



Inferencing Behaviour of ESL Readers

Ho Cheung Lee

(petre_lee@yahoo.com)

Ying Wa Primary School, Hong Kong SAR, PR China

Abstract

Knowledge about how young English-as-a-second-language (ESL) readers draw inferences is important input for teachers when designing lessons to teach reading strategies. This paper reports on an enquiry into the inferencing behaviour of ESL primary school students, aiming to give directions to the lesson intervention of a larger action research project on explicitly teaching inferencing. Nine male Primary Six (Sixth Grade) students in the author's class from a school in Hong Kong were selected to take part in the study. To reveal how they made inferences while reading English texts, they were asked to participate in a think-aloud session in which they read a narrative text and an informational text in English. Analyses of their protocols suggested that they had low performance in bridging and global inferencing, and that this situation was even more obvious with the informational article. Implications for the teaching of inferencing to enhance L2 reading comprehension were discussed.

1 Introduction

As a front-line primary school ESL teacher, I observe and study my students' reading behaviours through their assessment scores, daily reading performances, lesson observations and both formal and informal discussions with my colleagues. We do notice that our students tend to look for direct answers from texts, as if the "answer hunt" is all that counts. When it comes to questions that require the drawing of *inferences*, students, especially those at intermediate reading levels and below, find it hard to arrive at complete and relevant responses. The current situation is that, regarding reading English as L2, many students have never seen reading as a process of thought stimulation (Smith, 2004), and do not realize that various skills and sub-skills are involved in successful reading comprehension (Bernhardt, 2005; Hedgcock & Ferris, 2009; Hudson, 2007). In search for a change and with the ultimate goal of shaping readers into engaged and independent learners, I decided to carry out an action research project on how ESL students should learn to read English strategically.

The study reported in this article forms part of this larger project which studies how L2 inferencing can be taught explicitly in primary classrooms. In this study, I investigated the inferencing patterns of nine Primary Six (Sixth Grade) ESL learners when they read materials in English by conducting think-aloud sessions with them. This study builds on previous work on reading strategies of second language readers such as Block (1986, 1992), Salataci and Akyel (2002), and Upton (1997). Block's projects analyze the components involved in the L2 reading process by collecting think-aloud data; Salataci & Akyel's study investigates the reading strategies used by a small group of L2 learners before and after the implementation of reading instruction, with think-aloud being a part of the data collection process; and Upton's work studies the L1 and L2 comprehension

strategies used by a group of L2 readers by using the think-aloud method. The present study follows the same line of studies and looks into the L2 reading process via the think-aloud method, but with a focus on the application of inferencing. I borrowed the concept of inferencing behaviour in a second language from Kembo (2001). The present study has the objectives of identifying the participants' patterns of inferencing use and providing insights to inform the development of pedagogical measures on reading strategy training.

2 Background and theoretical framework

Drawing inferences is, to a large extent, a necessary process in reading comprehension. It is one of the central cognitive processes in reading comprehension (Nassaji, 2004). Kispal (2008) states that inferencing is likely to take place when readers want to get from the reading materials more than what they can understand literally. Winne, Graham and Prock (1993) also affirm that inferencing is an essential component in reading comprehension in the way that such an engagement must be present whenever literal comprehension takes place.

Different researchers define the role of inferencing differently in the theories of reading, and seldom does any reading theory name inferencing explicitly as a key component. Yet, the componential trend of reading theories, at least, indirectly gives inferencing a considerable amount of significance. Bernhardt's (1991) three-component model of reading describes the process of L2 reading as consisting of "language," "literacy" and "world knowledge." Expanding on the last two, "literacy," according to Bernhardt, refers to the strategic side of reading comprehension, which is the ability to choose the most appropriate approach to tackling a text and to knowing why such an approach should work best; and "world knowledge" means background knowledge. Given that inferencing is generally considered as a reading strategy and/or skill (e.g. Grabe & Stoller, 2002; Hudson, 2007) which requires the use of world knowledge or schemata in certain area (e.g. Cromley & Azevedo, 2007; Kispal, 2008; Nuttall, 1996), it naturally has a cross-componential significance in Bernhardt's conceptual framework. And therefore, as an ESL teacher, I relate good inferencing ability to successful reading comprehension, which is a notion supported by Cain and Oakhill (1999).

The subject of inferencing has been studied extensively in the last two decades as a reading skill with multi-categories. Researchers such as Pressley and Afflerbach (1995), Singer (1994), and Trabasso and Magliano (1996a) have produced detailed lists of inference types in different perspectives. Lee (2013) re-categorized the commonly quoted inference types into *logical* and *functional inferences*, and simplified them for teaching and learning purposes. This paper borrowed Lee's categorization for illustration for the present study and expanded it slightly to cover global inferences. Table 1 displays the categorization of inferences, with sample inferences drawn from this short passage:

John came back home, completely soaked. He would never play with Mary again near the duck pond.

Some inferences are drawn mainly from textual information and/or from the logical relationships among lines; these are the types in the *logical inferences* category. And some are produced more intentionally through a conscious interaction with the text; and those are termed them *functional inferences*. While the terms are not mutually exclusive, they draw on previous researchers' work and provide us with a concise framework presenting the two different dimensions where inferences may be identified.

Important as it seems in theory, there has been little research done on children's inferencing in L2 reading. Zhang, Gu and Hu (2008) admit that knowledge about how children use strategies during second language learning is limited. Therefore, it is not surprising that studies specifically revealing ESL readers' inferencing patterns while reading English have been scarce. Also, it has been pointed out that there are few studies of how students' inferencing abilities can be improved (Grabe, 2009; Kispal, 2008; Nuttall, 1996). In fact, the few studies on learners' strategic reading behaviours, be they qualitative or quantitative, have made little attempt to link the findings to pedagogy (e.g. Kembo, 2001; Laing Gillam, Fargo, & St Clair Robertson, 2009; Law, 2008).

Table 1. Logical and functional inferences (Revised from Lee, 2013)

Inference Types	Details	Sample Inferences
<i>Logical Inferences</i>		
Bridging	Forms connections in texts to attain coherence.	“He” refers to John.
Causal bridging	Forms connections in texts by means of cause-and-effect reasoning.	John was soaked <i>because</i> something happened to him at the duck pond.
Elaborative	Gap-filling. Supply extra but essential information to the text to enrich mental representation of it.	John returned home after playing with Mary. He was all wet and felt unhappy.
<i>Functional Inferences</i>		
Explanations	Explains why things occur.	John was pushed by Mary into the duck pond. That’s why he was all wet.
Predictions	Predicts what is to come.	John would be scolded by his mum.
Associations	Associate the textual meaning with world knowledge and supply relevant information.	John and Mary probably didn’t see the warning sign at the pond.
Global	Summarizes and gets the gist from texts.	John had an accident and he was all wet.

As stated, some previous think-aloud research work may have similar objectives to the present investigation. Block (1986, 1992) studied the think-aloud protocols of ESL students at university level. Her studies involved collecting and coding participants’ think-aloud protocols, through which she identified and interpreted ESL students’ strategic patterns. Similarly, Upton (1997) studied adult ESL students’ patterns of strategy use when reading English. He adopted the think-aloud approach and coded the protocols elicited. It was found that readers with various levels of L2 competence differed in their strategy use to gain understanding from English texts. A discussion on L1 and L2 strategy use derived from his data was also provided. Furthermore, Law (2008) collected and studied the think-aloud protocols of 82 primary school participants. The protocols were studied for the constructive learning activities they had adopted while they were reading. All of these studies point to the notion that more skillful readers manage to use higher level strategies to attain better comprehension.

These studies have provided rich information and rigorous discussions about the reading process among language learners; nonetheless, ESL students at primary levels were not targeted, nor did the previous work lead to ample implications for the teaching and learning of L2 reading. I attempted to address this research gap in the inferencing patterns of primary ESL students and the teaching of inferencing through this study.

3 The study

The current study aimed to investigate the inferencing behaviour of my Primary Six ESL students when reading English texts. There were two research questions to answer:

- a) Are there specific patterns observable in the participants’ use of inferencing when reading English?
- b) What can we learn from the observed patterns (if any) in the participants’ use of inferencing when reading English?

To address these questions, I conducted a think-aloud session with each of the invited participants. I collected and analyzed their think-aloud protocols for noticeable thought patterns. This investigation helped me to understand the current situation of my students’ inferencing behaviour

and provided insights into their needs in L2 reading and especially how they might be trained for inferencing in L2.

3.1 Research background and setting

As mentioned, this study is a component of a larger action research project I am conducting, which aims at studying how inferencing skills can be taught explicitly to my Primary Six (Sixth Grade) students in ESL lessons. This study attempted to identify the participants' inferencing behaviour in L2 reading and justify the subsequent measures to be taken for classroom interventions. A reading test was administered first to my two classes of Primary Six students (N=67). The results revealed a general incompetence in certain questions which called for a deeper investigation of the students' thinking process while reading. I then selected the students from different ability groups to participate in think-aloud sessions. This paper reports the findings from the think-aloud studies.

The participating school is a Chinese-as-a-medium-of-instruction boys' primary school located in the urban area of Hong Kong. Most of the students' families have medium social-economic status. English is a second language in Hong Kong and it is a compulsory subject in mainstream schools. The local Chinese students normally start learning English when their schooling starts, at the age of six.

3.2 Participants

With reference to Block's (1986) earlier study of reading strategies of L2 readers involving nine participants, in this study, nine students from my Primary Six classes were invited to participate. All of the participants were male students, since the school was a boys' school. They were aged 11-12. The participants were selected from three ability groups on the basis of their most recent English subject scores in school. Two of the participants were considered high-achievers in English, ranked within the top 25 of the 160 students in Primary Six; four of them were medium-achievers in English, ranked between 40 and 80; and the remaining three were low-achievers in English, ranked below 90. Permission was granted by the School Head and the participants' parents to involve the children in my research. Participants with different levels of English competence were chosen to collect information about any difference in the use of inferencing between the proficient and less proficient English readers. All of the participants were informed of the purpose of the research and had some experience of the think-aloud procedure before this study, as I had introduced and demonstrated this reading activity in class. Yet, none of them had received any systematic and/or intensive training in L2 inferencing in school, as it had not been a part of the school's English language curriculum.

3.3 The think-aloud method

The think-aloud method has been used widely in reading research for investigating the participants' use of reading strategies and their understanding from reading (see e.g. Law, 2008; Mckeown & Gentilucci, 2007; Pressley & Afflerbach, 1995). Pressley and Afflerbach's analyses of the verbal protocols from reading comprehension have provided researchers with rich data about reader's cognitive behaviour during the process of reading. In think-aloud studies, participants are often asked to express verbally what is in their minds during and after reading a given passage. This method is particularly adequate for studying how meaning is made in the reading process since it reveals the way readers deal with the reading problems they may encounter (Ericsson & Simon, 1999).

However, I must admit that the adoption of the think-aloud method is not without drawbacks. In terms of revealing the comprehension process, think-aloud participants may not always report all of the strategies they employ (Salataci & Akyel, 2002). Also, the demand to verbalize explicitly what readers think during reading might cause an extra cognitive load for participants, who are

already involved in a cognitive activity (Nielsen, Clemmensen, & Yssing, 2002). Yet to some, such load does not seem to be problematic because think-aloud could be the closest possible way to reveal readers' cognitive processes (Katalin, 2000). This study has adopted the think-aloud method with its restrictions acknowledged. A few measures were taken which might maximize the chance that the think-aloud protocols would reflect participants' thoughts truthfully: I made the task more manageable for the participants by selecting reader-friendly passages as materials; I did a think-aloud demonstration for them; I conducted all the think-aloud sessions in their L1; and I provided minimal prompts and encouragement when needed.

The procedure of the present study followed the classical think-aloud operational guidelines as described by van Someren, Barnard and Sandberg (1994). The necessary components include a comfortable room, clear instructions, a warm-up part, main tasks with minimal prompting, audio/video recording, protocol transcription, and analysis. In the present study, each of the nine participants was invited to a one-to-one think-aloud session where I, the researcher, gave instructions and assistance. The students' L1, Cantonese, was used as the medium of exchange to ensure that their expressions would not be obstructed by language barriers. At the start of the session, I informed the participants of the purposes of the study. Since all participants had experienced think-alouds during English lessons, only a short think-aloud demonstration from me was performed to refresh their memories of what a think-aloud was. It turned out that all of the participants were able to think aloud while reading in the session. The task instructions given to the learners, translated in English, are attached in Appendix A.

I asked each participant to read two passages for comprehension: one narrative text and one informational text¹. I presented them with the passages, printed on paper, one after another, line by line. I did this by covering the passage with another sheet and sliding this cover down to reveal each line. When a new line was shown, the previous lines were all visible so that participants might make meaning connections. To cancel out the order effect, four of the nine participants began the task with the narrative text, while the rest did the informational article first. For each article, only the title line was shown at the start, with the rest covered. Then, more lines were revealed at intervals. In between the revelation of lines, I asked the participants to report to me whatever they were thinking and what they had and/or had not understood about the text at that moment. I did not interfere with their verbal report, unless they had come to a lengthy silence. Occasionally, minor prompting was given to the participants who were reluctant to speak at times and/or who failed to elaborate on an unclear response.

The narrative passage used for this study is titled "The travellers and the bear" from Wright (2003) (see Appendix B); and the informational text is from Time For Kids (2009), titled "Green buildings" (see Appendix C). Each of the texts contained about 80 words. Wright's work instructs teachers to do storytelling in class and the sample stories involved are not only of high pedagogic value, but are also well structured to conform to what makes a good story for educational purposes. The texts from Time for Kids, which is a children's magazine, are authentic English texts for child readers from all over the world. The texts from these sources were selected for their high writing quality and relevant intended readership.

I chose the narrative and informational texts for this study for two reasons. First, the participating students were most familiar with these two types of texts under the English language curriculum of the school. Second, these two text types are used quite frequently in verbal protocols analyses for the investigation of reading processes (for the use of narrative texts, see e.g. Laing & Kamhi, 2002; Trabasso & Magliano; 1996b; for expository texts, see e.g. Kucan & Beck, 2003; Singer, Harkness, & Stewart, 1997).

To ensure the texts would be suitable for the think-aloud purposes, they had been modified by me, along with another experienced primary school English teacher, to ensure their readability for our Primary Six boys. We changed vocabulary items and sentence structures to ensure that challenges from vocabulary and syntax would not hinder the drawing of appropriate inferences. And during the modification, we bore in mind that the altered texts should not become more challenging to make inferences from. Both of the texts in their final versions scored below 20 according to The McAlpine EFLAW® Index (McAlpine, 2005), indicating that the texts were quite easy for

EFL readers to comprehend. The verbal data from the students were audio-taped and transcribed verbatim for the investigation of their inferencing patterns.

In the actual think-aloud sessions, I also asked post-reading questions to the participants. But considering the scope of this paper, only the analyses of the while-reading think-aloud responses from the participants are reported.

3.4 Data collection & analysis

The approach to data collection and analysis was adapted from earlier think-aloud research work on understanding reading strategies (e.g. Block, 1986, 1992; Upton, 1997). Think-aloud data from all nine participants were transcribed and translated. A sample coded transcript is attached in Appendix D with codes briefly defined and denotations explained. Given the rather limited number of participants in this research project, it was difficult for me to go beyond looking at trends emerging from the think-aloud protocols. Still, I expected the data to reveal useful patterns in the participants' inferencing behaviours that would provide me with pedagogical directions.

In this study, I collected and studied the participants' introspective responses. Introspective data are those obtained during reading. The participants' responses were broken into meaningful chunks for coding. Each unit was coded according to the closest response type with which it could be described. The coding scheme for this study is shown in Table 2. Multiple coding was permitted should a unit explicitly show features in more than one category.

Table 2. The coding scheme

Response Types	Definition
Bridging	Response contains explicit reference to information obtained from previous line(s). Indication of the antecedent of a pronoun is a typical example.
Global inferencing	Response shows meaning and/or message deriving from a section and/or the whole of the passage.
Explanation	Response explains or attempts to explain information presented in the text based on background knowledge and/or information obtained from previous line(s).
Elaboration	Response expands the line by adding extra and relevant information from background knowledge to enrich the reader's comprehension.
Association	Response demonstrates relevant contextual but unessential knowledge activated by the line. This may include imaginative feedback, comments and sensible questions.
Paraphrasing	Response repeats the exact line, translates it, and/or paraphrases it without adding any new information to it.
Unclassified	Response incomplete, represents personal comments which do not show comprehension, or not describable by the other response features.

Five types of common inferences formed the key part of the coding scheme, which included bridging, global inferencing, explanation, elaboration and association. This selection was deemed adequate, as I was able to code the verbal protocols of the two high-achieving participants who were the first two to do the think-alouds. The coding scheme then remained valid for the rest of the protocols produced. The coding scheme included paraphrasing, which is not a type of inference. I had that included, because I find it to be a common reading strategy, and it might tell us something about how the students approached a text. Table 3 displays the actual use of the coding system, with examples from the think-aloud protocols. After coding, the number of instances of the different responses for each participant were counted and recorded.

Table 3. The measures of students' introspective responses

Response Types	Examples	Remarks
Bridging	Uh ... the two of them were walking in the forest ... (Ben, narrative)	The "them" had "the travelers" as referent, which appeared earlier.
Global inferencing	These later two lines may be talking about the issue of power. (Alan, informational)	Summed up a part of the passage.
Explanation	Perhaps the man was shocked too much and then he misunderstood things. (Jacob, narrative)	Explained why the man heard from the bear.
Elaboration	I guess these buildings helped save our power and they didn't hurt our earth. (Jerry, informational)	Expanded the presented line (3 rd) with the understanding of helping to save power.
Association	I guessed that they were attacked by the bear when they were travelling. (Kurt, narrative)	Associated the travellers and the bear in the title with fighting scenes.
Paraphrasing	They didn't have air-conditioners. (Henry, informational)	Almost a complete translation of the line.
Unclassified	I can't understand this line. (Jack, informational)	Unsuccessful comprehension.

I coded all responses in the think-aloud sessions, while a second rater, who was a PhD candidate in Education, coded and scored 40% of the responses randomly. The agreement rate between the raters was 87%. Any discrepancies remaining in coding and scoring were resolved through discussion.

4 Findings

The participants were all able to react verbally to the presented texts and they all felt comfortable to express themselves while reading. Although all of them produced useful verbal data during the think-aloud sessions, the lower-ability participants tended to produce fewer inferencing instances in general.

The average number of the overall eligible while-reading inferencing instances recorded for each high-achiever was 32.5 for the narrative text and 29.5 for the informational text; for each medium-achiever, the figures were 22 and 13 respectively; and for each low-achiever, the figures were 17 and 9.7 respectively.

Also, as can be seen easily from the tables, the lower-achievers produced more instances of irrelevant responses. At the end of the think-aloud session, most of the participants claimed that they had understood the given texts fully, even though some might have hesitated frequently and produced irrelevant responses at times.

The coding results from the participants' think-aloud protocols are presented in Tables 4 and 5 according to the different text types. All the students' names are pseudonyms. The findings below are presented in terms of the observed patterns from the participants' introspective responses, and their awareness of textual cohesion and coherence

Table 4. Think-aloud (Narrative) results*

Responses	High-achievers		Medium-achievers				Low-achievers		
	Geoffrey	Kurt	Ben	Alan	Jacob	Jerry	Kenneth	Jack	Henry
Bridging	5	5	6	5	3	1	4(2)	1	3
Global inference	0	0	0	0	0	1	0	0	0
Explanation	12	4	6	3	3	2	5(2)	2	4
Elaboration	3	7	4	6	0	4	3(2)	5(3)	3(1)
Association (including questioning)	13	16	9	11	13	11	16	7(1)	9
Paraphrase	13	2	4	15	0	10(3)	6(1)	9(1)	6(1)
Total (legitimate inferences)**	33	32	25	25	19	19	22	11	18

Table 5. Think-aloud (Informational) results*

Responses	High-achievers		Medium-achievers				Low-achievers		
	Geoffrey	Kurt	Ben	Alan	Jacob	Jerry	Kenneth	Jack	Henry
Bridging	3	3	2	2	0	0	0	0	0
Global inference	0	0	0	2	0	2(1)	0	0	0
Explanation	0	0	3	0	0	1	0	0	2(1)
Elaboration	6	9(2)	1	2(2)	0	5(1)	5(1)	4(4)	3
Association (including questioning)	16	24	18	8	14(6)	2	14(4)	6(3)	9(1)
Paraphrase	4	3	14	11	2	12	8(2)	7(2)	7(4)
Total (legitimate inferences)**	25	34	24	12	8	8	14	3	12

* Results shown in number of instances observed; a bracketed number, if any, implies the number of wrong interpretation instances/irrelevant responses.

** Excluding instances of paraphrase and wrong interpretation instances/irrelevant responses.

4.1 Observed patterns

In response to the first research question, several patterns in the participants' use of inferencing during L2 reading were observed. A salient pattern was observed that the participants did not show much of their abilities in bridging textual information or arriving at a relevant global inference from a part or the whole article. For the narrative text, medium- to low-achieving participants showed merely three instances of bridging on average and the whole group showed almost no global inferencing tendency. One example of bridging came from a medium-achiever while reading the narrative text, as quoted here:

Alan: Oh, the men may be referring to the two *travellers*. (On 1st line)

In this example, Alan successfully linked the first line of the narrative "Two men were walking in a forest" with its title "The travellers and the bear" and expressed his understanding of the "two men" being the mentioned "travellers."

The frequency of the use of bridging and global inferencing got even lower in the informational text, where most of the medium- and low-achievers did not demonstrate explicit bridging abili-

ties at all. The number of global inference instances in this text type was again close to nil for all participants.

The use of explanatory inferences, or explanations, is different across the text types. The participants tended to show more explanatory skills in the story than in the informational article. The medium- and low-achieving groups produced on average three to four instances of explanation in the story, whilst for the majority the informational text prompted no explanatory instances.

The patterns of elaboration and association were similar for both text types. There were about four elaborative instances on average while reading the texts with more than 10 instances of association. An instance of association from a low-achiever while reading the informational text is quoted below:

Kenneth: They might need to walk near the fountains or the waters. (On 5th line)

The fifth line of the “Green building” text read “They did not have air-conditioning.” It referred to the living condition of people before 1930s. When the line was shown, the participant made this utterance expressing an extra and unessential piece of information activated by the line. Kenneth imagined an alternative way of cooling down during the days without air-conditioning.

There was little pattern observed across the groups of different English standards in the use of paraphrasing in the participants’ think-aloud processes, probably because it had to do with how individuals approached the texts. If the child tended to read aloud the lines either in English or Cantonese translation, he would have a higher record of paraphrasing. And such a tendency, as suggested by the results, may not be associated with the individual’s English standard.

4.2 Awareness of textual cohesion and coherence

The second research question relates to what we can learn from the observed inferencing patterns of the students. I think that a great deal of knowledge emerged provided from the think-aloud data of the inferencing patterns, with the students’ awareness of textual cohesion and coherence being a significant part. Textual cohesion and coherence are concerned with the ways in which ideas in a text are connected. According to the definitions of Halliday and Hasan (1976), textual cohesion has to do with how a text is put together by the use of cohesive ties such as references and connectives; whereas coherence has to do with the logical flow of the ideas from the text (see also Carrell, 1982; Frestl & von Cramon, 2001). On the basis these concepts, I looked at the participants’ awareness of textual cohesion through their demonstration of bridging competence, with which they linked ideas from different lines together semantically. I also looked at their awareness of textual coherence through their global inferencing competence, with which they could show their understanding of a larger portion of the text as a logically constructed chunk.

On the demonstration of bridging from the protocols, the participants did not come up with a lot of bridging instances on the whole during their think-alouds, but they might have found the narrative text an easier piece to make sense of cohesively. Their introspective responses to the narrative text do show a few instances of bridging inferences across the ability groups. In the example below, Ben bridged the fourth line of the text “The other man couldn’t run and couldn’t fight the bear by himself so he lay on the ground,” with the fifth line “The bear came to the man and smelled his head. Then the bear went away.”

Ben: And the *bear* immediately approached the man lying on the ground. (On 5th line)

Ben elaborated “the man” from the fifth line into “the man lying on the ground,” referring back to the information presented from the last line. Thus it was counted as an elaboration and also a bridging instance. Here, Ben acknowledged the semantic relation between the two lines by pointing out the referent of “the man.”

Bridging instances came more rarely in the informational text. Only the higher achievers would make such attempts. Kurt bridged the notion of “Green buildings,” which was also the title of the informational text, with the third line “Those houses did not use power or hurt our earth in any way.”

Kurt: Oh, it means that in the *green building*, no electricity would be consumed ... (On 3rd line)

With respect to the participants' global inferencing competence, the available data reveal a very small related figure. Jerry was the participant to draw the only introspective global inference in the narrative text, while he and Alan were the only two attempting to draw global inferences while reading the informational text, from which they yielded four instances in total. Jerry produced the following global inference towards the end of the informational material:

Jerry: This piece mainly talks about environment protection ... (On 8th line)

In general, from the collected think-aloud protocols, the trend appears to be that the participants seldom read the articles as a coherent whole, or that they did not demonstrate sufficient awareness of the importance of recognizing textual coherence in reading comprehension.

5 Discussion & implications

The findings from the verbal protocols of the participants contribute to our understanding of the inferencing behaviour of primary school ESL students as well as the L2 reading processes. The findings also have practical implications to reading instructions for ESL.

5.1 *Inferencing behaviour of participants*

Concerning the observable patterns of inferencing from the data, from the think-aloud protocols, the results of the study produced a similar picture to that produced from Block's (1986) earlier work. Block's analyses of her nine participants' reading strategies patterns, using the think-aloud method, revealed that their use of paraphrasing, association, and interpretation was clearly more extensive than that of integration and text structure recognition. This aspect of her findings could be comparable to my current finding that, in general, the participants' use of paraphrasing and association was more frequent than their use of bridging and global inferencing. In other words, it appears that, while reading the texts, the participants tended to base their mental representations heavily on their personal knowledge and textual fragments, almost neglecting the inter-related ideas the texts tried to bring out.

With respect to the extent to which English proficiency and text types play a part in the participants' inferencing. In terms of the difference in inferencing behaviours shown by participants of varying English standards, the results of the present study suggest that the lower achievers in English tend to produce fewer inferencing instances and more irrelevant responses during think-alouds. This is in line with one of Kembo's (2001) findings that reading ability correlates with inferencing performance; in terms of the potential influence of text types in the inferencing process, the results reveal that the narrative text elicited more legitimate inferences than the informational text, despite the former having fewer lines and total words. There were a total of 204 legitimate inferencing instances counted for the narrative text, while there were 140 for the informational text. The difference was rather obvious. On the whole, the results of the study suggested that English proficiency and text types appear to have an effect on at least the quantity of inferencing produced.

5.2 *Cohesion and coherence in reading process*

The ability to draw inferences from texts is a necessary skill in the process of understanding texts cohesively and coherently, as it helps link up ideas and fill the gaps to form an integrated picture (see e.g. Singer, 1994). I anticipated that an important aspect of the participants' inferencing behaviours could be revealed, if I could find evidence from their think-aloud protocols showing how well they could synthesize information from texts. From the coding scheme I used in this study, bridging and global inferencing are the two factors considered to be the most relevant in revealing the participants' proficiency in textual cohesion and coherence respectively. However, as mentioned in the Findings section, these areas of their inferencing were particularly weak.

There could be several reasons for the participants' lack of cohesive and/or coherent awareness while interpreting texts, especially with informational articles. First, in terms of the children's metacognitive development, some previous studies have shown that younger readers are not as good as the older ones in summarization performance (see e.g. Vieiro & Garcia-Madruga, 1997). After all, the participants in this study were all Primary Six boys who were merely 11 or 12 years old, and they were reading texts in L2. Second, according to earlier research on individual differences in bridging inference processes, the ability to draw bridging inferences is promoted by the readers' readiness to access pertinent knowledge while reading, their working-memory capacity, and their vocabulary knowledge (Singer, Andrusiak, Reisdorf, & Black, 1992). In terms of the participants' language proficiency, most of the participants were not skillful ESL readers; thus, they might be unable to demonstrate the required readiness to access relevant knowledge while reading, good working-memory, or a wide range of vocabulary for drawing bridging inferences. Third, the two texts that were used for the think-alouds were fundamentally different from each other in terms of content and style. The students in the school were more familiar with narrative texts than informational texts in English, not to mention that the comprehension of informational writings often provides few opportunities for personal connections (McKeown & Gentilucci, 2007), causing difficulties to read with cohesion and coherence. And fourth, I would argue that the fact that most participants failed to demonstrate their ability to summarize and bridge in reading English can be attributed to the fact that they had never been trained systematically and intensively in inferencing for reading English.

While all of the above factors may have caused the seeming superficiality of the participants' L2 reading approaches, with the exception of the first on age, the other three could be manipulated via classroom intervention. This gives lesson planning a significant role in improving ESL readers' inference-drawing skills for better awareness of textual cohesion and coherence.

5.3 Teaching inferencing

While teachers may need to be selective, when it comes to teaching strategies for enhancing language acquisition (Krashen, 2013), it is generally agreeable that the conscious application of reading strategies could lead to success in reading (Zhang & Seepho, 2013). As a matter of fact, there has been little controversy about teaching reading comprehension (Duke & Pearson, 2008/2009). We have seen, at least in the past fifteen years or so, a number of researchers in reading bringing the teaching of reading strategies, including inferencing, to the forefront (e.g. Hudson, 2007; Liang & Dole, 2006; Nuttall, 1996). As for improving reading in ESL, it could be effective teaching inferencing skills explicitly in class and drawing students' attention to the significance and benefits of strategic reading (Lee, 2013).

In terms of the teaching and learning of inferencing, the results from the current study revealed at least two important issues: first, there is a great deal of room for improvement in the students' inferencing abilities; and second, inferences that demand the students to synthesize larger chunks of information from English texts are not drawn frequently. The lack of global inferencing awareness observed in the majority of the participants may reflect that they were not accustomed to reading strategically to draw inferences derived from a larger chunk and/or the whole of the passage. As discussed, the students' target language proficiency, training experience, and the choice of text genre for processing were among the major classroom factors which caused their inferencing behaviour as observed. Focusing specifically on strategy training, I argue that even readers who are equipped with reading strategies may need to be trained for decision-making in strategy use. Readers, regardless of their reading competence, may as well have their own strategies for tackling texts, and the selection of strategies could be influenced by issues such as reading motivation, reading purpose, text difficulty and past experience in reading. Cain and Oakhill (1999) attributed errors in inferencing to poor choices of reading strategies, and stated that good inferencing skills probably cause good reading comprehension ability. This implies that teachers have an important role in re-directing the weaker learners to the more effective ways of reading.

Three pedagogical implications can be made in response to the results of the current study. First, inferencing, as a reading skill, should be made a significant part of reading programmes, starting at least at the upper primary levels. A focus could be set on the ability to draw inferences that call for a global understanding of the text and/or the coherence of propositions in the text. Teachers' think-aloud demonstrations could be helpful in raising the students' awareness in global inferencing and they could provide them with access to the minds of proficient readers. Keene and Zimmermann (2007) have recorded successful inferencing lessons with primary children through the think-aloud approach, despite the fact that they were learning in their L1.

Second, although there should be a balance between the use of narrative and non-narrative texts for reading instruction, more effort could be put into training children in inferencing with informational articles. Content in informational texts are very often not linked in time but in other forms such as opposition, cause-and-effect and topic-and-example, which primary school students may not be familiar with, not to mention that the theme of an informational text itself may already be unfamiliar to the young L2 readers. Teachers may have to make an effort to teach students how to look for and identify different textual patterns in informational texts in order to facilitate their understanding and mental representation of the whole picture. Some literature does support the importance of identifying textual pattern in reading instructions and suggests ways to teach this (e.g. Mikulecky, 2011). And in the case of encountering an unfamiliar topic, readers may benefit from teacher's instruction to activate relevant background knowledge (Pulido, 2007).

Finally, I suggest revisiting the assessment policy and task design for reading training to emphasize the importance of reading for meaning in addition to reading for answering questions. At upper primary levels, at least, attempts could be made to assess students' reading abilities through higher-order thinking tasks which can reflect how much they can infer from the text, rather than merely testing how much factual information they can find directly from a given passage. Even though efficient and proficient readers may have their top down, interactive, and bottom-up skills developed (see e.g. Hedgcock & Ferris, 2009; Hudson, 2007), earlier experimental studies by Alderson and Lukmani (1989) and Alderson (1990) have suggested that lower-level skills of reading are not necessarily a prerequisite for the higher-level skills. Language teachers, then, should not be restricted by the thought that the students need to learn reading for specific information before learning cognitive reading skills. The dominance of literal questions in test papers, worksheets and lessons could deprive the students of the chance to apply their cognitive skills in reading, hindering the development of their competence in reading for deep meanings.

6 Conclusion

This study offers insights into the inferencing behaviour of ESL learners. Qualitative data were analyzed from the think-aloud protocols of nine primary school participants, collected through think-aloud sessions. To answer the primary research question on the students' ESL inferencing behaviour in reading, it was observed from the analysis that their use of bridging and global inferences was particularly limited, especially with the informational article. In general, the students did not show strong evidence of a habit of making meaning for coherence and global understanding with the English texts given. This could be attributed, among other possible causes, to their poor choice of strategy and lack of training. With respect to the implication for teaching, I have argued here that language teachers are responsible for training the students to be skilled readers, and that classroom intervention could help in this regard. Several pedagogical measures have been suggested and elaborated, including the teaching of textual patterns of informational articles and a shift in the task designs for teaching and assessing towards the higher-order end.

However, one may need to interpret the findings presented in this report with caution. As with other related qualitative studies, especially case studies, the pattern of thoughts depicted by the students' responses may only be viewed as hypotheses, as they were generated from the data of a relatively small sample. It would be exciting if the present study could be repeated with a much bigger group of participants. Follow-up studies could be done, focusing on the process and effec-

tiveness of inferencing training in the L2 environment to prove the validity of the arguments presented.

While language teachers in different professional contexts will interpret the findings and discussions in this study from their own perspectives against their teaching contexts, cultural background and experience, this study sheds light on the direction of the English reading curriculum of the participating school and provides teachers of reading who serve in other contexts with some theoretical and practical insights into inferencing for reading comprehension. The results of this study provided me with the basis to carry out my action research and initiate a school-based reading scheme with success to date.

Notes

¹ The term “informational text” is adopted by the Curriculum Development Council (2004) of Hong Kong to refer to the English articles that are non-literary, non-imaginative and non-persuasive, whereas in research papers on reading comprehension, the term “expository text” is often used to refer to the same type of texts.

References

- Alderson, J. C. (1990). Testing reading comprehension skills (Part one). *Reading in a Foreign Language*, 6, 425–438.
- Alderson, J. C., & Lukmani, Y. (1989). Cognition and reading: Cognitive levels as embodied in test questions. *Reading and Writing: An Interdisciplinary Journal*, 5, 253–270.
- Bernhardt, E. B. (1991). A psycholinguistic perspective on second language literacy. *AILA Review*, 8, 31–44.
- Bernhardt, E. B. (2005). Progress and procrastination in second language reading. *Annual Review of Applied Linguistics*, 25, 133–150.
- Block, E. (1986). The comprehension strategies of second language readers. *TESOL Quarterly*, 20(3), 463–494.
- Block, E. (1992). See how they read: Comprehension monitoring of L1 and L2 readers. *TESOL Quarterly*, 26(2), 319–343.
- Cain, K., & Oakhill, J. V. (1999). Inference making ability and its relation to comprehension failure in young children. *Reading and Writing: An Interdisciplinary Journal*, 11, 489–503.
- Carrell, P. L. (1982). Cohesion is not coherence. *TESOL Quarterly*, 16(4), 479–488.
- Cromley, R. A., & Azevedo, R. (2007). Testing and refining the direct and inferential mediation model of reading comprehension. *Journal of Educational Psychology*, 99(2), 311–325.
- Curriculum Development Council (2004). *English language education key learning area: English language curriculum guide (Primary 1-6)*. Hong Kong: The Education and Manpower Bureau, HKSAR.
- Duke, N. K., & Pearson P. D. (2008/2009). Effective practices for developing reading comprehension. *Journal of Education*, 189 (1/2), 107–122.
- Ericsson, K. A., & Simon, H. A. (1999). *Protocol analysis: Verbal reports as data*. (3rd rev. ed.). Cambridge, MA: The MIT Press.
- Frestl, E. C., & von Cramon, D. Y. (2001). The role of coherence and cohesion in text comprehension: An event-related fMRI study. *Cognitive Brain Research*, 11, 325–340.
- Laing Gillam, S., Fargo, J. D., & St. Clair Robertson, K. (2009). Comprehension of expository text: Insights gained from think-aloud data. *American Journal of Speech-Language Pathology*, 18(1), 82–94.
- Grabe, W. (2009). *Reading in a second language: Moving from theory to practice*. Cambridge: Cambridge University Press.
- Grabe, W., & Stoller, F. L. (2002). *Teaching and researching reading*. Essex: Pearson Education Limited.
- Halliday, M. A. K., & Hasan, R. (1976). *Cohesion in English*. London: Longman.
- Hedgcock, J. S., & Ferris, D. R. (2009). *Teaching readers of English: Students, texts, and contexts*. New York: Routledge.
- Hudson, T. (2007). *Teaching second language reading*. Oxford: Oxford University Press.
- Katalin, E. (2000). “Please, keep talking”: The ‘think-aloud’ method in second language reading research. *Novelty*, 7(3).
- Keene, E. O., & Zimmermann, S. (2007). *Mosaic of thought: The power of comprehension strategy instruction*. (2nd ed.). Portsmouth, NH: Heinemann.
- Kembo, J. A. (2001). Testing of inferencing behaviour in a second language. *International Journal of Bilingual Education and Bilingualism*, 4(2), 77–96.
- Kispal, A. (2008). *Effective teaching of inference skills for reading* (Research report DCSF-RR031). Slough: National foundation for Educational Research..

- Krashen, S. (2013). Should we teach strategies? *Electronic Journal of Foreign Language Teaching*, 10(1), 35–39. Retrieved from <http://e-flt.nus.edu.sg/v10n12013/krashen.pdf>
- Kucan, L., & Beck, I. (2003). Inviting students to talk about expository texts: A comparison of two discourse environments and their effects on comprehension. *Reading Research and Instruction*, 42(3), 1–31.
- Laing, S. P., & Kamhi, A. G. (2002). The use of think-aloud protocols to compare inferencing abilities in average and below-average readers. *Journal of Learning Disabilities*, 35(5), 437–448.
- Law, Y. K. (2008). Chinese children's constructive activity and text comprehension. *Journal of Research in Reading*, 31(4), 379–403.
- Lee, H. C. (2013). Thinking matters: Inferencing in ESL reading lessons. *TESOL Journal*, 4(4), 717–742.
- Liang, L. A., & Dole, J. A. (2006). Help with teaching reading comprehension: Comprehension instructional frameworks. *The Reading Teacher*, 59(8), 742–753.
- McAlpine, R. (2005). *Global English for global business*. Wellington: C C Press.
- Mckeown, R. G., & Gentilucci, J. L. (2007). Think-aloud strategy: Metacognitive developing and monitoring comprehension in the middle school second-language classroom. *Journal of Adolescent and Adult Literacy*, 51(2), 136–147.
- Mikulecky, B. S. (2011). *A short course in teaching reading: Practical techniques for building reading power* (2nd ed.). White Plains, NY: Pearson Longman.
- Nassaji, H. (2004). The relationship between depth of vocabulary knowledge and L2 learners' lexical inferencing strategy use and success. *The Canadian Modern Language Review*, 61(1), 107–134.
- Nielsen, J., Clemmensen, T., & Yssing, C. (2002). Getting access to what goes on in people's heads?: Reflections on the think-aloud technique. In *Proceedings of the Second Nordic Conference on Human-Computer Interaction, Aarhus, Denmark* (pp. 101–110). New York: ACM Press.
- Nuttall, C. (1996). *Teaching reading skills in a foreign language*. Oxford: Heinemann.
- Pressley, M., & Afflerbach, P. (1995). *Verbal protocols of reading. The nature of constructively responsive reading*. New Jersey, NJ: Lawrence Erlbaum Associates.
- Pulido, D. (2007). The effect of topic familiarity and passage sight vocabulary on L2 lexical inferencing and retention through reading. *Applied Linguistics*, 28(1), 66–86.
- Salataci, R., & Akyel, A. (2002). Possible effects of strategy instruction on L1 and L2 reading. *Reading in a Foreign Language*, 14(1), 1–17.
- Singer, M. (1994). Discourse inference processes. In M. A. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 479–515). San Diego: Academic Press.
- Singer M., Andrusiak, P., Reisdorf, P., & Black, N. L. (1992). Individual differences in bridging inference processes. *Memory & Cognition*, 20(5), 539–548.
- Singer, M., Harkness, D., & Stewart, S. T. (1997). Constructing inferences in expository text comprehension. *Discourse Processes*, 24(2-3), 199–228.
- Smith, F. (2004). *Understanding reading* (6th ed.). Mahwah, NJ: Lawrence Erlbaum.
- Time For Kids (2009). *Time for kids: Almanac 2010*. New York: Time For Kids Books.
- Trabasso, T., & Magliano, J. P. (1996a). Conscious understanding during comprehension. *Discourse Processes*, 21(3), 255–287.
- Trabasso, T., & Magliano, J. P. (1996b). How do children understand what they read and what can we do to help them? In M. Graves, P. Van Den Brock, & B. Taylor (Eds.), *The first R: Every child's right to read* (pp. 160–188). New York: Teachers College Press.
- Upton, T. A. (1997). First and second language use in reading comprehension strategies of Japanese ESL students. *TESL-EJ*, 3(1). Retrieved from <http://www.tesl-ej.org/wordpress/issues/volume3/ej09/ej09a3/>
- van Someren, M. W., Barnard, Y. F., & Sandberg, J. A. C. (1994). *The think aloud method: A practical guide to modelling cognitive processes*. London: Academic Press.
- Vieiro, P., & Garcia-Madruga, J. A. (1997). An analysis of story comprehension through spoken and written summaries in school-age children. *Reading and Writing: An Interdisciplinary Journal*, 9, 41–53.
- Winne, P. H., Graham, L., & Prock, L. (1993). A model of poor readers' text-based inferencing: Effects of explanatory feedback. *Reading Research Quarterly*, 28(1), 52–66.
- Wright, A. (2003). *Storytelling with children*. Oxford: Oxford University Press.
- Zhang, L., & Seepho, S. (2013). Metacognitive strategy use and academic reading achievement: Insights from a Chinese context. *Electronic Journal of Foreign Language Teaching*, 10(1), 54–69. Retrieved from <http://e-flt.nus.edu.sg/v10n12013/zhang.pdf>
- Zhang, L. J., Gu, Y. P., & Hu, G. (2008). A cognitive perspective on Singaporean bilingual children's use of reading strategies in learning to read in English. *British Journal of Educational Psychology*, 78, 245–271.

Appendices

Appendix A

Instruction for think-aloud sessions

Thank you for taking part in this study. We will conduct the session in Cantonese.

This study tries to reveal what is going on in your head while you are reading some English texts. This is to help me design lessons to help students read English better. What we will be doing now will not negatively affect your school results.

We will now do a “self-talk” activity. In a moment, I will give you two short English passages to read. One of them is a story, and the other piece is an expository text. I will show you line by line.

While you are reading, what you have to do is to try to read out whatever is in your mind. You may do it in Cantonese or English. You speak as if you are explaining the text to yourself to make you understand the piece as completely as possible. Your talking may involve some guessing, predicting, inferencing, linking, clarifying, commenting, criticizing, questioning and so on. Please try to make yourself understand the text thoroughly.

Do not talk to me during your talking. Treat it as if I was not there.

Now, I will do a demonstration. See how I do it with this sample text.

Appendix B

The travelers and the bear (Adapted from Wright, 2003, p. 191)

- Two men were walking in a forest.
- Suddenly a bear came.
- One man ran and climbed up a tree.
- The other man couldn't run and couldn't fight the bear by himself so he lay on the ground.
- The bear came to the man and smelled his head. Then the bear went away.
- ‘What did the bear say?’ said the man in the tree, smiling.
- The man on the ground said, ‘The bear said, “Is he your friend? Why did he leave you?”’

Appendix C

Green buildings (Adapted from Time For Kids, 2009, p. 37)

- Green buildings are not new.
- For thousands of years, humans built houses with natural things.
- Those houses did not use power or hurt our earth in any way.
- Before the 1930s, most buildings used far less power than today's buildings.
- They did not have air-conditioning.
- However, people at that time burnt coal for heating.
- That caused a lot of smoke and that polluted the air.
- So, after 1970s, many countries around the world made laws to ask builders to stop or control the smoke coming out from buildings.

Appendix D

Sample of a coded think-aloud protocol with rubrics

Think-aloud protocol (On narrative text; introspective data only; transcribed from Cantonese)

Participant (P): Geoffrey, 6A

Researcher (R)

Code	P/R	Utterance	Time	Remarks
Instruction, modeling, and data from informational text skipped.				
	R	<i>Is it a difficult thing to do?</i>	6:11	
	P	<i>No?</i>		
	R	<i>No, ok, now we have a second one. Ready, start.</i>		
5	P	<i>The travellers and the bear.</i> Perhaps I have read this story before.	6:17	Title revealed.
	R	<i>Doesn't matter. What's in your mind?</i>		
5	P	Perhaps it talks about a few people travelling,		

5 5 5		or having <i>adventures</i> and they met a bear. And they might be attacked or so. I don't know.		
6 6 1, 5	P	It says there were two <i>travellers</i> . And they were in the <i>forest</i> . Perhaps because it says ' <i>and the bear</i> ', they might be attacked by a bear!	6:37	1 st line revealed.
1 6 3 3 3	P	It's true. They were walking and suddenly a <i>bear</i> jumped out. Maybe it tripped over something and fell out, or it wanted to attack, or it was hungry.	6:47	2 nd line revealed.
6 5 5 1	P	There was a man and he ran and climbed up to the tree. But he shouldn't be fast enough. It's hard. I wonder how the other one was.	6:59	3 rd line revealed.
6 5 5 5 6 5 5	P	And the other man, I mean he couldn't run. He should be at the same time. Perhaps the bear was nearer to him. Or he was more scared. And he couldn't...I mean <i>fight</i> , I mean he couldn't fight against the bear, and so he lay on the ground. But what was the use lying on the ground? To be eaten by it? I mean / perhaps / I mean they were having an adventure and they should be bringing weapons to protect themselves.	7:13	4 th line revealed.
6 1 6 3 6 3 3 3	P	<i>The bear</i> walked to the man, one of the <i>adventure / travellers</i> . It smelled his head. Why smelling? I don't know. It wanted to kiss him? But then the <i>bear</i> ran away. Was it because it thought he was dead, or it was too smelly, or it was not interested? I don't know.	7:48	5 th line revealed.
6 6 3 3	P	Then that man, that man on the tree said with a smile, 'What did the bear say?' It probably was to make fun of him. Because the bear smelled his head and it looked like talking to him so he made fun of him.	8:11	6 th line revealed.
6 1 6 4 3 3, 4 3, 4	P	That man, the one lying on the ground said, 'He' / ' <i>Is he</i> ', that means the one on the tree, is he you friend? Is he really / Why did he leave you?' It means it wasn't what the <i>bear</i> said. It was to mock at the man, telling him that he actually thought that the one climbed up the tree wasn't his friend. Because he abandoned him and only cared out himself but not him. That's it.	8:27	7 th line revealed.
	R	<i>Very good. Thank you very much.</i>		
Post-reading interview skipped.				

Codes definition:

1.	Bridging	Linking to information from a previous line.
2.	Global inference	Information summed up from several lines.
3.	Explanation	Serving to explain matters.
4.	Elaboration	Expanding the immediately relevant information from the line.
5.	Association (including questioning)	Drawing from background knowledge to give comments.
6.	Paraphrase	A mere translation or paraphrasing.
	(No coding)	<ul style="list-style-type: none"> ● Incomplete utterance in terms of meaning. ● A repetition of the sentence already made. ● A mere reading aloud of the line from text in English. ● A personal comment to the text content without any explicit demonstration of inferential understanding.

Denotations:

<i>Words in italics</i>	Words spoken in English
...	Brief hesitation
(pause)	Longer stop
/	Immediate self-correction
[bracketed words]	Intended words
(indiscernible)	Utterances believed to be with meaning but not understandable
(grammar error)	Utterances contain grammatical problems
(mumbling)	Sounds of mumbling