the pause function to complete a rehearsal between lines. Only Pair No.5 recorded the contents in one shot. To conclude, the participants in Task 4 generally could use the target sentence patterns to express their ideas in a fluent way. This indicates that the design decisions worked well with this group of students.

5.3 Task 2: Note-taking Task

In Task 2, the note-taking task, the participants were expected to obtain information from Scene 2 and use the target sentence pattern to type sentences on the screen. In the first cycle, it was found that the participants tended to type incomplete sentences or sentence fragments such as “There is some dirt.” Also, the provided sentence clue “there is” might mislead and limit the participants’ output. Thus, Suggestion No. 4 indicated that the sentence pattern clue should be modified as “There is...in” in order to guide the participants to make a more complete sentence. Also, another clue “He wears” should be given in order to avoid sentences like “there are dirty boots.”

In the second cycle, the participants in the note-taking task were successfully

guided to type complete sentences for each clue: clothes, pocket, fingers, and boots.

Excerpt 5.3

● (Pair No. 4)

- (a) He wears noble clothes.
- (b) There is a pen in the right pocket, but left pocket is nothing.
- (c) There is some dirt [*sic*].
- (d) They are dirty.

● (Pair No. 5)

- (a) There is a noble clothes [*sic*].
- (b) Right one has a pen, and left one has nothing.
- (c) The finger has some dirt.
- (d) They're dirty, socks smells [*sic*].

● (Pair No. 6)

- (a) He weres [*sic*] noble clothes.
- (b) There is a pen in his right pocket. And there is no things [*sic*] in his left pocket.
- (c) There is some dirt on his fingers.
- (d) His boots are dirty.

From the excerpt, it could be observed that the participants mostly made complete sentences. Pair No. 4 and Pair No. 5 made three complete sentences out of four. Pair No. 6 made all of their four sentences in a complete way. Only the sentence (c) of Pair No. 4 and sentence (a) of Pair No. 5 were incomplete and wrong sentences: “There is some dirt.” and “There is a noble clothes.” Besides, two pairs used the target sentence pattern clues “There is...in...” and “He wears...” Only one pair (Pair No. 5) did not use any of the patterns but still could express their ideas. Generally speaking, the participants in the second cycle made more complete sentences than the participants in the first cycle. This could be due to the adding clue of “there is...in...” and “he wears...” Therefore, the adjustment for Suggestion No.4 was successful and could be kept for the next cycle.

5.4 Scene 3: Matching

In Scene3, the matching task, the participants were required to match the vocabulary with the correct pictures on the screen. When the participants pressed the score button at the bottom of the screen, it showed the total score of the matching results. In the first cycle, the participants were not sure how to use the mouse to do the matching. The participants were also noticed that they had a tendency to adjust their answers when they did not score 100 percent. (The first cycle design did not allow the participants to change their answer once they pressed the score button. Pressing the button completed the exercise regardless of the outcome). Based on what was observed, Suggestion No.5 was that a clear instruction on how to drag the mouse was necessary. Also, a button “Try (the task) again” should be provided in order to offer the participants the chance to correct their errors.

In the second cycle, an instruction on how to drag the mouse was provided. That was, “Choose a word, press the mouse button and drag the pointer to the correct picture.” Also, a button of “Try again” was shown beside the score button (Figure 5.2).

Pair No. 4 read the instruction, dragged the mouse to match the word with the picture, and then scored 100%. They did not press the “redo” button. Pair No.5 also followed the instructions smoothly. Gou in Pair No.5 controlled the mouse while his partner looked at the screen. Then Gou mismatched two words. His partner told him “Try again!” So Gou pressed the button and finally matched all the items correctly. Pair No.6 first read the instruction quietly. Then one member, Anne, did the matching while Jin looked at the screen. Anne scored 100%, so they did not press the “Try

again” button.

It was observed that the participants in the second cycle received clearer, more concise information on how to drag the mouse in order to do the matching task. They did not hesitate as the participants in the first cycle did. Also, when matching wrongly (Pair No. 5), the participants did not give up and enter the next task. Instead, they pressed the “Try again” button to receive a score of 100%. Thus, for the next cycle, the instruction on mouse-dragging and the button of “Try again” was evaluated as worthy of being kept for further observation.

5.5 Task 5: Giving Orders

In Task 5, the participants were asked to explain the process of obtaining the powder from the dead man’s fingers into the tape recorder. In the first cycle, pairs tended to write down lines before recording their steps. On the other hand, pairs liked to be able to hear sound files of each word because it helped them accomplish the task. Following Suggestion No.2, the participants in the second cycle were encouraged not to write down lines. As for the sound files, they were kept for the second cycle in order to observe participants’ reactions.

In the second cycle, the participants had some tendency to write down lines before recording. Pair No.5 first used Chinese to say the process: light the match, drip the wax on the hand, and get the model. One member, Du, asked his partner, Gou, to say the process in English. Together they composed the sentences (more details of



Figure 5.2. Scene 3

pairs' interaction will be discussed in a later section). Then Gou did a rehearsal and then directly recorded the process of obtaining the powder in the tape recorder. As for Pair No. 6, they also used Chinese to discuss a possible process. Then one member rehearsed the process and then directly recorded it into the tape recorder. Both Pair No.5 and No.6 did not write down their lines on paper. Pair No.4 wrote the lines down. They first discussed the possible process with each other, using both Chinese and English, and then wrote down lines in order to read them aloud into the recorder. In this cycle, though not all pairs avoided writing down lines, at least all of them delayed the writing to the end of their discussion. The encouragement and reminder seemed to work for the participants. Thus, in the third cycle, the reminder of trying not to write down lines was kept.

On the other hand, the participants in the second cycle did not show preference for the sound clip. They only clicked the picture, listened to the pronunciation of the

word, and then moved on to discuss the possible process. However, the design of the sound clip could still be kept in order to obtain more information from the participants in the third cycle.

5.6 Scene 4: Detective Work

In Scene 4, the participants were asked to read the results of the gunpowder experiment and discuss two important points: (1) Based on the gunpowder experiment, try to imagine what might have happened in the gun-firing situation, and (2) There is a pen in the dead man's right pocket. What does that mean? In the first cycle, the participants did not have a clear understanding of how gunpowder behaved and failed to make logical inferences from the results of the gunpowder experiment. Suggestion No.6 advised that a clear explanation and illustration on how gunpowder works could be given to the participants.

In the second cycle, a screen with an explanation on how gunpowder spreads was added (as in Figure 5.3). The explanation in Chinese says: when you fire a gun, the bullet goes forward while gunpowder spreads backwards towards the shooter's hand. Gunpowder thus can be one piece of evidence in the police officer's investigation. Besides the explanation, an illustration of a hand holding a gun is presented.

Pair No. 4 clicked on the results of the powder experiment and summarized the information they received. After reading the explanation and seeing the illustration on gunpowder, one pair member, Shen, tried to figure out which hand the dead man used to fire the gun. However, his partner, Lee, said "I really don't have a clue" and suggested to move on to the next task (F4-12-3). Shen then stopped discussing the topic. Pair No. 5, after reading the results of the powder experiment, Du of this



Figure 5.3. Scene 4

pair asked his partner, “Do you know what gunpowder is?” His partner said “No.” Then Du shortly explained, “When you shoot the gun, the powder will spray onto your hand.” Then they entered to the explanation page. Du quickly identified that the illustration and text was about gunpowder, which he had just explained to his partner. Therefore, he hurried his partner to click to the next page. In the discussion page, Du asked his partner, “Which hand does gunpowder spread to?” His partner told him, “The back of the right hand and the left hand palm (F5-13-2)” (However, the real answer should be the back of the left hand and the right hand palm.) Then after reading the second question on the page, they entered the next page without any discussion. As for Pair No. 6, they noticed in the illustration page that the back of the hand would be covered with gunpowder. So Anne of this pair thought that since the back of the dead man’s left hand had gunpowder, he might fire the gun with his left

hand. However, in the discussion section, they found the conflict between the facts that the man was right-handed and that the back of his left hand had gunpowder (F6-13-1).

It could be observed that only one pair (Pair No. 6) was successfully guided by the design of the explanation and discussion. This pair first noticed the back of the hand instead of the palm had the gunpowder trace in the illustration page. Second, they were successfully guided (by the first question on the discussion page) to infer that gunpowder on the back of the left hand meant that the dead man might have used his left hand to fire. Furthermore, they were guided (by the second question on the discussion page) to find out that the dead man should be right-handed. This conflict was critical for making their final decision on whether the dead man was the real murderer. In short, only Pair No. 6 managed to find the conflict. Pair No. 4 was stuck at the illustration page, while Pair No. 5 did not collect the right evidence (the back of the left hand had gunpowder) and thus could not move forward to the conflict point.

To successfully notice the conflict between the clues of the dead mans dominant hand and the hand that fired the gun, the participants were expected to notice the way gunpowder spreads, especially on the back of the hand instead of the palm. However, the difficulty that Pair No.4 and Pair No.5 encountered suggested that the program design needed to present the key point, the back of the hand, in a more explicit way. The original way to present “the back of the hand” was embedding it within a passage in Chinese in the illustration page (Figure 5.3). However, in the previous gunpowder experiment, the key clue, “the back of the hand” was in English (Figure 3.18). Using different language to present the key clue

in two places made it obscure. When reading the illustration page, the participants could not easily refer back to the relevant phrase in the previous gunpowder experiment. To solve this problem, it is suggested to use the same expression in English for the key clue, the back of the hand, in the experiment and the illustration page in order to remind the participants of the clue. Also the font of the key clue could be modified to be more outstanding to catch the participant's eyes.

5.7 Scene 5: Newspapers

In Scene 5, the participants needed to comprehend the information provided in the two pieces of news (Figure 3.20 and Figure 3.21). As described in the Prototype section (3.4.2), the participants were expected to (1) Identify the dead man in Holmes's house was the butler based on Newspaper 1 (Figure 3.20), and (2) To infer that Mr. Chen's son might have had a motive to kill his father from Newspaper 2 (Figure 3.21)

In the first cycle, the participants failed to make logical inference for the real killer. This was due to the difficulty in comprehending the spreading of gunpowder. Based on what was observed, an explanation page was added to the second cycle Scene 4 (Figure 5.3) to help the participants understand the spreading of the gunpowder; meanwhile, Scene 5 was not revised since no problems seemed to occur on this page.

In the second cycle, Pair No. 4 and No. 5 failed to find the clues provided by the two newspaper articles in Scene 5. Pair No. 4 read Newspaper 1 and was confused with the sentence, "The butler ran away after he fired." They wondered, "Why the man ran out of the house and then the gun was heard firing in the house?" Then after

reading Newspaper 2, Lee of Pair No. 4 said, “The butler’s hand had some gunpowder, so he was the real killer.” Then Pair No. 4, after reading Newspaper 2, changed their mind and made a wild guess, “The butler shot Mr. Chen, and Chen’s son, in turn, grabbed the gun and shot the butler.” Pair No. 5, after reading the newspaper in Scene 5, told the researcher, “It is very hard to make a guess.” I asked them to click back to the newspapers and think again. Du of Pair No. 5 then also made a wild and wrong guess, “Mr. Chen’s son was the real killer, since the butler disappeared before the gun was fired.” His partner agreed with him without much thinking.

To analyze Pair No. 4 and No. 5’s thinking process, I found that they made two mistakes. First, they were confused by the word “after” in the key sentence, “The butler ran away after he fired.” They thought that the butler ran out of the house and then the gunshot was heard in the house. This is understandable, because when the study was conducted, the usage of “after” in such a sentence pattern had not been presented in their textbook. This misunderstanding led the participants to hold the view that Mr. Chen’s son fired the gun. Although this was a possible interpretation, the reasoning process was not correct. Second, since Pair No. 4 failed to spot the significant clue of “being right-handed” and “gunpowder on the back of the left hand” in previous scenes, they thought that the butler also fired the gun simply because his hand had gunpowder on it. That is, they believed both the butler and Mr. Chen’s son were the killers, which is not the case at all. Both Pair No. 4 and Pair No. 5 failed to make an accurate interpretation because they based their inference mainly on Newspaper 1, which was actually an erroneous report.

Only Pair No. 6 successfully synthesized all the clues to make the final inference, which was the closest answer to the original design. After reading

Newspaper 2, Jin of this pair said, “The financial problem caused the boss to sell his antiques.” Her partner, Anne, then asked, “Why Mr. Chen was killed?” They clicked back to Scene 1, listened to the butler’s calling for help, and inferred that the butler was innocent. Then they discussed the possible motive for the killer. After they discussed this with each other, they reported their reasoning to the researcher: first, based on the butler’s sound clip, he might be innocent, and that both the policeman and the son might be comrades. Second, from Newspaper 2, Mr. Chen might have had a financial problem and that his son might be angry at Mr. Chen for selling the family’s antiques. So the son fired the gun at his father and at the butler. Third, as for gunpowder, it might be that the son spread the powder on the butler’s finger for some reason. Then the researcher asked their opinion about the clue of right-handedness. Anne said, “Since the butler is a right-hander, it is not possible for him to fire with his left hand.” It was an accurate interpretation.

Pair No. 6 made their final conclusion based on several clues. These clues included the sound file in Scene 1, pocket-searching in Scene 2, the gunpowder experiment in Scene 4, and Newspaper 2 in Scene 5. Also, they did not limit themselves in the information provided by Newspaper 1, which did not accurately describe the true situation. By correlating all the clues and information, Pair No. 6 made their final conclusion which was the closest to the answer in the original story which this program is based on.

In the first two cycles, only one pair successfully solved the problem as the program design had expected. This fact suggests that the program might need to give the participants more help, particularly in the three aspects: (1) Altering the difficult sentence pattern, “The butler ran away after he fired” in order to avoid misunderstanding, (2) Reminding the participants of the possibility that information

provided by Newspaper 1 might not be accurate, and (3) Helping the participants to recall all the clues they have been given in previous scenes.

5.8 Discussion and Conclusion of the Second Cycle

In the second cycle, the participants were invited to interact with the program which was adapted according to suggestions generated from the first cycle. The participants' reactions were observed and discussed for the adjustment of the third cycle. In this section, two issues are discussed: (1) The participants' problem-solving ability, and (2) A brief summary of suggestions for program adaptation.

5.8.1 *Problem-solving Ability*

In the second cycle, the participants were observed to have difficulties in accurately inducing the identity of the real killer. Compared with the first cycle, the participants' reactions in the second cycle indicated more fundamental problems that were not found in the first cycle. In the first cycle, the researcher interpreted that the participants failed to make accurate conclusions on the real killer simply because the design did not provide an explicit explanation on the spreading of gunpowder. However, the adjustment in the second cycle, the adding of an explanation page on gunpowder, still did not help much. Only one pair out of three successfully followed the logic and made an accurate inference as the program had expected. In the previous sections, detailed reasons for the participants' failure and suggestions for program adjustment were discussed. Based on those insights, the issue of problem-solving ability is further discussed as follows.

First, in the aspect of program design, two points could be considered: (1) Language consistency, and (2) Checking grammar points. On language consistency, the adding of the explanation page on the spreading of gunpowder failed to guide the participants to notice the key clue “the back of the hand” mentioned in the previous scene of the gunpowder experiment (discussed in 5.6). The participants had difficulties in matching the information on the two pages and thus provided inaccurate interpretation in their conclusions. This failure was probably due to the fact that the explanation page was presented in Chinese while the other page was in English. This result suggests that language consistency plays an important role in supporting learners. It can also be inferred that by presenting the key clues, either textual or virtual ones, in a consistent way, it can make the key clues more explicit and avoid learners from ignoring them. The program design, in this way, could support learners to identify the key clues.

On checking grammar points, Pair No. 4 and Pair No. 5 were confused with the word “after” in the sentence “The butler ran away after he fired” in Newspaper 1 in Scene 5 (discussed in 5.7). This result indicated that the program designer should have checked the wording through cycles of testing. When designing Newspaper 1 in Scene 5, I was not aware of the fact that the word “after” in the sentence pattern had not been introduced in the textbook. In the first cycle, the participants, probably due to insufficient explanation in the gunpowder experiment in Scene 4, did not show any signs of difficulty in understanding the sentence. In the second cycle, due to the support of an explanation page of the spreading of gunpowder, the participants were able to move forward and clearly articulated their interpretation on the sentence (mentioned above) so that the researcher was surprised to observed that the word “after” was unfamiliar to the participants in this sentence pattern. Only through

cycles of observation could the program designer gauge the appropriateness of the grammar points language use and thus avoid unnecessary obstacles in learners' problem-solving process.

Second, with respect to learners' problem-solving ability, two issues could be considered: (1) The ability to discern trustworthy information, and (2) Correlating information. First, the ability to discern trustworthy information was considered a key ability when observing the reactions of Pair No. 4 and Pair No. 5 to Newspaper 1 in Scene 5 (discussed in 5.7). The two pairs read Newspaper 1 and believed what it described was completely true. They did not doubt the truth of the information. Therefore, they were misguided by it and failed to make an accurate interpretation. On the other hand, Pair No. 6, based on other clues in the previous scenes, said, "The two gunshots (mentioned in Newspaper 1) might not be true." This critical thinking skill avoided limiting themselves to one piece of information.

One of the factors that led Pair No. 6 to question the information provided by Newspaper 1 was that Pair No. 6 collected all the clues in the previous scenes and correlated them (discussed in 5.7). In the process of correlating, they found one clue (e.g., the sound clip in Scene 1) conflicted with the others (e.g., Newspaper 1 in Scene 5). Therefore, they dared to doubt the veridicality of the clue and generated a more reasonable conclusion. Correlation of clues and information is an important ability when using investigation programs like the one in this study, and it is also the key to the success of any problem solving task.

To sum up, the aspects that affected the participants' problem-solving performance in this study included: (1) Language consistency in presenting key clues, (2) Using grammar points or language phrases that are familiar to the participants, (3)

The participants' ability to discern trustworthy information, and (4) The participants' correlating of information ability. The first two aspects could be adjusted in the next cycle, since learners' performance should not be diverted by problems caused by the program design. As for the latter two aspects, two points needed to be considered before making further adjustment. First, if one of the goals for the program targets helping learners produce accurate reasoning, it may be necessary to remind learners in Scene 5 that Newspaper 1 may not be accurate; meanwhile, a collection of all the clues presented in the previous scenes could be provided for learners to recall before they make their final conclusion. These adjustments mean to help learners in their critical thinking and synthesizing ability in some way. However, the insertion of the meta-cognitive reminders might decrease the authenticity and challenge of the story-based detective program. To the researcher, this is a dilemmatic decision to make. In the third cycle, I decided to postpone the consideration of the authenticity issue but give the participants more help in order to observe what would happen under a learner-friendly situation.

5.8.2 Design Adjustments

Adjustments to be made based on observation of the second cycle are followed:

(1) *Task 1*. Presenting the four WH words in Chinese (L1) in order to leave space to think about how to ask the question in English.

(2) *Scene 4*. Using the same expression in English for the key clue, the back of the hand, in the experiment and the illustration page in order to remind the participants of the clue. Also modification of the key clue font to be more noticeable

therefore drawing more attention to it.

(3) *Scene 5*. Altering the expression “The butler ran away after he fired” in order to avoid misunderstanding. Also, it is necessary to remind the participants of the possibility that information provided by Newspaper 1 might not be true. Finally, it is necessary to remind the participants of all the clues they have been given in previous scenes in order to help them make accurate inferences.

Based on these suggestions, the program was adjusted before inviting the third cohort of participants to work on the program in the third cycle.