# A STUDY ON THE DEVELOPMENTAL CHARACTERISTICS OF HONG KONG PRIMARY STUDENTS' ABILITY TO INTEGRATE TEXTUAL INFORMATION IN NARRATIVE TEXT READING

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# A Study on the Developmental Characteristics of Hong Kong Primary Students' Ability to Integrate Textual Information in Narrative Text Reading

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# CERTIFICATE OF ORIGINALITY

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# Abstract

Integration is one of the key constituents of students' reading ability. However, systematic investigations have rarely been reported in this field worldwide. As international assessment programmes (e.g. PIRLS) and local public examinations (e.g. Hong Kong Territory-wide System Assessment) on reading have shown that Hong Kong primary students' integration ability in reading is yet to be developed, it is of great theoretical and practical importance to get a deeper understanding of this ability. Therefore, the aim of the present study is to explore the developmental characteristics of Hong Kong primary students' integration ability in reading and factors that influence the development. The present study was conducted among Grade 4 and Grade 6 students in Hong Kong who were at the stage of "read to learn". Using narrative as a sample genre, the present study aims at finding out: (1) what are the characteristics of integration performance of Hong Kong Grade 4 and 6 primary students in reading narrative text? (2) What are the differences between integration performance of Grade 4 and Grade 6 students? (3) What are the differences between integration performance of boys and girls? (4) What are the factors that influence the development of students' integration ability in reading?

To answer the research questions, the present study adopts multiple methods to triangulate the findings, including reading integration test, semi-structured interviews with teachers and students and student questionnaire survey. Specifically, a "six integration skills" is first proposed, which includes identifying a referent of pronoun (IRPN), identifying relationships between adjacent sentences (IRS), identifying main

idea (IMI), identifying relationships among paragraphs (IRP), abstracting specific information (ASI) and summarising the whole text (SWT). A reading integration test was then designed according to these skills and 352 Grade 4 students and 371 Grade 6 students participated in the test. Upon completion of the test, all participants completed a questionnaire designed to investigate potential factors that influence the development of students' integration ability. In addition, the researcher interviewed 24 students to explore the process of how they answered items in the test and 7 teachers were selected randomly for interviews to investigate teachers' perceptions of students' integration ability development and their teaching methods.

The present study has reached some conclusions based on the statistical analysis of quantitative data and text analysis of qualitative data. The major findings are: (1) Primary students in Grade 4 and Grade 6 have attained preliminary integration ability in reading but still have room for further development. Students in both grades performed best in IRS and worst in ASI; (2) In general, students in both grades performed better in integration skills relying on "straightforward inference" (IRS, IRPN and IMI) than in those skills requiring complex inference and language transformation (IRP, ASI and SWT); (3) Grade 6 students performed significantly better in individual integration skills than Grade 4 students. Compared with Grade 6 students, Grade 4 students were unable to identify complete information referred by pronouns and had difficulties in identifying the relationships between adjacent sentences and between paragraphs and locating topic sentences. Also, Grade 4 students were not capable of summarising specific abstracted information in a complete and brief way. Therefore, Grade 4 students performed worse in terms of complicity and accuracy in integrating information of the whole text than Grade 6

students; (4) In general, girls performed better than boys in total integration score and individual integration skills, which indicates that girls' develop their integration ability earlier than boys. However, boys may gradually catch up with girls' performance in some easier skills such as IMI and IRS; and (5) Three factors play important roles in development of students' integration ability in reading, use of reading strategy, extensive reading and reading attitude.

In sum, the present study has revealed some developmental characteristics of students' integration ability in the context of Chinese teaching. A series of implications of Chinese curriculum, teaching and assessment are drawn from the results of this study in order to improve students' integration ability.

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# Content

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# Chapter 1 Introduction

The ability to read is being valued more than ever before because knowledge has become the great source of individual development nowadays. This poses new demands for readers. Students are able to meet the challenges of society only when they possess good reading skills and ability. Elementary education is the crucial phase where people receive training in reading and development of reading ability influences their academic and career future (Knighton & Bussière, 2006; Bertschy, Cattaneo & Wolter, 2009). Additionally, it demonstrates a country's competiveness to have a wealth of talents who are effective and efficient readers (Mullis, et al., 2009). The ability to integrate in reading, among many others, is essential to the overall reading capacity and has in recent years received an increasing amount of attention in teaching and research fields.

## 1.1 Background of research

### 1.1.1 The ability to integrate is important in reading

Reading involves a combination of multiple skills, in the process of which a reader identifies literal meanings of words and phrases, integrates sentences and ideas (e.g., understanding relationships between sentences and summarising passage meanings) and establishes connections between text information and personal experience (e.g. Kintsch,1988; 1998; Irwin, 2007; Gunning, 1998). Skills related to identification of letters and words in text are referred to as basic reading skills, while those that concern the understanding of concepts and ideas conveyed by the text are termed higher level skills, and integration is widely considered as one of higher level skills (Rapp, et al., 2007).

Extant research has showed that all sorts of integration abilities play important roles in reading comprehension. At the sentence level, Dewey (1933/1963) believed a crucial step in successful understanding is the identification of meaningful relations. Graesser, McNamara & Louwerse (2003) regarded sentence integration as "a cornerstone of comprehension" (P82). At the whole-text level, van den Broek, et al. (2003) suggested that the ability to integrate "is central to reading comprehension" (P707). Li & Zhang (2001), in particular, identified that one of the reasons for low comprehension level in reading was the lack of or low proficiency in summarisation skills. In short, Cain, Oakhill & Bryant (2004) suggested that integration, as one of the higher level abilities, entails identification of meaning of the text as a connected whole rather than as a series of individual words and sentences, which is the foundation to grasping and transferring knowledge from text to life. It is thus fair to believe that the ability to integrate reflects the extent of comprehension in reading.

### 1.1.2 The ability to integrate is valued internationally in the teaching and assessment of reading

Many researchers have highlighted the value of teaching students the ability to integrate. Torgesen (2006) argued that the teaching of reading should begin from identification of words and phrases and gradually move up to higher-level skills, i.e. summarising ability. Xia (2001) believed that in teaching focus should be on the skills to identify or summarise the main ideas of text in primary school. These suggestions have all shed light on practical teaching and assessment.

The importance of integration ability is also reflected by the requirements of curriculum. Many countries and regions have issued guidelines for curriculum since the beginning of the 21$^{st}$ century and most of these curricula have stressed cultivation of the integration ability.

In China, according to the Chinese curriculum standards for compulsory education (2002, 2011) in mainland China, students in primary schools are required to develop a series of progressive skills of integration. For instance, Grade 3 and Grade 4 students are supposed to have a preliminary understanding of the main idea of a text while Grade 5 and Grade 6 students need to "understand the plot of a story and describe the most impressive scenes, characters and details briefly" (Ministry of Education, PRC, 2002, 2011). The higher the grade is, the more complicated are the skills of integration required.

Similarly, Hong Kong has been promoting and implementing an ability-oriented curriculum since the educational reform in 2001. It is stated that Grade 4 to Grade 6 students are required to understand simple and easy text, summarise the main idea, identify writing craft and recognise the theme of a text (Curriculum Development Council, 2004). These skills are also related to integration.

Another example is the common core standards launched in 2010 by education department of United States. This standard highlights four aspects of reading literacy that are worth teaching: Key ideas and details, Craft and structure, Integration of knowledge and ideas, Range of reading and level of text complexity (Council of Chief State School Officers & National Governors Association., 2010). All but the last are closely related to the ability to integrate in reading.

Attention needs to be paid not only to teaching but also assessment. Progress in International Reading Literacy Study (PIRLS) is a longitudinal, regular, international programme for assessment of reading literacy, held by the International Association for the Evaluation of Educational Achievement (IEA). It assesses four abilities in students: Focus on and retrieve explicitly stated information, Make straightforward inferences, Interpret and integrate ideas and information and Examine and evaluate content, language and textual elements (Mullis, et al., 2009).

Another internationally renowned programme is the Programme for the International Student Assessment (PISA) by the OECD. It is held every three years since 2000 and evaluates performance in maths, science and reading. For reading, abilities to access and retrieve, integrate and interpret, reflect and evaluate are assessed (OECD, 2009).

The National Assessment of Educational Progress (NAEP) in the US is another assessment programme for primary and secondary schools on a periodic basis, also referred to as the Nation's Report Card that reports the learning progress of students in all subjects. For reading, it assesses Grade 4, 8 and 12 students on three dimensions: locate/recall, integrate/interpret and critique/evaluate (National Assessment Governing Board, 2008).

A review of the major reading curricula and frameworks of assessment around the world leads to the conclusion that the ability to integrate has been recognised as a central ability in reading and its development in students is of paramount importance.

### 1.1.3 The need to enhance students' ability to integrate

Despite the recognised importance discussed above, students in primary schools are nevertheless either lack the ability or are not reaching the desired levels, as has been documented in a series of studies.

In China, a study in the 1990s revealed that a large proportion of students failed to conclude the main idea of a paragraph or a text; most students could not describe the characters and objects briefly even though they demonstrated an understanding of them. A national study in China in 1997 also suggested that primary school students have low levels of analytical, synthesising and summarising abilities (Xue, 2008). The limited integration ability hinders learning of knowledge and understanding of the world (Zhi, 1992). A similar problem exists in primary schools in Hong Kong also.

Although they achieved excellent performance in PIRLS2011, they still demonstrated less "advanced" reading skills than Singapore and Finland. Also, girls in general did better than boys and the performance gap between the two genders was larger than in PIRLS 2006. The main difference was found in interpreting, integrating and evaluating (Mullis, Martin, Foy and Drucker, 2012).

Territory-wide System Assessment, a local assessment programme for assessing students' basic academic abilities in Hong Kong, has identified some difficulties that students encounter in integrating in reading: (1) Students' performance in summarising the main idea is below expectations. (2) Students are unable to identify the main topic and theme of a text and the common mistakes are choosing segments as the main ideas of paragraphs, or just copying sentences in the text, or confusion about meaning of different paragraphs (HKEAA, 2010). That said, developing students integration ability remains critical.

One of the causes of students' difficulties is the low efficacy of teaching in the reading classroom. National Reading Panel (2000) specified that traditionally, paradigms in reading comprehension have asked students to identify obvious answers in the texts they read, to a list of questions, which requires low-level reading skills. The same applies to Hong Kong's classrooms. Teaching of reading comprehension in Hong Kong was "heavily dictated by teacher handbooks and guides for commercially produced textbooks" and "decoding the textbook passages was considered to be the main objective" (Tse, 2009).

As suggested by existing literature, classroom questions that teachers ask are mostly retelling-related, which does not fulfill the requirements for developing integration ability (Zhu, 2009). PIRLS 2006 also discovered that reading teachers in Hong Kong tended to focus less on following reading strategies than the world average did: explaining or supporting their understanding, identifying main ideas and

making generalisations and drawing inferences (Mullis, et al., 2007), latter two of which are directly related to the integration ability and hence the hindrance in the development.

Another cause lies in the fact that some teachers do not acquire enough knowledge of integration ability and how to teach this ability. Some teachers are used to teaching low-level abilities and face challenges to adjust the approaches of teaching, while others go for the other extreme and abandon some practices in the past, such as grouping paragraphs and summarising main ideas, believing it is the requirement of the educational reform (Zhou, 2009; Li, 2009). In brief, integration ability has drawn international attention in research and literacy teaching, but at the same time, it is also one of the most difficult abilities to learn (HKEAA, 2007-2010; van den Broek et al., 2003). That said, exploring the characteristics of the development of students' integration ability bears theoretical and pedagogical significance.

## 1.2 Research scope

### 1.2.1 Scope establishment

The present study was conducted within primary schools. Primary education lays the foundation for an individual's growth. It is the golden period when a student develops physical and intellectual abilities rapidly, including comprehension and communication skills through language study. In the case of Hong Kong, Chinese language, the mother tongue of many, is central in one's primary school education.

Components of Chinese language learning and teaching are listening, speaking, reading and writing, among which, reading is essential to the enhancement of Chinese language ability. It is the foundation for studying other subjects and hence for the overall education.

Regarding students' reading literacy, multiple dimensions are included, such as comprehension ability, interest in reading and social interaction (Mullis et al., 2009; OECD, 2009). Reading comprehension is considered as the central dimension (Gambrell, et al., 2007). Therefore, the core of reading instruction is to enhance students' comprehension ability.

Among the various components of reading comprehension ability, integration ability is an important part as it allows readers to construct a stable structure based on meaningful integration of text meanings. As a result, this research intends to investigate ways to improve students' integration ability, given the less than satisfactory status in the classroom.

### 1.2.2 Terms and definitions

#### Reading

A broad definition of reading is the interpretation of all symbols from astronomical signs to animal traces, musical notes, cartographic markers, etc. (Downing & Leong, 1982). Gibson and Levin (1975) defined reading as "extracting information from the text." Note that the "text" here refers to textual materials, graphs and tables, etc. However, in most cases, reading is used in a much narrower sense that refers only to the interpretation of textual materials.

Reading is more than just looking at the words. Bartless (1932) argued that reading comprehension is a "process of striving for meaning". Perfetti (1995) pointed out that reading is thinking guided by printed text. Kamhi (2007) believed that reading is a complex of higher-level mental processes that include thinking, reasoning, imagining and interpreting. Based on these arguments, reading is a combination of looking from outside and cognitive processing from inside.

Goals always accompany reading. Britton & Black (1985) believed that reading

involves a process of solving problems, in which readers understand the text using effective strategies under certain tasks. National Reading Panel (2000) suggested that readers derive meaning from text when they engage in intentional, problem solving thinking processes.

Reading is a social activity and is believed to be intentional thinking during which meaning is constructed through interactions between text and reader (Harris & Hodges, 1995). That said, it is a socialisation process when readers construct meanings through reading. In summary, reading in this research is defined as the process where readers conduct a series of cognitive activities, including making reference, integrating and interpreting, to construct the meaning of text.

**Process of reading**

Existing literature describes reading as a bottom-up process where readers start with words and gradually work up to the whole text. Cain (2009) said that readers need to recognise each word and its meaning, then link this information with syntactic knowledge to make meaningful sentences and integrate the meanings of each sentence to construct a coherent and integrated representation of its meaning. Psychologically, this process is also regarded as a "memory-based" process which believes that readers' comprehension relies on continually retrieving information from text and then activating the relevant information from working memory and long term memory accordingly. By constantly building connections between the newly incoming information and the information in the memory, readers are able to construct a network of ideas and adjust this network when moving forward (Gerrig & McKoon, 1998).

On the other hand, reading has also been regarded as a top-down process where readers need to actively and constructively search for meaning as they read in order to

acquire in-depth understanding of the text (Graesser, Singer & Trabasso, 1994). This conception considers the reader's pre-set goals or presumptions are at the "top", for which evidence "down" from the text will need to be found.

Kintsh (1988, 1998) proposed a synthesised framework from the perspective of psycholinguistics, that is, the "construct-integrate" model. The "construct" is the first phase in which readers build a representation consisting of a set of hierarchical propositions varying in importance or a network of propositions. This representation is also called as "text-base". The "integrate" is the second phase in which readers integrate the context-related concepts and de-activate irrelevant concepts. This process results in a greater activation of concepts linked to other concepts, and a loss of activation of peripheral concepts that have fewer connections to other concepts in the mental representation. The two phases interact with each other to form an integrated and coherent representation of the whole text.

In brief, regardless of the approach (i.e., top-down or bottom-up), readers recognise the literal information and combine it with personal knowledge and experience for further interpretation and evaluation. Zhu (2005) suggested that readers employ six skills in reading: retelling, explaining, integrating, expanding, evaluating and creating, among which, integrating plays an important role in the comprehension process.

Therefore, this research regards the reading process as the cognitive activities conducted in reading. It is a dynamic and interactive process that can be from words to the whole text (as in bottom-up) or from a presumption or a pre-set goal onwards.

**Integrating**

Dictionaries define "integrate" as to combine one thing with another so that they become a whole (Pearsall, 1998), which says enough about how combining is a big

part of integrating.

Psychologically speaking, integrating is the process of distilling knowledge down to its key characteristics, organised in a parsimonious, generalised form (Marzano & Kendall, 2007). This definition reveals that integrating contains the psychological processes of analysing, rearranging and extracting commonalities from information, etc.

In the context of reading, integration has been defined in different ways. From the point of view of reading assessment, OECD (2009) emphasises that integrating involves first inferring a relationship within the text (a kind of interpretation) and then bringing pieces of information together, thereby allowing an interpretation to be made that forms a new integrated whole. This definition indicates that integration includes multiple cognitive activities and the scope of integration ranges from textual relationship to content of text.

Kintsch (1988, 1998) suggested that integration refers to the spreading of activation across the network until it settles. In this process, readers activate the concepts linked to others while at the same time depress the less linked ideas. However, he stressed that readers have to form a firm understanding of the textual meaning ("text base") before integrating the text information and, therefore, his definition tends to prefer the integration between readers' personal experience and knowledge and textual information.

Gagné et al. (1993), on the other hand, believed that integration is necessary for producing a more coherent declarative representation of ideas in the text. By connecting two or more ideas, integration can occur within a complex sentence, across sentences and even across paragraphs. Compared with Kintsch's definition, Gagné et al. (1993) tend to agree that integration happens within the text and doesn't involve readers' personal experience. Furthermore, compared with PISA, Gagné et al.

(1993) regards “integration” and “summarisation” as two different processes involving inference, while PISA agrees that integration includes summarisation according to the above definition.

In summary, it is concluded that different kinds of integration take place during reading. Normally, it not only aims at combining textual information but also textual information and personal knowledge. This research focuses on the integration of text information for a more in-depth study. In view of the definitions proposed by PISA and Gagné et al. (1993), integration in this research refers to the identification of relationships within the text and the summarisation of textual information in order to form larger, fuller and superior concepts.

**Narrative**

Definitions of narrative vary. Generally speaking, narrative is the representation of an event or a series of events (Abbott, 2008).

To be more specific, Heath and Branscombe (1986) argued that narratives are expressions of event-based experiences that (a) are either stored in memory or cognitively constructed, (b) are selected by the writer to transmit to the reader, and (c) are organised in knowledge structures that can be anticipated by the audience.

Most narratives are constructed with a goal-based structure. Yopp & Yopp (2000) proposed basic elements of a narrative: narrative texts have characters, have a plot and setting, are temporally ordered and are goal-based. Ryan (2007) suggested that narrative is about problem solving, conflict, interpersonal relations, human experience and temporality of existence. Besides, a number of theories on the organisation of narratives, also known as “story grammar”, have been proposed (e.g., Thorndyke, 1977; Stein & Glenn, 1979; Mandler, 1987).

In a word, narrative is a genre that consists of events that mainly states personal

experience or the development of certain things.

## 1.3 Research goals and objectives, questions, and significance

### 1.3.1 Research goals and objectives

This project was a multi-layered, multiple-case study conducted in years 2010 to 2014. Typical schools and grades were sampled randomly for the administration of tests, questionnaire survey and interviews. The focus is the characteristics of integration ability in reading among the 4th and 6th graders, in order to reveal the ways students develop this ability.

To explore deeply, international literature on integration ability was reviewed and research instruments with high validity were developed. Furthermore, as a research project conducted in local schools, the research outcome will also be shared with Chinese language educators in Hong Kong for enhancement of their work.

### 1.3.2 Research questions

The following are the research questions of the study:

(1) What are the characteristics of integration performance of Hong Kong Grade 4 and 6 primary students in reading narrative text?

(2) What are the differences between integration performance of Grade 4 and Grade 6 students?

(3) What are the differences between integration performance of boys and girls?

(4) What are the factors that influence the development of students' integration ability in reading?

### 1.3.3 Significance

1. To complete the reading assessment system of integration ability. Although integration ability is one of important abilities in primary schools, few specific frameworks seem to have been designed for teaching, learning or testing of it. Thus, by proposing the structure of integration ability, this project provides more theoretical insights into integration ability that can be used for future teaching and research.

2. To reveal the development of integration ability among children in Hong Kong by investigating the characteristics of the ability across the sampled classes and schools. The outcome of this empirical study is expected to provide a profile of students' integration ability in reading and fill the research gap.

3. To suggest effective teaching strategies for enhancing students' integration ability in reading. Despite the fact that teaching of integration ability is of paramount importance for Chinese language teachers in Hong Kong, they currently lack teaching strategies to apply in classroom. Since the present study reveals developmental characteristics of integration ability as well as its influencing factors, teachers can gain more understanding on effective ways to teach integration ability.

4. To provide suggestions for curriculum development. Given the importance of integration ability, this project provides more specific suggestions on designing Chinese language curriculum in future.

## 1.4 Organisation of the thesis

The thesis is composed of the following six chapters:

Chapter 1 gives an introduction for this study. It introduces the background of this study with an emphasis on the importance of cultivation of reading literacy and highlights of the current students' problems in integration ability development. It then

sets the scope of research and defines the key terms and also states the research focus of this study.

Chapter 2 reviews the existing literature. It reviews a large body of literature on reading process, reading ability structure, structures of integration ability and reading ability development, which provides the basis for developing the conceptual framework and interpreting the results of this study.

Chapter 3 introduces the research design of this study. It first introduces in detail the theoretical framework of integration ability and then elaborates the procedure for developing research instruments and methods of data collection and analysis. The various indicators of quality of research instruments, such as validity and reliability, are also discussed in this chapter.

Chapter 4 describes integration ability development in grades. It analyses students' performance in integration ability tests in terms of grade difference and gender difference and further discusses developmental characteristics of students' ability to integrate textual information with reference to the available literature and student and teacher interviews.

Chapter 5 describes factors that influence students' integration ability. In order to gain deeper understanding of students' development of integration ability, this chapter discusses the effects of three factors, use of reading strategies, extensive reading and reading attitude.

Chapter 6 provides conclusions based on the results of this research and presents the major findings briefly and discusses implications for curriculum, instruction and assessment in reading.

# Chapter 2 Literature Review

## 2.1 The process of reading comprehension

The study of reading process attempts to unveil the complex and dynamic mechanism of thinking during reading. Findings will not only have pedagogical implications for secondary and primary schools' reading courses, but also lay the psychological grounds for advancing techniques like machine reading and artificial intelligence.

Bartlett (1932) conducted an experiment to examine the role of memory in reading process, which has been regarded in experimental psychology as the first rigorous cognitive research on text reading. Later, more researchers have proposed various models of the reading process since the 1980s when priming methods were brought in and tracking eye movements became possible.

Current studies on the reading comprehension process can be categorised into two streams, referred as "online" and "offline". The former focuses on the cognitive process during reading and the other is the psychological representation after reading. Van den Broek, et al. (2009) argued that there is a causal relation between the two: the constant processing of information during the reading comprehension lays the foundation for forming of offline text representation in the reader's mind/memory. In other words, no offline text representation is formed without effective online processing.

One of the common grounds established in the field is that the core of reading comprehension is the construction of a coherent representation of text in memory. The coherent mental representation is formed by integrating textual information and

readers' prior knowledge. It can be depicted as a network with dots of facts and events and linkages that build meaningful relations between them (e.g. Oakhill & Cain, 2007; Kintsch, 1998). The degree of how appropriate, meaningful connections are established between pieces of information from the text and the readers' prior knowledge is reflected by coherence. But in the process of reading, a number of factors such as readers' memory, text types and readers' personalities contribute in their own ways to construction of the mental representation and hence the various interpretations of what the process is really like are proposed from a variety of perspectives.

### 2.1.1 Memory-based processes

Memory plays an important role in the process of reading. Generally speaking, two kinds of memories are needed, the working memory which keeps information active in the brain during processing of information, and the long-term memory that stores prior knowledge in the mind, which can be story plots that the readers have already known, or individual knowledge and experience. Working memory is temporal and easily changeable, while long-term memory is comparatively stable, though it is constantly developing as well.

Regarding how the memories contribute to readers' comprehension, researchers who support "memory-based processes" argue that comprehension of the text is based on the information triggered from the memory (Gerrig & McKoon, 1998). In other words, comprehension of words, propositions and ideas can only be possible after they are deciphered and the relevant information in memory is activated. The activated information is temporarily stored in the working memory, which then signals the long-term memory and triggers a spread of activation through the reader's knowledge base. This spread of activation refers to how activated information sparks

another piece of information and connects with it. The process continues as the reading goes on. Active information that shares more commonalities with others is kept, whereas isolated information that fails to create linkage is usually discarded or depressed. Activation after activation, the reader gradually establishes a stable and complete reading representation in mind that constructs the meaning of the text. That is when the comprehension of the text is complete (McKoon,, Gerrig & Greene, 1996; Myers, & O'Brien, 1998).

Since the memorisation-based process emphasises that only when new information from words and sentences is acquired can the relevant memory in the long-term memory be activated, this process is also interpreted as a bottom-up process, which believes that comprehension begins with words and sentences and gradually reaches the understanding of the whole text (Gough, 1972; Singer and Ruddell, 1985). However, the term "bottom up" only reveals the path of eye movement during reading, so "memory-based" is more appropriate to describe the mental activities in this process.

The term "memory-based processes" describes the reading process as automatic and passive, where the spread of activation depends on the strength of the connection between the information stored in the working memory and that in the long-term memory. The "strength", however, is influenced by many factors. For instance, concepts in long-term memory that share features in common with the content of working memory are activated quicker (McKoon, Gerrig, & Greene, 1996). Besides, similarities among concepts (Collins & Loftus, 1975), existence of causal connections (e.g., O'Brien & Myers, 1987; Rrizzella & O'Brien, 1996), can both impact the activation.

On the other hand, disputes exist in discussions of the scale of the information activation. McKoon & Ratcliff (1992) proposed the Minimalist Hypothesis that

argues that readers maintain local comprehension and automatic inferences without connecting with information in the long term memory when the reader conducts no strategic, motivated, goal-oriented processing of the text. On the contrary, inference is made only when the reader fails to establish coherence between information (i.e. the absence of explicit relationships between adjacent sentences) and when they can extract information from the long-term memory easily (e.g. to access distant text).

Nevertheless, this hypothesis has been challenged by Myers, O'Brien and colleagues. They stress that information in the long-term memory is also activated non-strategically, passively and quickly during reading to establish the global coherence even when readers continually maintain local comprehension (Albrecht & Myers 1995; Mckoon & Ratcliff, 1998; O'Brien, Rizzella, Albrecht & Halleran, 1998). Empirical evidence also suggests that some distant information is activated during reading to respond to anaphoric reference (e.g., Dell, McKoon & Ratcliff, 1983). Albrecht and O'Brien (1993) also discovered that distal knowledge is reactivated even under conditions where there is local cohesion. A similar finding has been reported in the Chinese reading context also (Wong and Mo, 2004).

The memory-based theory demonstrates the importance of memory when readers retrieve the information from text and reveals the complicated internal activities of minds. However, the over-emphasis on memory leads to the ignorance of readers' creative thinking. For instance, in most cases, people can still read and comprehend text even when some unfamiliar words exist.

From the perspective of the "memory-based processes", integration can be regarded as the passive and automatic connection of information. This conclusion is correct to some extent. For instance, the process of identifying the referent of a pronoun in the text is often automated for a skilled reader. Yet, the passive and automatic connection obviously cannot go on when little relevantinformation is

provided in the text or when the reader has insufficient information stored in the long-term memory. In this case, readers can fail to activate or build connection and have to exert themselves to integrate.

### 2.1.2 Explanation-based processes

Contrary to the memory-based process, the theory of "explanation-based processes" puts emphasis on readers' activeness and strategic effort during the reading process. It is developed on the basis of Goodman (1967), who claimed that reading is a psycholinguistic guessing game where selecting, anticipating, testing and verifying are involved.

The "explanation" in this theory refers to the explanation of the text. Readers need to conduct a series of active, constructive processes of "search for meaning" during reading in order to acquire deep understanding of the text (Graesser, Singer & Trabasso, 1994).

To elaborate, the term "searching for meaning" includes two aspects. On the one hand, it is deeply rooted in readers' innate drive to explain all sorts of situations encountered in reading (Hilton & Slugowski, 1986; Schank, 1986). Readers constantly and repeatedly evaluate whether the available information is relevant and sufficient to explain what is encountered, particularly regarding causal antecedents, agent goals and causal relationships (Trabasso et al., 1989). Studies show that, for instance, useful information for comprehending the text is activated with a higher frequency than less helpful one (e.g. Goldman& Saul, 1990; Suh & Trabasso, 1993).

On the other hand, readers actively adjust their reading strategies according to the goals of reading, the guessing or anticipation, and they also monitor the consistency between the goals of reading and comprehension of the text. If the goal calls for a standard of comprehension dependent on sense making, then readers infer

in a way that supports the construction of a coherent situation model (i.e. local and global coherence). On the contrary, if a goal requires shallow processing (e.g., skimming through a text for key words), then readers do not make complex inferences to fulfill the text representation that is disconnected and incoherent. Zwaan (1994), for instance, discovered that readers set aside resources differently according to the genre of the reading text. Linderholm & van den Broek (2002) found through the "think-aloud protocol" that readers' inferences vary with different purposes of reading (i.e., for business or for pleasure). In most cases, readers also employ various strategies depending on the occasion or purpose of reading (e.g., vandenBroek, Lorch, Linderholm & Gustafson, 200l; van den Broek, Risden & Husebye-Hartman, 1995). In addition, readers hold different anticipations when experiencing the transition of time, or the happening of an event from the text (e.g. Rapp, Gerrig & Prentice, 2001), which may result in different products of reading.

Graesser, Singer & Trabasso (1994) argued that the "search for meaning" is a constant activity during reading regardless of how coherent the text is. Some later studies further found that readers not only always seek explanations from the text, but also update the text representation according to the new information acquired (e.g. Fletcher & Bloom, 1988; Bower, Morrowd., 1990). This indicates that readers' goals guide the processes of reading comprehension.

In all, the explanation-based perspective believes comprehension is formed based on readers' anticipation, guessing and imagination. So the meaning of the text is constructed rather than retrieved. That is why this theory is also named the Constructionist Theory. In addition, since readers always assume an upper goal for reading the text before searching for information to verify, this theory is also regarded as a "top-down" process of reading.

To the present research, this theory indicates that readers should make effort to

integrate instead of relying on automatic connection between ideas. Besides, it also suggests that students can use reading strategies to improve the effectiveness of integration.

### 2.1.3 Interactive model

As suggested earlier, neither of the previous theories, "memory-based" or "explanation-based", unveil the complete picture of what the reading comprehension process is really like. Factually, both theories are observed to happen simultaneously during reading comprehension. In an experiment by Van den Broek, O'Brien, Halleran and Kendeou, the effects of constructionist processing and memory-based processing during reading were examined. The texts presented to subjects varied in two aspects: (1) target sentences were followed with either a strong or a weak explanation; (2) a potential alternative explanation earlier in the text was either detailed or not. For the first variation, the data of reading speed showed that the subjects' understanding of the target sentences was influenced by the strength of explanations, indicating the effect of constructionist processing. For the second variation, subjects' availability of earlier information seemed to be influenced by the detailedness of explanations by measuring speed of recognition, indicating the effect of memory-based processing (cited from, van den Broek, Rapp & Kendeou, 2005). Therefore, reading is regarded more widely as an interactive process, but disputes exist in regard to how the interaction is conducted.

The Schema Theory

Bartlett (1932) was among the first to propose the term "schema" to describe the form of memory in understanding information, stating it as a mental framework. Rumelhart (1977) developed this argument and considered that reading comprehension is an interactive process based on the Schema Theory. The "schema"

in the theory refers to a structure that stores ordinary events and linguistic and discourse knowledge (please see Nassagi, 2007 for more definitions). For instance, readers can store a schema of the restaurants, the lectures or any other occasions or events that they have been to.

Rumelhart (1977) believed readers in order to comprehend the text have to combine the input from the text and the established knowledge in the schema together, which requires simultaneous application of both bottom-up and top-down approaches. What readers decipher from the text becomes either an empirical evidence of the relevant, known concepts or fills the gaps in the schema as new-in information. This is a bottom-up process. Then the top-down process promotes the assimilation of the input and the schema, if they are consistent with each other and if the input coincides with the anticipation made according to the schema. Otherwise, an accommodation process is needed to help readers understand new concepts by selecting reasonable information from the input and accounting established knowledge in the schema for an explanation.

The Schema Theory highlights the interactive relation between what is known to the reader and the text information. According to this theory, it is smoother to integrate information if the readers have acquired some relevant schemes, such as they can use the knowledge of text structure to produce the summary of the text.

The Schema Theory nonetheless falls short in two respects:

(1) It does not describe how readers' understanding of the text evolves and gains depth. Neither does it reveal how factors such as memory and text characteristics influence comprehension. (2) Despite its capacity to explain how readers understand heavily scripted events such as watching a movie and dining in a restaurant by assimilation, it fails to elaborate the complex process where readers "accommodate" unique, unscripted activities for their understanding.

Construction- Integration Model (CI Model)

Unlike its contemporary, schema-based models of comprehension, the CI model proposed by psychologists Kintsch and van Dijk focuses on processes and strategies during comprehension (e.g., Rumelhart, 1977; Schank & Abelson, 1977). It describes the iterative processes in mapping current discourse input to the prior discourse context, which is regarded now as central to reading comprehension.

According to Kintsch's CI model, the process of comprehension consists of two phases: construction and integration.

The construction phase is bottom-up and retrieval based, where the input activates automatically the relevant knowledge in reader's mind and constructs a primal, incoherent network of propositions. The representation formed in this stage is loosely structured and mixed with irrelevant information. Four potential sources of activation are at each cycle of input during construction: the current input (sentence or proposition), earlier sentence or proposition, relevant knowledge and possibly reinstatements from prior text.

The integration phase comes after the construction phase, spreading activation in a top-down manner across the network until it settles. This process leads to a greater activation for concepts that share more in common with other concepts and a less activation for distant concepts that are less linked to other concepts in the mental representation. Information activated during the construction phase is iteratively integrated. That way, a hierarchical, stable, coherent mental representation can be gradually formed.

Kintsch mentioned that the process of text comprehension is conducted in cycles, in elements of a phrase, a sentence or a passage. Some elements are kept in the working memory, for further processing with the new sentence, which results in

resonance among the sentence elements and coherence is obtained through reprocessing of propositions. The scale of the resonance decides the activation level of the resonating elements and consequently the coherence level with the rest of the elements. The description of the two phases – construction and integration – reveals more explicitly the processing mechanism of the mental activity than other theoretical models. With this theory, some of the reading phenomena can be explained. For instance, it takes longer to read a structurally and conceptually complex text than a simple one because teachers need more time to form the text base and the situational model.

According to Kintsch (1988, 1998), three levels of mental representations are generated in the process of construction and integration.

(1) Surface structure, which refers to the literal wording and syntactic relations between words and sentences. It is necessary for the higher level processing but its specific components such as parsing and lexical access are usually not considered to be included in the text comprehension framework (Kintsch, 1998)

(2) Text base, also named basic text representation, consists of a series of propositions. Each proposition is an argument and together they represent explicit meaning of the text. Text base represents information at varying levels of abstraction, delivering meaning via propositions at each level accordingly. These propositions are connected with each other. Propositions that provide literal and specific information construct the microstructure of the text and propositions that are more abstract and represent the global, general relations – such as the text title, target sentences – make the macrostructure of the text. In all, text base is a coherent network of propositions and concepts. Although readers' knowledge of vocabulary, sentence structure and text structure is required, the target of this phase is mainly concerned about textual information.

(3) Situational model refers to readers activating their background knowledge with hints taken from the text to go beyond the stated text, such as inferring deeper meanings behind words in the text. In other words, readers build coherence for comprehension with the knowledge already stored in their minds, previous reading experience and hints from the text that can fill the gaps between what is clearly stated and what is suggested underneath. Generally, this is a dynamic constructive process involving the interaction among the reader, the text structure and the semantic content.

The interactive process between discourse input and prior knowledge that results in the three representations stated above proposed by Kintsch and van Dijk has indicated the varying levels of the comprehension process. Despite its inability to explain details of micro-processing, as criticised by Pressley and Afflerbach (1995), the model offers an in-depth explanation of the comprehension process.

It is concluded from Kintsch's CI model that readers form the representation of text base before they interpret text information with personal experience. In the phase of "text base", as suggested by Kintsch, readers need to manipulate various pieces of information to construct both microstructure and macrostructure. They not only integrate at a local level to extract literal meaning of text, but also at a global level to link ideas across sentences to resolve the story plot. Therefore readers should try to identify relationships within a text and summarise the content, which is related to the concept of integration ability defined in the present study. In this sense, the skills of integration ability proposed by this research fall in the scope of text base.

Landscape Model

In the light of the CI model, an array of theories and models are developed (e.g. Long et al., 1996; Gernsbacher, 1990; Richards & Singer, 2001), among which, the Landscape theory proposed by van den Broek and his team has been widely recognised as the most influential theory after Kintsch (van den Broek, Risden, et al., 1996; van den Broek et al., 1999).

The Landscape theory emphasised that the activation of information is based on readers' standards of coherence, i.e. the extent of comprehension that the readers try to achieve or the goals of reading. If the reader has a relaxed standard of coherence, then a cohort of activation (related information being automatically activated and connected in the brain) is sufficient. If the reader holds a strict standard, they will conduct coherence-based retrieval, which is an active search for related information in text and background knowledge based on the coherence. No matter which standards the readers adopt, readers establish various types of coherences including referential, causal, temporal, spatial and more.

van den Broak believes that reading comprehension contains multiple cycles that process information, in every one of which new concepts get activated and old ones are either kept in working memory or discarded. Cycle after cycle, the reading process is in fact a series of cyclically and dynamically fluctuating activations that resemble the beautiful landscape, and hence its name.

The Landscape theory, based on Kintsch, explains in more specific terms how reading comprehension is a dynamic process and its notion of standards of coherence. It also highlights the active role that readers play and mitigates the contradiction between the memory-based and explanation-based perspectives. With regard to the integrating process, it may also influence the quality of integration.

From the liaterature introduced above we can see that the understanding of reading comprehension as an interactive process has been evolving over the years. It went from being an "assimilation and accommodation process" in the Schema theory to a multi-factor, multi-layer, multi-phase, cyclical process in the CI model and the Landscape theory, which match up to the complexity of reading comprehension.

### 2.1.4 Summary

The above is a retrospect of the overall history of research on the comprehension process, in which the memory-based model and explanation-based model have focused on some aspects of the process, whereas the interaction-based models reflected more about the mental process of reading comprehension. Among various theories of reading comprehension process, Kintsch's CI model which explains more completely and accurately the comprehension process has become the classic theory in the field. And Van den Broek and his team who put forward the Landscape model that sheds light on the process and product of reading comprehension, have also attracted wide attention.

Furthermore, these theories of comprehension process deepen our understanding of the integrating process. Since the present study focuses on the integration of textual information, the target of integration is constructing a textbase. For this purpose, multiple levels of integration are needed. Besides, various factors are also involved according to these theories. From the memory-based perspective, integration happens based on memory. With memory, readers can conduct quick and automatic integration. They trigger a series of activations not only within close information, but also among distant information (O'Brien, Rizzella, Albrecht & Halleran, 1998), whereas explanation-based model suggests appropriate reading strategies to promote integration efficiency. The schema theory supports that a prior shema is necessary to integrate and Van dan Broek, on the other hand, emphasises that readers' "standards

of coherence" is also vital when integrating. The above findings all contribute to the design of the theoretical framework of this study.

## 2.2 The structure of reading ability

Studies of the ability contained in the process of reading comprehension have generated three different opinions in terms of the structure of the ability. The first stream believes the reading ability is a unitary, holistic and indivisible skill that cannot be subdivided (e.g., Rost, 1993). The second argues for the opposite that the ability contains various sub-skills (e.g., Davis, 1968; Mirhassani&Khosravi, 2002). The third opinion supports the idea that skilful readers tend to employ multiple, mutually independent sub-skills in reading which gradually grow to become one after years of practice (Stein & Glenn ,1979; Cummings, 1983).

For the purposes of teaching and assessment, it is necessary to divide the reading ability into various sub-skills and efforts have been made in an attempt to depict all skills involved in reading, for example, Smith & Dechant (1961) listed 23 and Munby (1981) proposed 19. However, without an upper framework or structure that groups the micro-skills, exhaustions of them alone seems counterproductive in advancing the theoretical study and the teaching and assessment. Thus, examination and categorisation of the skills is needed to structure the reading abilities.

### 2.2.1 The process-oriented structure

Reading is a dynamic process that extracts and constructs meanings of a text, in which readers employ multiple skills simultaneously. Thus various structures of abilities have been proposed based on the comprehension process.

Gunning (1998) proposed that readers use four abilities in the process:

(1) Comprehending. Readers comprehend literal meaning of text. Basic elements of the narrative text, such as names of people and places, dates and venues, can be

identified and paraphrased.

(2) Organising. Readers are able to identify and connect important information in the text. For instance, they can identify and summarise main ideas of a paragraph, theme(s) of the text, and can group and put messages in order.

(3) Elaborating. Readers can link what is retrieved from the text to the pre-established information in mind. Typical tasks of this ability include making inferences, creating images and analogies, giving comments and evaluations.

(4) Monitoring. Readers are aware of the cognitive process taking place in reading. For instance, they reflect the extent of their own comprehension of text and try to employ a number of strategies to ensure complete comprehension.

In what Gunning (1998) has proposed, both #(1) and #(2) are abilities to obtain and organise meanings from the text, while #(3) retrieves what is stored in the reader's mind and makes connections with the text, and #(4) reflects how readers exert various levels of self-control over different stages and activities in the comprehension process. The categorisation is a reasonable reflection of both the bottom-up and the top-down approach to reading.

On the contrary, Irwin (2007) examined the abilities used in the comprehension process in a different way and proposed the following:

(1) Understanding sentences. Readers understand individual sentences. The readers try to group chunks of words into meaningful phrases, which is called "chunking". Readers should identify boundaries between meaning phrases and select important ideas of a sentence to remember.

(2) Connecting sentences. The reader analyses and identifies the relation between clauses and sentences, during which inferences are made to connect two simple sentences meaningfully. The reader is required to identify the references of the pronouns, analyse the logical relationship between sentences and fill the gaps of

meaning where necessary. As a result, readers establish local coherence of text.

(3) Understanding the whole. The reader summarises the main ideas based on which an overall understanding of the whole text can be formed. This process requires two skills. One is summarising paragraph meaning through identifying and constructing topical sentences and the other is organising memory using text structure.

(4) Elaborating. The reader makes inferences that are neither the author's intention nor serve the need to interpret the text.Typical activities that occur at this stage include, for instance, predicting what might happen, connecting the text information with readers' similar experience, responding to the text effectively, imaging and thinking critically.

(5) Metacognition. The reader controls his or her cognitive process of reading comprehension and long-term recall through active employment and constant adjustment of reading strategies. It is the self-awareness and self-control exerted by the reader on the cognitive process, which involves knowing when one does or does not understand text and knowing the method of achieving cognitive goals.

Despite both Gunning (1998) and Irwin (2007) having had similar views on the abilities of elaborating and monitoring, they hold different opinions on the abilities to understand textual information. While Gunning (1998) simply differentiates the abilities used to understand literal meaning and overall ideas, Irwin (2007) pays more attention to the abilities used to understand increasingly complicated text elements, such as a sentence and the whole text.

Another researcher Mayer (2003) categorised the following abilities believed to be used in the reader's understanding of informational texts:

(1) Selecting. The reader pays attention to what are the most relevant parts of the passage.

(2) Organising. The reader connects the relevant information into a coherent structure.

(3) Integrating. The reader links the new knowledge with the prior knowledge from long-term memory, which denotes activation of relevant existing knowledge and assimilation of the incoming knowledge into it.

(4) Monitoring. The reader judges whether or the newly constructed knowledge makes sense, which is a meta-cognitive process.

Although Mayer (2003) shared some of the recognised abilities with Gunning (1998) and Irwin (2007), i.e., #(2), #(3) and #(4), emphasis was placed on a top-bottom reading approach since Selecting was considered as an ability to be used at the early stage of comprehension process when the reader reads with a clear goal of search.

In all, structures proposed by Gunning (1998), Meyer (2003) and Irwin (2007) tend to agree that the abilities used to understand textual information and to intepret text with reference to personal experience are different. This is consistent with Kintsch's (1988, 1998) Construction-Integration (CI) Model. Because according to this model the reader forms a textbase which connects textual information together and then a situation model where the reader integrates the textual information with knowledge in one's mind.

Among the abilities used to process textual information, some abilities are related to integration, such as "organising" put forward by Gunning (1998) and Mayer (2003) and the "connecting sentences" and "understanding the whole" raised by Irwin (2007). Therefore, the present research, in particular, takes into account these parts of extant literature when developing the theoretical framework.

### 2.2.2 The cognitive-process-level structure

To know the levels of student's reading ability is vital to both teacher and student

in the teaching and assessment of learning. Correspondingly, a large mass of research in this area has been devoted to this. Inspired by Bloom's Taxonomy of Learning Domains, most of these researchers have attempted to classify reading abilities into higher and lower levels.

Gray (1960) was among the first to propose three levels from an order of low to high: “reading the lines”, “reading between the lines” and “reading beyond the lines”. This classification reveals the fact that the higher is the level of meanings constructed, the more is the complexity of thinking required in the process. The classification has been influential in forming of many studies thereafter.

With reference to Bloom (1956), Barrett (1968) also proposed “Taxonomy of Cognitive”, which includes 5 levels of cognitive abilities:

(1) Literal Comprehension. Readers retrieve explicitly stated ideas and information. They may just need to recognise or recall some specific facts or incidents; however, the complexity also rises if they are required to recall a series of pieces of information.

(2) Reorganisation. Readers need to analyse, synthesise and organise the information retrieved from text. They may classify relevant information, outline or summarise the text. For these tasks, they also need to paraphrase the information.

(3) Inferential Comprehension. Based on the explicit information of text, readers infer the unsaid information and sometimes they need to refer to personal experience. The information inferred includes supporting details, main ideas, cause and effect relationships, predictions, character traits and so on.

(4) Evaluation. Readers make evaluative judgment about the quality of text in terms of accuracy, acceptability, desirability, worth or probability of occurrence.

(5) Appreciation. Readers examine the psychological and aesthetic effect of the text and react to it.

This structure revealed the cognitive demands of different reading abilities and thus it became very popular in the school as soon as it was published.

Smith (1969), who specialised in psychology in reading, argued that four understanding levels occur in reading, which are the following, in the order from easy to difficult:

(1) Literal comprehension. The reader achieves the most direct and literal understanding of every word and sentence in the text.

(2) Interpretation. Instead of understanding text by rote, the reader interprets text by summarisation and comparison. Interpretation involves a combination of thinking skills. For instance, achieving implicit information from between the lines, summarising information, reasoning, predicting, understanding motives and inferring inter-relationships.

(3) Critical reading. The reader generates personal responses and judgements of the nature, value, correctness and authenticity of the text.

(4) Creative reading. The reader pursues new perspectives and ideas away from and beyond the text, or provides a new solution to the problem in the text.

Smith (1969)'s structure has been recognised in the field for deepening understanding of reading abilities. Based on this, Han, Zhang and Lu (1983) classified reading into four types, i.e., cognitive, interpretive, evaluative and creative.

Except the structures proposed by researchers, some international programmes, i.e. PISA and PIRLS, have also developed their own structures of reading ability.

The Programme for International Student Assessment (PISA) is developed by the Organisation for Economic Co-operation and Development (OECD). Reading is one of the three domains assessed in PISA. Its reading ability framework is as follows:

(1) Access and retrieve. Readers access information in search of one or more pieces of explicitly stated information. Tasks of this aspect include identifying job

requirements from a job advertisement, a telephone number with a certain zip code or a matter of fact that supports or disapproves a certain argument.

(2) Integrate and interpret. Readers organise the text information. He or she demonstrates understanding of the coherence of the text (*integrate*) while making inferences from one aspect to another (*interpret*), which requires a deep, detailed and comprehensive expansion of the initial understanding.

(3) Reflect and evaluate. Readers connect the textual information and personal experience and knowledge so as to draw upon new knowledge, perspective or attitudes beyond the text.

Another equally influential international reading assessment programme is the Progress in International Reading Literacy Study (PIRLS). It is organised by the International Association for the Evaluation of Educational Achievement (IEA). PIRLS is a long-term and specialised assessment programme on students' reading literacy that is held every five years. Its assessment framework is as follows:

(1) Identify explicit information. The reader understands the literal meaning by decoding the words and grammar. The focus at this stage is to identify the relevant information explicitly stated in words and sentences.

(2) Make straightforward inferences. The reader connects two or more pieces of information retrieved from text. Making straightforward inference allows readers to achieve more information at sentence and phrase level. Connections can be made between local meaning, global meaning or between local and global meaning.

(3) Interpret and integrate ideas and information. The reader integrates various parts of information into a coherent whole through activation of the existing knowledge. This process requires readers to infer the content based on knowledge about the world in order to fill the gap of meaning and make up for what is not expressed

explicitly throughout the text.

(4) Examine and evaluate content, language and textual elements. The reader evaluates information critically. Based on knowledge of language practice and textual structure, the reader analyses and assesses the form of expression. They also compare the described world in the text to the established knowledge of the world in their mind, so as to assess the content and value of the text.

PIRLS considers the reading process as progressive levels of thinking. Understanding literal meaning starts the process, followed by making inferences and some stages that require higher levels of reading abilities, such as integrating and creating. That said, "identify explicit information" and "make straightforward inferences" are activities of lower-level reading, whereas "interpret and integrate ideas and information" and "examine and evaluate content, language and textual elements" are higher.

PIRLS and PISA are often referred to around the world as model frameworks of reading abilities. For instance, the US National Assessment of Educational Progress (NAEP) has constructed its framework based on the PISA framework (National Assessment Governing Board, 2008), and the State of Queensland (2004) has baded on the PIRLS. Tse (2005) also took reference to PIRLS and raised a new ability structure: (1) the reader grasps the literal meaning of the text with a series of activities from eye movement and gaze, to word identification, to sentence processing; (2) the reader makes inferences between the lines based on the literal meaning; (3) the reader connects meaning groups into a coherent whole and constructs the text structure; and (4) the reader compares comprehension of the text to their understanding of life and the world, which is necessary for literary appreciation or criticism.

In Hong Kong, Zhu (2005) proposed the framework of Six Processes of Reading Comprehension that emphasise the hierarchy of reading abilities and pays attention to

the most important skills required in society.

(1) Retrieving. It refers to retrieving explicitly stated information. Students just need to recognise some simple facts or ideas. It is the lowest level of reading comprehension, assessing students' basic and initial understanding of text;

(2) Explaining. It means paraphrasing specific words and sentences, which is related to students' understanding of local text;

(3) Integrating. It refers to summarising the theme of the text, sorting out the interrelationship of the contents, identifying author's craft. This process requires students to analyse and synthesise;

(4) Elaborating. It means inferring implicit meanings or extending the information of text. Students need to make inference with reference to their own experiences;

(5) Evaluating. It refers to appreciating and criticising content, language and textual elements;

(6) Creating. It refers to generating new solutions to problems in the text, suggesting new ways of writing, applying the information provided in solving authentic problems.

For these skills, Zhu (2005) stressed the difference between "integrating" and "elaborating": the former focuses on analysing and summarising the text based on an objective understanding of it, while the latter makes inferences and predictions based on previous literal understandings, which is more subjective in a deeper level. Because it is close to the Chinese education curriculum, Zhu's framework has been widely applied in the teaching and assessment of Chinese language reading education in Hong Kong.

Alderson & Lukmani (1989) also proposed eight reading abilities at various levels. They are: recognition of words, identification, discrimination, analysis, interpretation, inference, synthesis and evaluation.

In all, these structures have discriminated the cognitive difficulty of various

reading skills. Using these structures, teachers can conduct instructions to raise students' higher-level ability in reading.

However, controversies over how many levels and the boundaries of levels still exist (Alderson, 1990). For example, the "interpretation" skill is similar to "integration" in Smith (1969)'s framework, while Zhu (2005) further clarified the difference between these two skills by differentiating integration and elaboration. To gain a deeper insight into integration, we should separate it from interpretation and define its own sub-skills.

### 2.2.3 The simple/complex inferences structure

To construct a coherent representation of meaning of text, readers need to infer to connect information either from text or from personal knowledge base, and to understand the implicit meaning in text. Grasser et al. (1994) suggested there are various kinds of inferences involved in reading, such as causal inference, referential inference and character emotion inference. Based on the complexity of inference, researchers have discriminated the different abilities of reading.

Rosenshine (1980) compared an array of curricula across countries and identified eight types of abilities in three categories:

(1) Locating details. This is the simplest and involves recognition, paraphrasing and matching;

(2) Simple inference. It refers to the ability to draw inferences after reading short segments of a passage. Typical skills in this group might be:

--understanding words in context

--recognising the sequence of events

--recognising cause and effect relationships

--comparison and contrasting;

(3) Complex inferential skills. It refers to the ability to draw inferences after reading longer segments and passages. Typical skills in this group might be:

--recognising the main idea/title/topic

--drawing conclusion

--predicting outcomes

Rosenshine (1980) stressed the importance of making inferences in reading. He categorised abilities based on whether inferencing is necessary and the complexity of the inferences. In the same vein, Hillocks & Ludlow (1984) proposed a taxonomy of skills when constructing a fiction-reading comprehension test for 9th to 12th graders. Two levels were introduced:

1. Literal level of comprehension

(1) Basic stated information. Identify the essential and recurrent explicitly stated information. (2) Key detail. Identify crucial details that are in causal relations with events of the story or those that connect episodes of the story.(3) Stated relationship. Identify inter- and intra- relationships between two or more characters, events, tasks, etc., which are usually stated in the text.

2. Inferential level of comprehension

(1) Simple implied relationship. Make inferences about the implied relationship between two or more adjacent pieces of information.

(2) Complex implied relationship. Make complex inferences based on a large amount of details of, e.g., why the character changes his or her personality.

(3) Author's generalisation. To infer to the conceptions about the general situation that human face based on the information given by the work.

(4) Structural generalisation. Generalise about the organisation of certain parts of a work and explain how the parts achieve certain effects.

Hillocks & Ludlow (1984) believed that literal level of comprehension does not

require inferences and in the inferential level of comprehension, simple implied inferences require abilities less complicated than other abilities do.

Meneghetti et al. (2006) listed 10 reading comprehension abilities and categorised them into basic and complex aspects based on the result of structural equation:

1. Basic aspect. Incorporate the essential elements of text comprehension:

(1) Characters, times and events. Differentiate and identify characters, events, durations and locations of the events.

(2) Events and sequences. Identify major events and their sequences, character behaviours and their reactions to the events.

(3) Syntactic structure. Understand the syntactic elements of the text.

(4) Connections between parts of the textLink different information in the text based on the reader's semantic and logical knowledge with the goal to create a consistent structure of meaning.

(5) Inferences. Readers try to guess the meaning of unfamiliar words within the context of text (lexical inference) or infer the meaning of certain sentences (semantic inference).

2. Complex aspect. It includes some of the more elaborate competences：

(1) Text sensitivity. It is the ability to recognise the complexity of the text, identify the information based on its relevance, distinguish various literally genres such as descriptive, narrative and argumentative and the structures of various types of text.

(2) Text Hierarchy. It is the ability to assign relevance to information in the text correctly.

(3) Mental Model. It is the ability to construct a coherent mental representation of the text by selecting relevant information and integrating it with existing

knowledge.

(4) Text Flexibility. It is the ability to provide a new approach or to modify the current approach according to own aims or task requirements.

(5) Errors and Inconsistencies. It is the ability to monitor the degree of comprehension and to check for the consistent and inconsistent information of the text. Overall, the structures of reading abilities are essentially categorised on the basis of the complexity of inferences, in which basic aspects do not or only require simple inferences while complex aspects demand complex and elaborated inferences.

Summarising briefly, inference-complexity-based ability structures can reveal the essential relationships between various reading abilities to a greater extent. But the limitation lies in the blurred boundary between simple and complex inferences. For example, Rosenshine (1980) suggested that "comparison and contrasting" is a kind of simple inference but this ability is sometimes considered as complicated by other researchers. Thus, the drawback of this type of categorisation is subjectivity.

### 2.2.4 Lexicon-based ability structure

Recognising words is the premise of reading. Students' capacity of lexicon is one of the most important determinants of reading comprehension and is thus viewed by some as an important reading skill.

Davis (1968) was among the first to explore the skills required in reading comprehension using factor analysis. He concluded after several studies with eight potential factors: (1) Recalling word meanings; (2) Drawing inferences about the meaning of a word from context; (3) Finding answers to questions answered explicitly or in paraphrase; (4) Weaving together ideas in the content; (5) Drawing inferences from the content; (6) Recognising a writer's purpose, attitude, tone and mood; (7) Identifying a writer's technique; (8) Following the structure of a passage.

Davis (1968) revealed that a strong connection between the ability to recall word

meanings and reading comprehension and suggested that good reading comprehension is only possible after acquisition of a certain amount of vocabulary and automaticity in recognising them in a text. The findings shed light on many of the later studies that adopted similar methods on similar subjects. For instance, Spearitt (1972) conducted factor analysis and claimed that there were four separate factors: (1) recalling word meanings; (2) drawing inferences from the content; (3) recognising a writer's purpose, tone and mood; and (4) following the structure of the passage. Li & Zhang (2001), using factor analysis, explored the Chinese language reading comprehension ability of 4th to 7th graders in China and discovered the following factors that influence their proficiency: (1) Vocabulary; (2) Integrating sentence meaning; (3) Classification and summarising; (4) Understanding feelings; (5) Inference; (6) Evaluation and appreciation; and (7) Application.

That said, vocabulary capacity does have an impact on students' reading comprehension. Thus, Gough & Tunmer (1986) proposed a framework called Simple View of Reading, in which they formulated the process as R=D * LC. In this formula, R represents reading comprehension, D decoding words and LC language comprehension. When the decoding is slow and inaccurate, R is undermined because the reader is not sure of the word meaning and doesn't have sufficient cognitive resources to allocate to language comprehension. But when the D is fast and accurate, R is easier but still influenced by various language factors.

This framework (SVR) explains a lot of difficulties encountered by language learners in reading comprehension. It also has pedagogical significance that guides many teachers and educators to develop language courses (For more review of the SVR please see Hoffman, 2009). The questions about SVR, however, lie in two aspects: (1) In most cases, the term "reading comprehension ability" refers to cognitive abilities that retrieve or infer information from the text, but lexicon capacity

relies more on memorisation (e.g. Levy and Carr, 1990; Carroll, 1993; Protopapas, Simos, Sideridis & Mouzaki, 2012); and (2) lexicon capacity develops rapidly at the beginning of the phase of "learn to read" but slows down when it is automatised and has a minimum effect on reading comprehension (e.g., Paris, 2005). This suggests that SVR may not apply to students in all grades.

In all, studies on lexicon capacity have highlighted the importance of ensuring the student's vocabulary capacity when exploring the integration ability. Among the factors found in Davis (1968) and Li & Zhang (2001), integrative factors are still emphasised and shed light on this project.

In addition to the above mentioned perspectives of investigation, Hughes (1989) divided reading abilities into two types, macro and micro abilities. The macro abilities are as follows: Scanning text to locate specific information; Skimming text to obtain the gist; Identifying stages of an argument; and Identifying examples presented in support of an argument. The micro abilities are as follows: Identifying referents of pronouns; Using context to guess meaning of unfamiliar words; Understanding relations between parts of text by recognising indicators in discourse, especially for the introduction, development, transition and conclusion of ideas. Macro abilities are used to analyse the main ideas in the text, whereas the micro ones are for recognising and interpreting the linguistic features of the text.

### 2.2.5 Summary

Summarising briefly, researchers have had different opinions on how the reading abilities are divided and the number of sub-skills. Sometimes they even have different understandings on skills with similar names.

Table 2-1 is a comparison of all the abovementioned structures of reading ability.

Table 2-1 Comparison of structures of reading ability

| **Process-oriented** | | **Cognitive process level** | | | **Simple/complex inference** | **Lexicon-based ability** | | **Corresponding abilities** |
|---|---|---|---|---|---|---|---|---|
| Gunning (1998) | Irwin (2007) | OECD (2009) | PIRLS (2011) | Zhu (2005) | Rosenshine (1980) | Davis(1968) | Li & Zhang(2001) | This research |
| | | | | | | Recalling word meaning; | Vocabulary | Recognising words |
| Literal and semantic comprehension | Understanding sentences | Access and interpret | Identifying explicit information | Retrieving | Locating details | Finding answers to questions answered explicitly or in paraphrase | | Understanding literal meaning / Identifying explicit information |
| | | | | Explaining | Simple inference(understanding words in context) | Drawing inferences about the meaning of a word in context | | Contextualising words |
| Organising (Integration; Summarisation) | Connecting sentences Understanding the whole | Integrate and interpret | ■Make straightforward inferences ■Interpret and integrate ideas and information | Summarising | ■Simple inference (sequence of events; cause and effect relationship; comparison and contrasting) ■Complex inferential skills(main idea/title/topic) | ■Weaving together ideas in the content; ■Identifying a writer's technique; ■Following the structure of a passage | ■Integrating sentence meaning ■Classification and summarising | Integration |
| Elaboration | Elaborating | Integrate and interpret | Interpret and integrate ideas and information | Elaboration | Complex inferential skills(drawing conclusion; predicting outcomes) | Drawing inference from the content; Recognising a writer's purpose, attitude, tone and mood | Understanding feelings Reasoning | Interpreting textual information with reference to personal experience |
| | | Reflect and evaluate | Examine and evaluate content, language, and textual elements | Evaluation | | | Evaluation and appreciation | Evaluation |
| | | | | Creating | | | Application | Creating / Application |

According to Table 2-1, the ability to integrate textual information is recognised by most as an important ability, but its requirements remain a matter of debate. For instance, Gunning (1998) regarded it as part of text organisation which means the ability to connect elements in the text, while PISA and PIRLS combine both integration and interpretation together. Zhu (2005) distinguished different kinds of

integrations, in which “organising textual information” is named “integration” and “connecting textual information and personal experience” is called “elaboration” and thus his definition is more consistent with that of the present research.

Just as Oakhill, et al. (2003) pointed out, teachers need not only know students’ overall performance, but also need to understand how students perform on a specific ability. Thus, it is of paramount importance that we explore specifically the nature of integration ability and its development so as to improve teaching and assessment of reading.

## 2.3 Ability to integrate textual information

As mentioned in previous sections, the ability to integrate is one of the key elements in the reading structure. The integration of textual information in a passage facilitates the construction of the textbase mental representation that includes the micro- and macro-structure. The microstructure is a reflection of the local passage properties (e.g., connectives) and forms coherence at a propositional or local level (McNamara & Kintsch, 1996). The reader not only connects word meanings to form propositions but also establishes the interrelationships between these propositions (e.g., logical, cause and effect, co-reference) (Kintsch & Rawson, 2005). The macrostructure, on the other hand, refers to the organisation of the text. The reader combines segments longer than words to form a topical structure. That said, the reader deals with both big and small units of information in a passage and they also need to handle their interrelationships and content.

In Hong Kong, some researchers paid attention to the integrated language test which requires students to write an essay after reading 4-6 texts and listening to an audio tape. It is generally believed that students employ four skills in this process, they are Contextual Awareness, Citation and Synthesis, Opinion and Argument,

Expression and Organization (e.g. Seto, 2010; Lam, 2011, Law, 2011, Shum, 2011 etc.). However, these skills have been beyond the limit of reading a single text.

By focusing on the integrating the textual information of a single text, we have summarized the following two perspectives to demonste the theoretical explorations of sub-skills and categorisations of this ability.

### 2.3.1 Integration ability from the perspective of textual elements processing

A text consists of words, sentences and paragraphs, which require different ways and levels of integration.

As stated in Section 2.2, Irwin (2007) proposed five reading abilities, i.e., understanding sentences, connecting sentences, understanding the whole, elaborating and metacognition. Among these, connecting sentences and understanding the whole are different ways of integrating based on textual elements.

(1) Connecting sentences. It means establishing local coherence or cohesive ties, which are relationships that tether sentences together. Three main types of sentence-connecting processes are experienced:

(a) Making anaphora relations. These are connections between words in which one is used in place of another.

(b) Understanding connective relationships. Except anaphoric relations, clauses and sentences are tied together through connective concepts.

(c) Making "slot-filling" inferences. These are inferences that fill in important missing information of the given situation based on the context. To fill the relevant "slots" may involve identifying a series of important elements such as agent (who did it), object (to whom or what was it done), instrument (what was used to do it), experiencer (who experienced the feeling or thought), source (where did it come from) and goal (what was the result of the goal).

(2) Understanding the whole. Readers select the important information from sentences and paragraphs and then summarise these details. For this reason, readers should be familiar with organisational structure of different genres. For instance, the story grammar of narrative points out that a well-written narrative usually involves six categories of information (setting, initiating event, internal response, attempt and consequence). Moreover, one of the following organisational patterns is usually used in content-area materials: description, temporal sequence, explanation, comparison-contrast, definitions-examples and problem-solution. Besides, this process also interacts with the process of connecting sentences by providing cues to each other. For instance, after identifying the overall structure of text, readers can search for the connectives between sentences.

From a cognitive point of view, Irwin (2007) regarded "connecting sentences" as three types of sentences-integration: identifying the reference of pronouns, identifying relationships between adjacent sentences and identifying relationships between different ideas. He considered "understanding the whole" a macro-integration of the whole passage that involves identifying important information and summarisation. What Irwin (2007) proposed can be regarded as a transition of abilities from sentence-integration to text-integration, which is also consistent with the process of forming textbase representation from a micro to macro level by Kintsch.

Descriptions of the ability to integrate from the perspectives of textual elements can also be found in Wei (1994), who argued that readers enter the phase of understanding the whole passage after identifying word meanings. Five levels of analysis and integration of the form and content of the passage are experienced at this phase:

(1) Comparing, classifying and grouping textual information to identify the organisational structure of the text;

(2) Analysing and synthesising the information within a paragraph to summarise the main idea of each paragraph;

(3) Identifying the interrelationships between paragraphs and between paragraphs and the whole text;

(4) Summarising the main ideas of the whole text;

(5) Understanding the form of the passage rhetorically and structurally in terms of how the author organises the information to convey ideas.

It is evident from the above-mentioned levels that Wei (1994) categorised the process of integration by within and between paragraphs, which, if compared to Irwin (2007), proposed more sub-skills to integrate information from sentences to the whole text.

A third structure of integration ability was proposed by Ye & Zhang (1998). They proposed five categories of reading abilities, i.e., word recognising, understanding, summarising, criticising and appreciating, according to textual elements. Some levels of integration are involved in "understanding" and "summarising".

(1) Understanding involves the following:

(a) Understanding the rhetorical devices of the whole text;

(b) Understanding the textual structure, i.e. understanding sentence meanings from word order and relationships between words, understanding paragraph meanings from sentence order and relationships between sentences and understanding passage ideas from paragraph order and relationships between paragraphs.

(2) Summarising includes the following:

(a) Summarising specific ideas;

(b) Summarising the main ideas of the passage;

(c) Summarising the characteristics of the text type;

(d) Summarising the writing features and style.

Wei (1994) and Ye & Zhang (1998) included not only abilities to integrate information of sentences, paragraphs and the whole text but also that of the form of composing the passage, e.g., summarising the writing features and style.

In general, the advantage of this classification is the clear distinction among sub-skills of integration by attaching them to different textual elements. With this classification, teachers can explain the sub-skills to students easily. However, this classification may also lead to misunderstanding of cognitive difficulties of different skills. For instance, integration between sentences may not be easier than integration among paragraphs. Thus further analysis of integration ability is still needed.

### 2.3.2 Integration ability from the perspective of cognitive processing

Unlike the perspectives from textual element, discussions of integration ability from a cognitive perspective can be found in research, on reading theories and reading assessment frameworks.

Gagne et al. (1993) proposed a structure of reading abilities that involves decoding, literal comprehension, inferential comprehension and comprehension monitoring, based on the theory of reading process by Kintsch. The structure involved the following components that are relevant to this study:

(1) Integration. Integration results in a more coherent declarative representation of ideas in the text. It usually ties two or more propositions together and can occur in a complex sentence or between several sentences or paragraphs. In the process of integration, the reader may need to employ the existing schema (declarative knowledge) or the grammar rules (procedural knowledge) to make inferences. That said, integration is not an automatic process and does require readers to make efforts, regardless of one's reading proficiency.

(2) Summarisation. The goal of summarisation is to form the macro structure of text, capturing the main idea with a set of hierarchically arranged propositions. Summarisation can be viewed as forming a mental outline of the passage. Readers have to make substantial inferences throughout the process to connect the large quantity of information for extraction of main passage ideas as the macro structure in the text is usually implicit.

Zhang (1992) proposed five cognitive reading abilities, which are words recognition, selection, interpretation, grouping and rearranging, extending. Some of them are closely related to the ability to integrate:

(1) Interpretation. It refers to the ability to transform text into one's own words. Its first and foremost representation is accurate summarisation and abstraction of text, for instance, summarising the main idea of a paragraph or the whole text.

(2) Grouping and rearranging information. It refers to reorganisation of the content of text, for instance, combining or re-classifying the content according to certain criteria; changing the sequence of events.

Xia (2001) suggested three reading abilities:

(1) Knowledge based reading abilities. This ability demonstrates students' mastery of foundational knowledge of language arts;

(2) Comprehension based reading ability, which requires readers to analyse the textual information; and

(3) Investigation based reading ability, which includes the ability to identify and appreciate, together with the ability to evaluate and judge.

The ability to integrate in this research shares similarities with "comprehension based reading ability", which encompasses the following:

(1) Analytical ability, or the ability to identify the logical elements or components in the text, the relations and the connections in-between. To be exact,

three skills are entailed, which are the element-identifying skill, the relationship-identifying skill and the structure-analysing skill. The element-identifying skill requires students to differentiate facts from hypotheses, positive and normative statement and conclusion from argument, as well as to identify potential assumptions. The relationship-identifying skill refers to the identification of (a) the factual or hypothetical evidence used to support arguments; (b) the consistency of arguments with the hypothesis; (c) the adequacy of support to arguments by evidence; (d) levels of relevance of materials; (e) primary and secondary topics; and (f) causal, chronological or other relations. The structure-analysing skill is one that analyses the order (e.g., narrative, expository, argumentative) in which ideas are arranged and expressed in order to identify the structure, theme and rationale of the text.

(2) Summarisation ability, or the ability to summarise the whole text. Readers figure out the main points of text.

(3) Categorisation ability, or the ability to group materials together. Readers group the materials according to their nature in order to identify the logical or the inter-propositional relation in the text, such as temporal, causal and spatial relationships.

Xia (2001)'s framework is comprehensive, however, #(1) "analytical ability" and #(3) "categorisation ability" are close in nature, which may cause confusion to teachers and students when the framework is applied in classroom.

Zhang, Zhang & Cai (2002) suggested three layers to the "core reading ability": the base, the developmental layer and the creative layer. The base is the understanding of textual information, the key representations of which are identifying, memorising and understanding words and phrases. The developmental layer refers to the analytical and summarising ability and the creative layer contains the ability to appreciate and

comment, as well as to create and apply, e.g., rearranging information and reconstructing ideas. Among the three layers, the "Developmental" one contains the most elements that are related to the ability to integrate:

(1) Analysing. It refers to breaking the passage into smaller and clearer segments or elements;

(2) Synthesising. Readers synthesise information from all segments of the text to form a comprehensive and all-rounded understanding. For instance, summarising the main ideas of paragraphs or the whole text, abstracting the main characteristics of characters and landscapes, identifying organisational styles (i.e., structure, thread, expression, etc.) and language features (i.e., wording, rhetorical devices, language styles, etc.).

Though Zhang, Zhang & Cai (2002) revealed the relevance of analysing and synthesising to integration, these two thinking skills continue to be commonly employed in other learning activities, such as solving mathematical problems, thus using them as the subskills of integration, which is insufficient to describe the nature of integration ability in reading.

In addition to researchers' personal views, some of the most influential testing systems in the field of reading assessment, i.e. PIRLS and PISA, also have their own definitions of the ability to integrate.

PIRLS describe the ability in three dimensions:

(1) Focus on and retrieve explicitly the stated information. Readers recognise the relevance of different pieces of stated information and identify the specific information needed. The typical task related to integration is finding the topic sentence or main idea (when explicitly stated).

(2) Make straightforward inferences. This is an automatic process, in which readers

recognise the implicit relations between two or more pieces of information. Sometimes, the information readers need to process not only appears in local text but is also related global meaning.

Typical tasks related to integrating include:

- Inferring that one event caused another event
- Concluding what is the main point made by a series of arguments
- Determining the referent of a pronoun
- Identifying generalisations made in the text
- Describing the relationship between two characters.

(3) Interpret and integrate ideas and information. This process involves much more complicated thinking than other aspects. Readers need to integrate not only local or global meaning but also need to connect details to form an overall theme. Although it may occur in local or global text, in essence, it is not a skill that goes beyond the phrase of sentence level.

- Discerning the overall message or theme of a text
- Comparing and contrasting text information

According to PIRLS, simple integrating in reading is an automatic process in which most tasks are done easily, like identifying topical sentences and finding the referents of the pronouns, etc. Integrating at a more complex level requires other abilities such as contrasting, comparing and abstraction of text meaning, which are relatively difficult.

Unlike PIRLS which differentiates different levels of integrating activities and attributes it to various abilities, PISA regards the ability to integrate as a single process. Both “integrating” and “interpreting” are processes to make sense of what is read internally and they share an intimate and interactive relationship. The reader first understands the meaning through inferring relationships within the text, which is a

process of integrating and then groups various pieces of meaning together to interpret the whole text.

The components related to the integration ability studied in this research are listed below:

(1) Making meaning from something that is not stated. It refers to identifying the underlying assumptions or implications of part or all of the text. To be more exact, they are:

- Recognising a relationship that is not explicit, such as inferring the connection between one part of the text and another, distinguishing principal and subordinate elements, or finding a specific instance in the text of something described earlier in general terms;
- Inferring the connotation of a phrase or a sentence.

(2) Understanding the coherence of the text:

- Recognising local coherence between a couple of adjacent sentences;
- Understanding the relationship between several paragraphs.
- Connecting various pieces of information to make meaning, whether it is identifying similarities and differences, comparing the degree, or understanding cause and effect relationships.

(3) Form a broad understanding. A reader must consider the text as a whole or in a broad perspective. That includes the following:

- Identifying the main topic or message, such as selecting or creating a title or assumption for the text, identifying the clearly stated main idea or a theme, explaining the order of simple instructions, identifying the main dimensions of a graph or a table, describing the main character or setting of a story, or deducing the theme or main idea from the repetition of a certain type of information (e.g. the frequently mentioned information);

• Identifying the general purpose or use of the text, for instance, explaining the purpose or use of a map or figure.

(4) Developing an interpretation. It requires the students to develop a deeper understanding by extending their initial broad impressions. They must comprehend the organisation of information in the text by understanding cohesion.Many such tasks demand logical understanding.

• Processing a sequence of just two sentences, relying on local cohesion. It is easier with the presence of cohesive markers such as “first” and “second” because they indicate sequence.

• Comparing and contrasting information and identifying and listing supporting evidence. One of the typical tasks is drawing together two or more pieces of information from the text. In order to process either explicit or implicit information from one or more sources in such tasks, the reader must often infer an intended relationship or category.PISA’s in-depth breakdowns of what constitute the ability to integrate pave the way for further investigation and understanding, especially for the present study.

Zhu (2005) developed Six Processes of Reading Comprehension and suggested that teachers can assess students’ integration ability from the following indicators:

(1) Sorting out the organisational structure of the text. The students are required to identify how the textual information is organised. The structures can be introduction-elaboration-conclusion, chronological, parallel, comparison, cause-effect, etc.

(2) Grouping sentences or paragraphs on the basis of structural relevance. This requires readers to analyse structure or form of text.

(3) Abstracting meanings of certain parts. The students are required to summarise the main idea of more than one sentences or paragraphs.

(4) Abstracting information from more than one parts of the text. The students are required to connect the ideas of various parts for a specific purpose, such as multiple evidences to an argument, causes of an event, or features of a character.

(5) Summarising the main idea of a few paragraphs or sub-parts of the paragraph. Tasks in this aspect sometimes require the students to divide the text into parts and subparts before summarisation of the meaning of each part.

(6) Summarising the main idea of the whole text. This is the summarisation of the largest unit of ideas, which requires a condensed and concise account of the original text.

(7) Identifying the literary features or writing styles of the text. The students are required to analyse literary features employed in the text and identify sentences where the features are used.

Compared with other frameworks, the above specifications proposed by Zhu (2005) have set explicit indicators for integration of internal relationships and structures in a text. As a structure designed to meet the requirements of Chinese language teaching and assessment, it can shed light on the present study.

In all, various structures of integration ability enable us to gain a deeper understanding of the nature of this ability. However, it is still controversial on its construct, for instance, Zhu (2005) proposed seven subskills while PISA tends to agree this ability occurs along with interpretation. As a result, further research is still needed.

### 2.3.3 Summary

To sum up, sub-skills of integration ability in reading have rarely been identified in extant research and so are studies that investigate integration as a standalone ability instead of being a component of other abilities. Methodologically, mostly only

subjective description has been adopted and empirical data is called for to fill the gap. As a result, rigorous research into integration ability is needed.

As is shown previously, analysis of integration sub-skills can be divided into two categories, one based on textual elements, indicating the targets students need to integrate and the other based on the cognitive process, emphasising students' mental status in integrating. Since neither is perfect, it would be better to combine these two perspectives for proposing a suitable framework of integration ability.

Another issue that needs to be addressed is that the conceptions of integration ability vary among different researchers. For instance, Gagné (1993) refers to integration ability as the analysis of the relationships between two or more statements in a text, whereas PISA includes the ability to analyse local and global relationships throughout the text and divides it into a number of sub-skills.

As indicated in the previous sections, integration ability is defined as the ability to analyse textual relationships and to summarise textual information. This ability is closely connected to the mental representation of the text-base. On the basis of previous research findings, the following understandings are achieved:

(1) The scope of integration can be local (e.g. connecting sentences, see Irwin (2007)) and global (e.g. integration within a paragraph and between paragraphs, see Wei (1994)). Gagné (1993) also pointed out that connections of propositions can be made between sentences or paragraphs. These two processes interact with each other. Local integration is helpful to recognise the overall structure of text, while the global integration also makes local integration more quickly.

(2) Integration ability can be categorised at different levels. On one hand, some skills of integration are easy to perform. For instance, PIRLS argues that integrations that "focus on and retrieve explicitly stated information" and "make straightforward inferences" are automatically achieved and require little effort. On the other hand,

some skills are difficult, such as the summarisation by Irwin (2007), which requires readers to make complex inferences and abstract expressions.

Table 2-2 lists a few influential frameworks of the structures of integration ability.

Table 2-2 Comparison of Integration Skill Frameworks

| Irwin(2007) | Zhu(2005) | Pisa2009 | PIRLS2011 | This research |
|---|---|---|---|---|
| Connecting sentences (anaphora relations) | | ⬩ Making meaning from something that is not stated (infer the connotation of a phrase or a sentence) | Make Straightforward Inferences (determining the referent of a pronoun) | Identifying the referent of a pronoun |
| Connecting sentences (making slot-filling inference) | | ⬩ Understanding the coherence of the text (recognising local coherence between a couple of adjacent sentences)<br>⬩ Developing an interpretation (process a sequence of just two sentences relying on local cohesion) | | Identifying relationships between a series of adjacent sentences |
| Connecting sentences (understanding connective relationships) | ⬩ Sort out the organisational structure of the text.<br>⬩ Chunk sentences or paragraphs on the basis of structural relevance. | ⬩ Making meaning from something that is not stated (recognising a relationship that is not explicit)<br>⬩ Understanding the coherence of the text (understanding the relationship between several paragraphs) | | Identifying relationships among paragraphs |
| Understanding the whole (select important ideas) | | ⬩ Form a broad understanding (identifying the main topic or message or by identifying the general purpose or use of the text) | ⬩ Focus on and retrieve explicitly stated information (finding the topic sentence or main idea when)<br>⬩ Make Straightforward Inferences (identifying generalisations made in the text) | Identifying main ideas |
| | ⬩Abstract meanings of certain parts.<br>⬩Abstract information from more than one parts of the text. | ⬩ Developing an interpretation (comparing and contrasting information) | ⬩ Make Straightforward Inferences (concluding what is the main point made by a series of arguments; describing the relationship between two characters; inferring that one event caused another event)<br>⬩Interpret and Integrate Ideas and Information (comparing and contrasting text information) | Abstracting specific information |

| | | | |
|---|---|---|---|
| Understanding the whole(summarise) | ♦Summarise the main idea of a few paragraphs or sub-parts of the paragraph.<br>♦Summarise the main idea of the whole text. | Interpret and Integrate Ideas and Information (discerning the overall message or theme of a text) | Summarising the whole text |
| | Identify the literary features or writing styles of the text | | N/A |

In the light of Table 2-2, the following skills of integration ability are proposed (please see Chapter 3 for more explanations):

(1) Identifying the referent of a pronoun

Integration of sentences takes place at all times as the reading proceeds, to maintain comprehension. Identifying referent of a pronoun is necessary in the process. The reader is constantly making straightforward inferences, sometimes automatically (PIRLS, 2011), despite the uncertainty of the distance between pronouns and the referents. The reader needs to search the antecedents and decide what the referent in some cases is.

(2) Identifying relationships between a series of adjacent sentences

With this skill, students are expected to establish local integration in a text. The reader is asked to decide the semantic relationships between two adjacent sentences with or without logical markers such as and, because, but, if…then, etc.

(3) Identifying relationships among paragraphs

This skill is related to the understanding of coherence. To conduct such a skill, students have to understand the meaning of every paragraph first. It is more effort-consuming than understanding inter relationships of sentences. Paragraph relationships (e.g., introduction-elaboration-conclusion, chronological, parallel, comparison, cause-effect) can be identified with markers such as “in all” or “therefore” or based on one’s own inference when no explicit markings in the text are found.

(4) Identifying main ideas

As suggested by PISA2009 and other studies, identification of the main ideas represents that the reader has constructed a hierarchical structure of text and achieved the macro understanding. For this skill, the reader is expected to notice if the theme of the text is explicitly stated, especially in the first or last sentence of a paragraph. Therefore, the reader needs to decide the importance of a certain piece of information.

(5) Abstracting specific information

This skill comes from Zhu (2005). It asserts a higher requirement to students' output of understanding: to summarise certain parts in writing. For this skill, students need to select relevant pieces of information and connect them to form a specific summary.

(6) Summarising the whole text

Summarising the whole text is an important skill for formation of the macro structure. The reader should consciously compare and contrast pieces of information in different parts of the text in search for the most important piece while ensuring the correct paraphrasing of the content idea.

Notably, the proposed structure of integration ability does not include the ability to identify literary, linguistic features or the writing styles of the author as that listed in Zhu (2005) and Wei (1994) because it is similar to the appreciation or criticising of the text expression, which is beyond the scope of integration for the present study.

## 2.4. Development of integration ability

Alexander and Fox (2011) identified the "development" as qualitative shifts in reasoning ability and an increasing comfort with abstraction. The research on the development of children's reading ability includes a number of aspects such as the difference between good and poor readers, developmental changes between genders and at different ages (For reviews, see Applebee, 1978; van den Broek, 1997; van den Broek, Bauer, & Bourg, 1997; van den Broek & Kremer, 1999). Oakhill et al. (2003) suggested that once the basic decoding skills are acquired, students' reading comprehension skills develop quickly with significant improvement at the age of 7 to 11. Therefore, integration as a higher-level reading ability is possible to be developed in middle years of primary school years because at that time students have fewer difficulties in decoding the text (Jenkins, Fuchs, van den Broek, Espin & Deno, 2003). However, the development of different integrating skills may be varied.

### 2.4.1 Identifying referent of a pronoun

To identify an antecedent is an important skill of syntactic integration. As Schunk (2008) suggested, compared with poor readers, skilled readers integrate ideas better within and between sentences. For example, skilled readers are quicker to determine a pronoun's referent, whereas poor readers benefit when noun phrases are repeated. Similarly, Oakhill (1993) found that children who are good decoders but poor comprehenders have difficulty in conducting pronominal reference. More researchers have revealed the characteristics of children's ability to identify the referents at different ages.

Chai (1967) was among the first to study the ability to identify referent of a

pronoun by asking children to resolve pronoun ambiguities. The researcher designed 176 sentences with pronoun ambiguities for four age groups, including the fifth, seventh and eighth grade children, and college sophomores. Since pronouns contained in each sentence had ambiguous antecedents, subjects were required to identify the most appropriate referent. As a result, the fifth grade subjects failed to complete the tasks, while the subjects from sophomore group were able to choose the most appreciate meaning for a key word by reducing other meanings. Both seventh and eighth grade subjects could resolve part of the pronominal referents.

Later, Rechek (1976) investigated third grade students' ability to comprehend anaphoric antecedents. 220 subjects from third grade were asked to read sentences containing anaphoric forms and to identify antecedents. These sentences were paraphrased with 3 anaphoric forms, including noun, pronoun and null. Furthermore, these sentences were also varied in terms of several contextual variables, such as length, kernels, parallelism, question and sentence frame. The results indicate that third grade students are not able to identify the referents in all contexts. To them, noun forms are easiest to comprehend, pronoun forms are less comprehensible and null forms the least comprehensible. Among all the contextual variables, only question and sentence frame affect comprehension.

Barnitz (1980) further studied the development in comprehension of selected pronoun-referent structures. The subject participants were second, fourth and sixth grade students. It was found that sentential pronominal structures were more difficult to comprehend than noun phrase pronominal and structures with backward references were harder to comprehend than those with forward references. Differences among participants at different grades were also identified: Grade 2 students were able to comprehend forward references and intra noun phrase and Grade 6 students were able to use inter-sentential noun phrase sentence pronominal structures but felt it difficult

to comprehend inter-sentential sentence pronominals.

The age difference was again confirmed by Chapman (1982). Using cloze tests, he found that students' performance increased with age for 8-, 11- and 14- year-olds, but overall, even 14 years olds were not well equipped with this skill. This result indicates that the ability to deal with anaphoric references is still under acquisition late in secondary school.

In summary, students in primary school have acquired the ability to comprehend pronoun references to some extent, but it is applied to only some pronouns and the accuracy of the comprehension is not guaranteed. Freeman (1988) concluded that students at second and sixth grades still experience difficulties in identifying pronoun references and the solution to it should not be intensive training on finding references but providing them with various text types to read.

### 2.4.2 Identifying relationships between sentences

The ability to identify meaningful relations between sentences is another important component of sentential integration. It seems that students begin to acquire this ability when they enter primary education. Paris and Carter (1973) conducted an experiment with 7- and 10- year-olds to examine children's ability to identify semantic relationships between sentences. In the experiment, participants were presented with a new group of sentences after reading a few sentences and were asked to determine whether these sentences come from the stories they just read. As a result, all participants were able to consistently make correct judgments whether the sentence was from the stories. Also, no significant differences were found among the two age groups. The results indicate that children at 7 are already able to recognise the connections among sentences and construct abstract, meaning-based representations beyond words and sentences level.

The cohesive signal of relations between clauses, connectives is also one of the research focuses when it comes to comprehension of sentential relationships. It is commonly believed that understanding connectives is one of the key features that separate good readers from poor readers (Cain, 2003).

To investigate students' understanding of connectives, Robertson (1968) conducted a Connective Reading Test for students in Grades 4 to 6 and found that although students' understanding of connectives increased with age, comprehension levels of these graders were too low: 57%, 66 % and 75%, respectively. Among 17 connectives used in the research, six connectives appeared to be difficult for students to understand. They were *however* and *although* (for concession); *which* and *thus* (for formal use); *and* (for multiple meaning); *yet* (for holding information).

Irwin & Pulver (1984) further demonstrated that development of the ability to comprehend causal relationships is affected by explicitness, reversibility and clause order. In the research, all passages used to measure students' comprehension had four versions that varied in explicitness (with or without a connective) and reversibility (normal clause order or reversed clause order). A total of 392 students from third, fifth and eighth grade participated in this study. They were asked to read the passages and answer questions that followed. By analysing students' performance, it was found the connectives significantly facilitated fifth and eighth grade students' comprehension of causal relationships but third grade students were not able to understand reversible causal relationships with or without a connective. As to the other two factors, reversibility was proved to affect third graders' comprehension but clause order only affected third and fifth graders' comprehension.

Cain and her colleagues have also conducted a series of research to investigate students' ability to understand different connectives. Cain, Patson and Andrews (2005) asked 145 eight to ten years old students to complete a cloze task and found that

10-year-olds were more capable of choosing correct connectives to signal temporal, causal and adversative coherence relations than 8-year-olds, but no age differences for additive relations were found.

To extend the above finding, Cain & Nash (2011) employed both offline and online tasks to explore the impact of connectives on students' reading comprehension. Participants were 8-year-olds, 10-year-olds and adults (graduates and undergraduates). In Experiment 1, both 10-year-olds and 8-year-olds were less capable of supplying correct connectives for cloze tasks than adults, but older children performed better than the younger. In Experiment 2, participants were asked to judge whether the connectives used to link two clauses were appropriate. 10-year-old children's performance was also better than that of 8-year-olds and even reached the level of adults except for the use of temporal connectives. In Experiments 3 and 4, it was found that connectives facilitated both 8-year-olds' and 10-year-olds' understanding, because they read more quickly sentences linked by an appropriate connective than those with an inappropriate connective.

Moreover, Crosson, Lesaux and Martiniello (2008) found that among 9-year-old English language learners performance for temporal, causal and adversative relations was poorer than for additive ones.

Apart from the research on students' understanding of connectives only, the relationship between students' understanding and use of connectives has also drawn the attention of a few scholars. Nippold, Schwartz and Undlin (1992) investigated readers' ability to use and understand adverbial conjuncts (e.g. nevertheless, however, or similarly) at ages of 12, 16, 19 and 24. The results showed that among these age groups, older participants could use and understand the conjunctions better, while the younger ones could only understand them without proper use. This indicates that even senior primary students are not fully capable of understanding and using connectives.

Acquisition of these connectives follows a developmental pattern. Bloom, Lahey, Hood, Lifter & Fiess (1980) indicated that children's acquisition of connectives start from additive connectives, followed by temporal, causal and adversative connectives. This conclusion was confirmed by Geva (2006), who further revealed that students' acquisition of positive connectives (e.g. and, because) is earlier than negative connectives (e.g. or, even, though), because the logical relations of former connectives are more consistent with surface code of the text. Geva (2006) also pointed out that sometimes children have difficulties in understanding the connectives even though they can use them. For example, fourth graders begin to use *but* and *although* but they may not fully understand the distinctions between coordinating and subordination conjunctions (Geva, 1983).

In summary, primary school students are in the process of developing the ability to identify sentential relations. Typically, they are (1) limited in the sorts of relations that can be understood, e.g., positive-relational connectives rather than negative ones (Robertson, 1968; Geva, 2006); and (2) able to use some connectives but the understanding of correct meaning is not guaranteed. It is affected by the sentence order, explicitness and other elements (Irwin & Pulver, 1984).

### 2.4.3 Understanding the structure of a text

Understanding structure of a text has been researched for a long time because it is helpful to integrate and thus build a coherent mental representation of the text (van den Broek, Lynch, Naslund, Ievers-Landis & Verduin, 2003). Comprehension of the structure of a narrative text depends upon the understanding of causal relations (e.g., Fletcher & Bloom, 1988; van den Broek, 1994). Readers should not only understand the connections between the events within individual episodes but also understand the relationships between the various episodes that make up a story (Cain, 2010).

Identifying the causal structure of narratives can be achieved by tracking the character goals that motivate the story to develop and the characters to act accordingly. The goals also explain the temporal and causal relations among events in the text, with which the actions are reasonable (Trabasso & Nickels, 1992). In the process of pursuing the goals in the story, a series of smaller sub-goals have to be created. It goes on to construct a hierarchically connected structure of goals, to which the readers can relate the input information and form a coherent causal network (Trabasso & Van den Broek, 1985).

Generally speaking, primary students have a better ability to comprehend narratives than expository texts that contain more contrasting and comparing, cause-effects and problem-solution structures (Meyer and Freedle, 1984). Studies have shown such evidence on third graders (Bridge and Tierney, 1981) and fourth graders (Boljonis and Kaye, 1980).

Studies have been conducted to investigate the construction of hierarchical structure in reading among students as well. The types of tasks can be put into three categories: recalling a story, identifying main ideas and judging or ranking the importance of information. From these tasks, researchers have gained some insightful findings on students' development of the ability to identify structure of text.

The first type of task designed to measure students' ability to identify the structure of a text is asking students to recall the story after reading. Stein (1979) was among the early researchers to do so. She asked both second and sixth graders to recall a story and its distorted version, one that contains parts moved around from the original. The results showed that both grades were able to recall the original more than the distorted one. However, when older children did the recalling, they were more likely to adjust the distorted content to the original order. She believed this was due to students' growing knowledge of story grammars. Taylor (1980) also suggested

that students develop skill in organising reading material into a higher-level structure as they accumulate more experience in reading. In the study, both fourth and sixth graders were asked to read and recall a short story. The older children recalled more superordinate material whereas the younger ones recalled more subordinate material. This result demonstrates that older children use higher level structure for organising and remembering the lower level material.

Taylor (1980)'s finding was echoed by Goldman & Varnhagen (1986). They compared 32 third and 52 fifth graders' comprehension of narrative causal structures and found that although their ability to identify important statements was not as mature as adults, both third and fifth graders mentioned higher level goals more often than lower level goals in both recalling the story and answering questions about the causes of events in the story.

Although children's storytelling is not necessarily related to reading, this method can reflect students' understanding of goal structure of narratives to some extent. Through children's storytelling, Trabasso & Nickels (1992) found that 4 year olds were able to acquire some understanding of goals and structures in narratives and by the age of 5 they could connect story events through a superordinate goal. They also found that by the age of 9, children told similarly structured stories as adults did, despite the immaturity of the story content and structure.

Trabasso et al. (1992) further found 3- to 5-year-old children began to produce goal structures in narration, and nine-year-old children were capable of establishing some critical aspects in a goal structure just as adults did. Correspondingly, it was also found that 4- and 6-year-old children demonstrated the ability to recognise the goal structure of audiovisual narrative stories by recalling more superordinate level information (van den Broek, Lorch & Thurlow, 1996).

Orrantia, Múñez & Tarín (2014) asked 30 4th graders and 36 6th graders to read

narratives that state the character's goal early in the text with an action later that were either consistent or inconsistent with the goal. The results revealed that 4th graders were able to detect the inconsistency between the character's goals and the actions, but with the help of illustration, they can integrate such information. For 6th graders, they spent more time on inconsistent actions than on consistent actions.

The second task that researchers used to examine students' understanding of structure was to ask them to judge or rank the importance of information, because readers can make such judgements only if they recognise the connections of a statement to other statements, episodes or parts of the text. The more the connections, the more important it is.

Brown and Smiley (1977) performed two experiments among 8-, 10-, 12- and 18-year-olds. They broke folk tales into idea units and first, asked children to rank the importance from most to least important, and then asked them to recall the stories after listening to them. They analysed the rating data and found that young adults had highly consistent ratings but it was the opposite for the younger children. Almost all 8-year-olds failed the tasks, and even 12-year-olds were only able to identify the most and least important information. However, the results of recalling data revealed that all age groups recalled more often the important elements than the unimportant elements. The seemingly contradictive findings between the two tasks suggest that younger children do not possess the meta-cognitive ability to differentiate importance of text information.

Stein and Glenn (1979) suggested that the reason for difference in the abilities of children of different ages to discriminate the important and unimportant information is because children at different ages may have different views about what is important in the text. In the study, 1st graders considered the consequences of actions as most important, while the 5th graders regarded the goals of the main characters as the most

important. Their findings actually indicate that lower age students lack the ability to recognise the various connections among pieces of information.

van den Broek (1989) further revealed the relationship between students' ability to judge the importance of information and textual properties. He asked 8, 11, 14 and 18 year-olds to judge the importance of the statements on the basis of their causal properties. There were two factors that feature the key statements: the number of their causal relations, and the kinds of relations they had. Relations were either intraepisodic (i.e., connecting statements in the same episode), or interepisodic (i.e., connecting statements in different episodes). From this research, the more intraepisodic causal relations a statement had, the more important it was ranked by children in all age groups. However, statements that had interepisodic relations were regarded as more important by 11 years and older. That is to say, younger children may not be as aware of qualitative or structural differences between different kinds of relations although they may be sensitive to the quantitative aspects of a statement's relational role within an episode. This pattern was further confirmed by students' answers to why questions. It was found that older children gave answers that crossed episodic boundaries more than the younger children did. These findings reflect the developmental characteristics of children's ability to infer and integrate relations in stories. This research also claimed that causal inference was vital to judge the importance of information.

When readers recognise the hierarchical structure of text in terms of importance of information, they are able to identify the main idea of text (OECD, 2009). Children develop the ability to identify main ideas drastically from when they are second graders to the sixth graders. For instance, it was found that children as young as in the second grade were able to abstract main ideas for pictures to some extent, however, older children (fifth and eighth graders) were better at organising pictures to form a

story (Yussen, 1982). Moreover, Yussen (1986) specifically revealed the developmental characteristics of students' ability to identify main ideas in pictorial stories. For second graders, they couldn't decide the important events in a story, neither could they select the superordinate statements of the story. They also tended to use important details of the story as the main idea. For fifth graders, their overall performance improved, but they had difficulties in both determining the importance of different events and selecting superordinate statements. As to eighth graders, they were able to decide important events, but struggled in distinguishing superordinate and subordinate statements.

Hare et al. (1989) conducted research with 75 fourth-grade, 78 sixth-grade and 107 eleventh-grade students in America. The students were asked to select topic sentences for texts which varied in explicitness and location. They found that fourth graders had difficulties recognising themes in a text, especially when the topical sentences were in the medial or final position of the paragraph. Students tended to select the first sentence as the theme even when it was about trivial details only. However, sixth graders were able to recognise the topical sentences regardless of location. van den Broek, Lynch & Naslund (2003) provided their subjects (757 students at the age of from 8 to 18, in grades 3, 6, 9 and 11) with two versions of one narrative story: a hierarchically structured (causal hierarchy) according to the character goal and a non-hierarchical (sequentially) structured one. The students were asked to select the main titles after reading them. They reached the following conclusions: (1) Even 8 year-olds were able to understand hierarchical structure of goals in the text and identify the main idea of the story. Evidences were found when the students chose the most superordinate goals than others as titles both for the hierarchically structured and nonhierarchical (sequential) structure narratives. (2) Students' ability to choose the superordinate goals increased with age. The third

graders tended to use more improper middle and subordinate goals as titles for the stories than 9th and 11th graders. This result accounted for younger children's difficulty in understanding the global structure, because they failed to recognise the connections between goals and episodes of stories.

In summary, children's ability to identify structure of the text is in continuous development. van den Broek, et al. (2005) have summarised the developmental trend of students' ability to identify the structure of text in the following sequence: (1) Concrete physical relations that occur close together; (2) Concrete physical relations between distant events; (3) Causal relations involving character's goals, emotions and desires; (4) Hierarchical and thematic relations between clusters of events; and (5) Translation of the story theme into a moral or a lesson. Specifically, children under 8 are able to identify causal relations (Trabasso & Nickels, 1992) and by the age of 8 to 10, they are able to identify super-ordinate goals and hence the main idea of the text and to determine importance of information, sometimes even similar to what adults are capable of (e.g. Trabasso et al., 1992; Taylor, 1980; Goldman & Varnhagen, 1986 ). When they enter the 6th grade, students are able to form a macro structure of the text and organise text information accordingly (Stein, 1979) and connect distant information in the text (van den Broek, 1989). However, there are studies that have demonstrated otherwise. For instance, Brown and Smiley (1977) suggested that 12 year-olds still have difficulties in judging importance of information, as opposite to some findings that 11 year-olds were capable of succeeding in the task (Stein and Glenn, 1979). The inconsistency among studies shows that 6th graders' ability to identify structure is still unstable. All abovementioned findings shed light on the present research.

### 2.4.4 Summarising a text

Summarising is asking the reader to provide a short, comprehensive and conclusive abstraction. It is a high level of integration, students not only need to recognise the structure of text, but also have to write down the product summarised, which increases the cognitive demand of this skill. Compared with other integration skills, it seems that the skill to summarise develops late. Luo (2001) conducted factor analysis after the reading tests and found that the skill to summarise is a key component in the 6th and 9th graders' reading ability. Also, the ability emerges to some extent in 6th graders although it only develops to a higher level by 7th grade.

A vast body of research has revealed that primary students' summary of text is different from that of older children or adults in terms of many aspects. For instance, young children have difficulties in summarising the text according to the structural importance or "centrality" principles as adults, because they sometimes ignore structurally important topic sentences and implicit main ideas and include only the ones that they find interesting (Hidi, 1984, 1985; Taylor, 1986). McConaughy (1980) found that children's summaries of stories were focused on the literal information of actions and events, lacking inferences about cause and effect and motivations of characters, because children often assign more importance to physical cause while adults focus on psychological cause. Clearly, these findings can be explained by the limitations of students' ability to identify the structure of the text.

Another reason for the difference in the quality of summaries produced by young children and older ones may stem from the strategies they use when summarising. Kintsch & van Dijk (1978) proposed four operations involved in producing a summary, which are also called as rules to summarise: (1) deletion of redundant propositions; (2) substitution of a sequence of propositions by a more general one; (3)

selection of the macroproposition of the text; and (4) construction of a macroproposition when one is not explicitly stated. Inspired by Kintsch & van Dijk (1978), Brown & Day (1983) studied the development of students' use of macro rules (selection, condensation, substitution, invention) in writing summaries. 18 fifth graders, 16 seventh graders, 13 tenth graders and 20 college students were involved in this study. The researcher found that even the youngest children had gained proficiency in summarising to some extent, and were able to use the more sophisticated summary rules, such as selecting the topic sentence. Specifically, fifth graders were aware enough to delete unimportant information of the story, whereas older children were able to use more sophisticated rules to condense the information. Regarding the use of superordinate substitution rule, younger children were not as frequent and effective as college students and tenth graders. The most difficult rule of invention was seldom used by fifth and seventh graders. Although tenth grade students used it, they couldn't use it appropriately in most cases. Even college students still did not master this rule. In addition, they found that younger readers tended to use a "copy-delete" strategy to summarise, in other words, younger children copied whatever was left from deletion to the summary. Obviously, they needed to gradually change from copying to more active types of processing in order to produce a high quality summary.

Meanwhile, Brown, Day & Jones (1983) also probed into the relation between planning and effective summarisation. They asked 46 5th, 7th and 11th graders and 11 undergraduates to write constrained and unconstrained summaries of stories they had previously learned. College and high school students tended to plan by making drafts before writing summary, which lead to inclusion of the most important information and more idea units with the same number of words. The few younger students who planned adequately performed at a level set by college students. Planning, not age,

was the best predictor of efficiency, although age and the propensity to plan were highly related. The ability to render information as succinctly as possible requires judgment and effort, knowledge and strategies and, therefore, develops later.

Some studies have also investigated the influence of textual properties on the performance of summarisation. For instance, Wan (1990) found topical sentences useful for children to summarise the main ideas in general but it was less effective for the less skillful readers when read complex text.

Generally, the development of students' ability to summarise text follows a certain sequence. Shen (2001) investigated the characteristics of summarisation ability among primary school students. He divided six levels of the summarising performance: (1) the summary is inconsistent with the original or far away from it; (2) the summary is mechanical copying of a few sentences from the original that does not summarise the meaning; (3) the summary captures some ideas of the original story but not comprehensive enough; (4) the summary contains the main events in the story but one or a few important episodes are missing; (5) the summary prioritises the information in a hierarchical structure and provides an accurate account of the text, albeit some redundancy in the wording; and (6) the summary is an accurate, comprehensive and concise account of the original. From the available literature, we can know that students in primary school possess the ability to summarise to some extent, but they still are not able to provide a good summary that meets the proper requirements in terms of content, structure and wording.

### 2.4.5 Influencing factors on the development of the ability to integrate

An array of factors can influence development of students' reading abilities. For instance, Oakhill & Cain (2007) reviewed the literature and argued that students need to develop inference-making ability, comprehension monitoring and sensitivity to

story structure in order to acquire better comprehension ability. On the other hand, Johnston, Barnes & Desrochers (2008) suggested that less skillful readers fail to exclude less important information and identify pronominal references because of limited capacity of working memory, which at the same time lowers their ability to make inferences.

Apart from these psychometric factors, there are also some factors related to teaching and learning. The foremost factor that most researchers have mentioned is use of reading strategies. Literature review shows that meta-cognition is one of the major reasons accounting for the differences in reading performance among readers. The comprehension monitoring readers keep asking themselves whether the passage makes sense, whether parts contradict one another and whether the text is consistent with their previous experiences (Markman, 1979). Vosniadou, Pearson and Rogers (1988) asked third and fifth graders to read stories containing inconsistent statements and pointed out anything wrong with the passage. The fifth graders recognised more than twice the inconsistencies as did third graders. The findings showed that students develop skills in comprehension monitoring as the reading experience grows. Markman (1977) further pointed out that the lack of constructive processing is the reason why readers have low meta-cognition in reading. Given the relevance between constructive processing and meta-cognition, some studies advocate the teaching of reading strategies in order to promote integration abilities. For instance, Van der Schoot, Vasbinder, Horseley and van Lieshout (2008) found that skillfulness in reading is related to the use of reading strategies; more successful comprehenders spend more time in processing important than unimportant text elements, while less successful comprehenders use equally long time processing important and unimportant elements of text. The teaching of reading strategies is therefore useful for less skillful comprehenders to improve their meta-cognitive levels that result in more

effective integration in reading.

Another important factor for students' acquisition of reading ability is extensive reading. Many researches have confirmed that the practice of extensive reading has a positive effect on students reading abilities. For instance, Stanovich (1986) proposed a "Matthew effect", claiming the more a student reads the better performance he will achieve, and vice versa. His claim was further confirmed by research conducted by him and his colleagues (Stanovich & Cunningham, 1992; Cipielewski & Stanovich, 1992). Anderson, Wilson & Fielding (1988) also found that extensive reading accounted for 16% of variance of fifth grade students' comprehension performance.

The third factor is reading attitude, which sometimes refers to the system including reading interest, reading motivation and reading confidence (Mullis, et al., 2007). Previous research has found that positive attitude is important to the development of students' reading ability. Baker & Wigfield (1999) suggested reading motivation predicted students' reading performance and the overall learning achievement. Wigfield & Guthrie (1997) found that girls held better reading motivation than boys in primary school, which explains the gender difference in students' reading performance.

From the above literature, it can be inferred that development of reading ability is influenced by a series of factors. However, little research has examined the relationship between these factors and the development of integration ability. Since integration ability is an important component of reading ability, the predictive effects of using reading strategy, extensive reading and reading attitude on reading performance should still exist. To test this hypothesis, the present research designs a relevant questionnaire for further analysis.

### 2.4.6 Conclusion

Studies have shown that students in Grades 3 and 4 have developed some reading

abilities. For instance, students in Grade 2 are able to comprehend some pronoun references (Barnitz, 1980) and students in Grade 4 can comprehend some causal relationships in the text. But it should be noted that the ability to integrate is still under construction and it develops late in primary school and is expected to reach a new level in Grade 6.

However, there is room for further research regarding development of integration ability:

(1) Focus of research: The relationship between different abilities to integrate awaits further investigation because most of previous research has been focused on a specific ability at a time. Some skills have attracted much more research in western context than in Chinese context, such as identifying the referent of a pronoun. In addition, research on developmental characteristics and differences between genders in integration ability has also been sparse.

(2) Subjects of research: Most studies include no more than 100 participants and large-scale studies have been few and far between.

(3) Methods of research: Psychometrics has been the predominant research method of measurement. For instance, students were asked to report after reading the importance of certain information, or whether target sentences are consistent with the textual information. They were asked to identify pronoun references, recall what had been read. Besides, student works were also compared for analysis of their summarisation characteristics. Generally, As Varnhagen & Goldman (1986) have summarised, two different sorts of methods are commonly used to investigate students' comprehension. One is asking students questions, which is a direct test that reflects the levels of comprehension. The other is free recall of what has been read, which requires students to understand the text and produce language output. In the teaching environment, however, reading comprehension tests can be conducted because the

results provide teachers with useful pedagogical implications. Therefore, this project explores students' integration ability using reading comprehension tests conducted in six primary schools across Hong Kong.

# Chapter 3 Research Design

The present study investigates the developmental characteristics of primary students' integration ability in reading and the relevant influencing factors. 723 students in Grade 4 and Grade 6 in Hong Kong participated in a reading integration test and post-test survey, and some of them were invited for semi-structured interviews.

## 3.1 Framework of integration ability in reading

As discussed in Section 2.3, the integration ability in reading consists of six skills: Identifying a Referent of pronoun (IRPN)、Identifying relationship between adjacent sentences (IRS)、Identifying main ideas (IMI)、Identifying relationships among paragraphs (IRP)、Abstracting Specific Information (ASI) and Summarising the whole text (SWT).

### 3.1.1 Identifying a Referent of pronoun (IRPN)

IRPN refers to the skill of identifying the relationship between pronouns and their referents in text, or locating the specific content referred by the pronouns. The use of pronoun is one of the important forms to maintain the cohesion of text, in which some words are used to replace other information that has been mentioned in order to maintain the coherence of the text as well as to be concise (Halliday & Hasan, 1976, 1985).

The objects referred by pronouns, in other words, referents, can be a phrase, a sentence, a person or an event. To identify the specific referents while reading is

regarded as an important reading skill because it allows readers to track characters, things, places or events in the text to ensure continuous understanding of the text (Gernsbacher, 1990; Graesser et al., 2003; Kintsch & van Dijk, 1978). With this skill, readers can establish the microstructure of the text and further form the basis for the textbase (Kintsch & Rawson, 2005).

The pronouns can be classified into three types according to the content of referents: Personal pronouns such as "I, me, we, us, you, he, him, they"; demonstrative pronouns such as this, that, these, those; locative pronouns such as here or there. In addition, according to locations of referents, there are two kinds of referring relationships: anaphoric relations, in which the referents appear before the pronouns, which can be named antecedents; and cataphoric relations, in which the referents usually appear after the pronouns (Hillday & Hasan, 1976; Thompson, 2004).

### 3.1.2 Identifying relationship between adjacent sentences (IRS)

IRS refers to identifying the semantic relationships between adjacent sentences, which is also one of the necessary skills for students to construct the microstructure (Kintsch & Rawson, 2005).

A variety of classifications of connections at sentence level have been proposed. Halliday & Hasan (1976) identified four types of relationships between adjacent sentences based on the semantic connections: additive, temporal, causal and adversative. Martin & Rose (2007) proposed a modified classification: additive, comparative, sequential and explanative. However, the categorisation proposed by Halliday & Hasan (1976) is more suitable to be adapted for analysis of primary students' reading performance and reading materials, because this categorisation is widely applied in the classroom teaching in Hong Kong. It has been proved that

primary students are already familiar with temporal and causal relationships in the text (van den Broek, et al., 2005) and the present study focuses on discussing students' ability in identifying the adversative and additive relationships.

Students could identify the relationships between adjacent sentences according to the connectives linking them. For example, "because" and "so" causality signal words while "before", "always" and "after" are temporal connectives. Readers spend less time on and comprehend better when reading sentences with connectives than reading sentences without connectives (Golding, Millis, Hauselt & Sego, 1994; Millis & Just, 1994).

### 3.1.3 Identifying relationship among paragraphs (IRP)

IRP refers to identifying the semantic relationships among paragraphs. "Paragraph" is often defined in two ways. Firstly, it refers to physical paragraph, namely, the basic and direct unit in text structure. It does not represent the logical structure of text, but appears as author's natural ending. Secondly, it refers to the conceptual paragraph, which refers to a group of rhetorical concepts. It is a coherent and complete discourse unit that discusses or describes a "core concept".

Therefore, students should not only be able to identify relationships among physical paragraphs but also need to sort out the logical relationships among conceptual paragraphs in order to understand the text more coherently. Van den Broek, Lynch & Naslund (2003) pointed out that readers can identify the relationships among different sections of the text through analysing the relationships among paragraphs, which is an important foundation for the formation of coherent reading representation. Hence, IRP is an important integration skill.

Similar to the relationships between adjacent sentences, the relationships among paragraphs include cause and effect, problem and solution, contrastive, additive and

time (The State of Queensland, 2004). Sometimes readers can also identify the relationships with the help of various signal words. However, students need to comprehend the main ideas of each paragraph first and thus the cognitive process is much more complicated than IRS since one physical paragraph usually contains several sentences.

### 3.1.4 Identifying main ideas (IMI)

IMI refers to identifying the sentences expressing the core idea of the text or paragraph. Normally these sentences contain macropropositions (Kintsch & van Dijk (1978).

By identifying the main ideas, students understand the text as a whole and establish a hierarchy among ideas. Van den Broek, Lynch & Naslund (2003) proposed that identifying the main idea of a text enhances readers' mental representation of the text from microstructure to macrostructure. Therefore, IMI becomes an important integration skill since macrostructure is also a key element of readers' textbase. However, this kind of comprehension is only the initial understanding of the text.

In the process, students need to determine the importance of sentences in paragraphs or in the text and distinguish between key ideas and minor details, so that they are able to identify the most general and overarching sentences. Students can identify the theme of the text with some of the signaling devices such as title, paragraph beginning and signal words (Lorch, Lorch, & Inman, 1993). However, Kintsch & Rawson (2005) asserted that there are also some influencing factors in the text, such as typeface, rhetorical cues, repetition of concept words, or structural features of the text, which might mislead students to find the correct topic sentence. Surber (2001) clarifies that it is easy for students to mistake some repeated but trivial information for important information, resulting in misidentification of the topic

sentence. In this sense, IMI is not necessarily an easy skill.

### 3.1.5 Abstracting specific information (ASI)

ASI refers to locating relevant information and abstracting it to meet specific needs.

According to the types of information needing abstraction, the tasks of ASI can be classified into two types: 1) summarising a specific group of sentences or a paragraph; 2) summarising relevant content about a specific idea, for instance, a character's psychological change before and after an event. With respect to the latter task, readers first need to identify the information to be abstracted. Whether students can find and retrieve such information depends upon clear understanding of the macrostructure of the text, especially when the information to be abstracted locates at different parts of the text.

For both types of tasks, there is no topic sentence explicitly stated for the information to be abstracted, and readers need to propose concise statements in their own words instead. In this case, readers need to process a series of cognitive operations. Kintsch & van Dijk (1978) stated that readers probably need to delete redundant propositions or substitute a sequence of propositions by a more general one. Also, Kirkland & Saunders (1991) stressed that students ought to superorinate, transform or reconceptualise the information in the text. In this sense, ASI is one of the complex integration skills.

### 3.1.6 Summarising the whole text (SWT)

SWT refers to presenting a short version of the key ideas based on the structure of the text (Chapman, Nasits, Challas & Billinger, 1999). It represents readers' understanding of the macrostructure of text and shows readers' deeper comprehension

of the text. Besides, it is also regarded as one of the criteria of discriminating skilled and poor readers (Brown & Day, 1983).

The mental process of SWT text shares much in common with the mental process of ASI. For instance, both ask students to summarise concepts and transform language expression. However, the major difference between SWT and ASI lies in the objects to be summarised. Since SWT refers to summarising the whole text, it covers much more information than ASI. Hence, students need to be capable of deleting, substituting and combining bigger text units when they are summarising the whole text (Hare & Borchardt, 1984). Due to the abundance of information, readers usually need to revise and adjust many times in order to produce a good summary (Johnston & Afflerbach, 1985).

There are four aspects of evaluating quality of students' summaries: correctness (summarising the original content), broadness (reflecting the major content), accuracy (containing important information and abandoning unimportant information) and conciseness (language requirement).

In all, among six skills of integration, IRPN, IRS and IMI require less of cognitive ability than IRP, ASI and SWT. This hierarchy of cognitive difficulties is helpful to reveal the ascending trend when analysing students' integration ability.

## 3.2 Sampling

The present study selects Grade 4 and Grade 6 primary students as research participants. The main reason is that students under Grade 4 are at the phase of "learn to read", and they mainly develop basic reading skills such as decoding, while students enter the phase of "read to learn" after Grade 4, and they begin to develop some higher level abilities, for instance, integration ability (Chall, 1996). In Hong Kong, the level of schools is reflected through the academic levels of students they

admit. Band 1 schools admit mostly high-ability students, Band 2 schools admit mostly moderate-ability students and Band 3 students admit mostly low-ability students. Therefore, the study selects 6 primary schools from Band 1-3 randomly to conduct the investigation. As shown in Table 3-1, School A and School B are B1 schools, School C and School D belong to B2 and School E and School F are B3 schools.

The present study applies opportunity-sampled method to select participant schools. Firstly, we invited consultants who had been involved in the relevant research in The Hong Kong Polytechnic University and were also familiar with the educational background in Hong Kong to recommend 6 schools in each band. Then we selected two schools from each band randomly. Later, we randomly selected 2 classes from Grade 4 and Grade 6 in each school, and recruited students in those classes to participate in the test and questionnaire survey.

Table 3-1 Students' demographic characteristics

| School | Grade | | Gender | | Total |
|---|---|---|---|---|---|
| | 4 | 6 | girl | Boy | |
| A | 72 | 71 | 62 | 81 | 143 |
| B | 70 | 68 | 57 | 81 | 138 |
| C | 71 | 69 | 70 | 70 | 140 |
| D | 62 | 58 | 58 | 62 | 120 |
| E | 51 | 69 | 49 | 71 | 120 |
| F | 26 | 36 | 28 | 34 | 62 |
| Total | 352 | 371 | 324 | 399 | 723 |

Note: A-B are B1 schools, C-D are B2 schools and E-F are B3 schools.

We selected 2 students from each grade, 24 students in total, for interviews. In order to explore the different processes among students, one low-achieving student and one high-achieving student in each grade, recommended by teachers according to

students' daily performance, attended the interviews.

In addition, we randomly selected 7 Chinese teachers out of 18 teachers who were in charge of the classes participating in the study for interviews. The interviewed teachers were teaching or used to teach Grade 4 or Grade 6 students, with more than 3 years' teaching experience. Their average teaching experience was 4.7 years, SD=1.82 (see Table 3-2).

Table 3-2 Teachers' demographic characteristics

| Teacher | Gender | Years of teaching |
|---|---|---|
| KT-A | Female | 5 |
| KT-B | Female | 3 |
| KT-C | Female | 4.5 |
| PK-A | Female | 3.5 |
| PK-B | Male | 6 |
| PK-C | Female | 3 |
| PK-D | Female | 8 |

## 3.3 Data collection

The present study adopts mixed-methods, including reading tests and interviews for data collection. The reasons for choosing mix-methods to conduct research are as follows: (1) Most prior studies rely on small sampled psychological experiments to explore the mechanism of one specific integration skill, but lack systematic analysis of various skills with larger samples. By adopting quantitative methods to analyse students' performance in the integration test, this present research supplements and extends the existing studies. (2) Qualitative research methods enable us to explore the developmental characteristics of students' integration ability and influencing factors from multi-perspectives, so that we can provide a full picture of the research results

(Creswell & Plano Clark, 2006).

### 3.3.1 Reading integration test

3.3.1.1 Selection of texts

Two narrative essays were included in the reading test because narrative essays are the most common genre in primary students' reading materials. It is easier for students to demonstrate their best performance by reading narratives compared with argumentative and expository essays.

In order to ensure that the selected texts were suitable to assess Grade 4 and Grade 6 students' integration ability, the present study invited Ms. Fong from School F to recommend essays first. As a veteran teacher and the coordinator of Chinese subject in school, Ms. Fong is capable of judging whether the texts were suitable for the test. With reference to PIRLS criteria in selecting texts, such as "close to students' life", "proper length" (around 800 words), "suitable for developing items", Ms. Fong recommended 15 texts to the researcher. Later, 4 texts were decided after several discussions with Ms. Fong. After a pilot study, 2 texts were excluded because they were either too difficult or too easy to understand. Thus 2 texts were finally selected.

Next, the researcher and Ms. Fong modified the language expression in texts in some places, such as deleting words that students might have difficulty in understanding and adding some sentences for coherence.

The selected texts included one fiction and one non-fiction. To select text in this way is consistent with the common classification of narrative in international reading assessments (National Assessment Governing Board, 2012). One text named "Wyra's job hunting" was a non-fiction text. It was about a story of a retired sports star who didn't give up practising smiling until he was recruited by an insurance company. The other one was a fiction titled "A house looking for a home". This is the story of a

house who discovered she had no home started to look for her home in cities, villages and the wild field. The two texts shared some typical features of narratives. For example, in both stories, the main characters needed to accomplish a specific goal, so they needed to complete many subgoals (Richards & Singer, 2001). Therefore students should consider the structure of the main goal as well as the subgoals when they integrate the information in texts (Goldman & Varnhagen, 1986).

3.3.1.2 Writing test items

Two steps were employed to formulate reading test items: (1) The researcher wrote test items for six integration skills; (2) The researcher invited 6 primary teachers to attend a focus group meeting. Participants included one teacher each from Schools A, B and F and three teachers from another Band 2school. They discussed test items to make sure that these items could be understood by students and reflect students' integration ability. After the meeting, the researcher modified test items according to the suggestions by teachers.

The test paper includes two types of test items: multiple-choice item, each item scoring 3, and short-answer questions, each item scoring 7. The total score of items for assessing each integration skill was 10. At the same time, the researcher also developed a scoring rubric for the test paper, however, this rubric was revised based on students' answers later.

The reading integration test asked students to complete 12 test items within 45 minutes. Student participants from Grade 4 and Grade 6 completed the same test paper in order to ensure the equivalence of standard to compare performance of different groups of students. It was found that most students could complete the test within the required time, indicating this test was suitable for both grades.

3.3.1.3 Pilot study

A pilot study was conducted to examine whether the research instruments were suitable to assess students' integration ability accurately and whether students could complete the test. The pilot study was conducted in 2 classes (one from Grade 4 and one from Grade 6) in School C, which were selected from among students who were not participating in the main study. School C is one of the intermediate-level schools, and the results of pilot study in this school provide reference to predict students' performance in high level (School A and B) as well as low level (School E and F) schools. 70 students in total participated in the pilot study.

Thus, the researcher modified the test paper based on students' performance in the pilot study: (1) Deleting some texts and test items. For selecting items, the test paper included 4 texts and 3 test items for each skill. After the pilot study, the researcher deleted the most difficult or the easiest text for students and deleted test items with low discrimination degree; (2) Revising instructions of some items to ensure students could understand the items correctly; (3) Modifying scoring rubric. With respect to the sample answers to short-answer questions, the researcher modified model answers based on students' answers to ensure accuracy of scoring; (4) Trying out the scoring rubric to mark students' answer sheets, based on which the interview protocol was revised.

### 3.3.2 PIRLS reading test

In order to validate the reading integration test, a PIRLS reading test paper was used to examine students' overall performance. All test items came from PIRLS2006 Test, and the text used was "An Unbelievable Night", a narrative essay translated into Chinese by Taiwan PIRLS Center (National Central University, 2007). The test paper contained 12 items: 6 were multiple choice items and 6 were short-answer questions.

According to PIRLS2006, each multiple choice item scores 1 and each short-answer question scored 1-2, 16 in total.

Students in School D completed the PIRLS reading test, which means they had to complete both reading integration test and PIRLS reading test.

### 3.3.3 Student questionnaire

Student questionnaire was designed to investigate students' experiences of completing tests and relevant factors that might influence the development of integration ability in reading. It was first designed by the researcher, and then modified by three university researchers and Ms. Fong to make sure the items represented the relevant concepts and students could understand the items.

3.3.3.1 Construction of Student questionnaire

Student questionnaire included the following two aspects:

1. Students' perceived experiences of the reading test

Students needed to choose the most difficult item from each text and explain the reasons. Also, they needed to compare the difficulty of the reading integration test compared with that of the semester examinations in the school. The choices ranged from "today's test is easier" to "today's test is much more difficult". The information reflected the difficulty of the test experienced by students, which indicated how difficult it is to acquire integration ability for primary students.

2. Factors influencing the development of students' reading integration ability

Researchers have identified many factors influencing students' reading ability development, such as school, family, social community and students' personal learning behaviors and attitudes (Bell & McCallum, 2008; Mullis, et al., 2009). Among various factors, use of reading strategy, exposure to extensive reading and reading attitudes, shed direct and important impact on students' reading ability

development. Hence, the questionnaire investigated how these three factors influence students' integration ability development.

(1) Reading strategy. Reading strategy is the readers' mental operations for effective comprehension of reading materials (Pani, 2004). Whether mastering reading strategies or not has been considered as an important indicator to distinguish good readers from poor readers (Pressley & Afflerbach, 1995; Alexander & Jetton, 2000). The present study summarises 10 reading strategies relevant to integration skills based on prior research (Block, 1986; Young, 1993; Abbott, 2006; Cohen & Upton, 2007; Zhu, 2010): a) summarise; b) understand causal relationships; c) delete; d) skipping; e) use own words; f) combine paragraphs; g) mind-map; h) use signal words; and i) catch key words.

(2) Exposure to extensive reading material. The more students read, more frequently they read, the easier it is for students to improve their reading performance (e.g. Anderson, Wilson & Fielding, 1988; Cipielewski & Stanovich, 1992). This indicates that extensive reading is a crucial factor that influences reading ability. Therefore this study further explored the relationship between students' performance in reading integration test and exposure to different types of narrative text. According to the text type documented in American National Assessment of Educational Progress (NAEP) 2013, the questionnaire investigated five types of narratives that are close to primary students' daily study: biography, fairytale, detective story, historical story and news report.

(3) Reading attitude. Reading attitude has been proved to be an important factor influencing students' reading ability development (McKenna, Kear & Ellsworth, 1995; Baker & Wigfield, 1999; Petscher, 2010). Current research has proposed different definitions for reading attitude. Some define it as readers' feelings, such as Alexander & Filler (1976)'s statement that "a system of feelings related to reading which causes

the learner to approach or avoid a reading situation" (Alexander & Filler, 1976, p. 1) while another definition includes more elements by referring it as "a state of mind, accompanied by feelings and emotions, that make reading more or less probable" (Smith, 1990, p. 215). The present study tends to agree on the second definition. With reference to classification in PIRLS 2006-2011 (Mullis, et al., 2007; Mullis, et al., 2012), the present study has assessed students' reading attitude from the following aspects: students like reading (such as "reading is interesting", "I like reading with my family"), reading motivation (such as "reading helps me to improve my performance in Chinese tests"), reading confidence (such as "I am affected by the text when I am reading").

In the second part of the questionnaire, a 4-point Likert scale was adopted. Students had to choose a value from 1 to 4 for each item. The bigger the value was, the more the students agreed with statement of the item.

3.3.3.2 Pilot study of student questionnaire

The questionnaire survey was conducted upon the completion of reading integration test. The questionnaire used in pilot study contains more items. The researcher did item analysis based on students' results and the Cronbach α value for the questionnaire is 0.85. Also, the researcher interviewed 3 student participants to check whether the instruction of the items had been understood correctly. At last, the researcher revised the questionnaire based on the quantitative statistics and qualitative data. The revisions are mainly in (1) deleting the items that students felt difficult to understand; (2) combining items that measured similar concepts. The final questionnaire required 15-20 minutes to complete. In the main study, the questionnaire survey was conducted after the test.

### 3.3.4 Teacher and student interview

After the reading integration test, the researcher visited schools for teacher and student interviews.

3.3.4.1 Student interview

Student interviews are designed to understand the students' thinking process when they are completing the reading integration tasks. The interview questions include:

(1) What difficulties have you run into in the reading test?

(2) Did you try to solve the difficulties? If yes, what methods did you use?

The interviews were conducted in groups and each interview lasted 30 minutes. After interview, the researcher transcribed the interview, checked the accuracy and analysed the transcripts.

3.3.4.2 Teacher interview

Teacher interviews were conducted to understand teachers' perceptions about the development of students' integration ability in reading and effective teaching approaches adopted.

The interview questions included: (1) Among various skills of reading comprehension, which skill do students perform better and which worse? (2) According to your own teaching experiences, how does a primary student's skills of integration ability develop? (3) Have you taught some reading strategies to develop students' integration ability? Do they comprehend and use the strategies well? (4) Do you think extensive reading could help students to improve their integration ability? Why? (5) How did students with different attitudes perform when you were teaching them integration?

Teacher interviews were conducted face-to-face and each interview lasted 30 minutes. There were 7 interviews in total. The interviews were transcribed and

cross-checked for further analysis.

In addition, the present study collected 190 students' scores of the latest term examinations from School B, School D and School E.

## 3.4 Research procedure

The present study was started in April 2010 and completed in January 2014. The procedure is shown in Table 3-3.

Table 3-3 Research procedure

| Phase | Time | Work |
|---|---|---|
| Phase 1<br><br>Design Frameworks and Literature preparation | 2010-2011 | Review literature<br>Develop framework, test items and scoring rubric of reading integration tests<br>Design reading integration test paper<br>Design student questionnaire<br>Invite experienced teachers to revise the test paper<br>Contact participating schools<br>Design interview protocols |
| Phase 2<br>Pilot study and revisions | 2012.3 | Conduct pilot study for reading integration test, student questionnaire and interviews<br>Revise research instruments<br>Revise language expressions of questionnaire |
| Phase 3<br>Data collection | 2012.4-2012.6 | Conduct reading integration test<br>Conduct student questionnaire survey<br>Conduct interviews with teachers and students |
| Phase 4<br>Data analysis | 2012.7-2012.12 | Score test papers, analyse students' performance and data input |
| Phase 5<br>Report writing | 2013.1-2013.12 | Analyse data and write dissertation |
| Phase 6<br>Research complete | 2014.1-2014.2 | Revise dissertation |

## 3.5 Scoring students' test papers and data analysis

Quantitative data were collected from reading integration test and student questionnaires, whilst qualitative data were mainly from student and teacher

interviews.

### 3.5.1 Scoring students' test papers

All the test papers were scored by a researcher Ms.Qu who has obtained MA degree in Chinese Linguistics. Firstly, Qu read and tried out scoring rubric with 30 students' test papers. After this trial scoring, she identified some places that needed to be improved in scoring rubric and collaborated with the researcher to revise it. Then she started to mark all test papers using the updated scoring rubric.

To score multiple choice items, scorer A gave students the corresponding credit only when the answers were correct. With regard to the short-answer questions, she should identify levels of students' performance in addition to scores on these items (details are illustrated in Chapter 4).

In order to guarantee the inter-reliability, 70 test papers were randomly selected and marked by both researcher and scorer A. The result of Spearman correlation analysis was $r=0.871$, $p<0.001$, indicating that the scoring results from different scorers are consistent.

### 3.5.2 Data analysis and report

The present study discusses the developmental characteristics of students' integration ability in reading and the relevant influencing factors. Both statistical analysis and qualitative analysis were conducted. The two types of analysis were mutually relevant and supplemented each other.

Content analysis (Mayring, 2004) was adopted to analyse interview data. Two researchers analysed the interview data. They deleted irrelevant words, and categorised similar ideas into different themes, such as answering process and teaching strategy, and then analysed the relationships among different themes. To

ensure reliability, the two researchers first analysed the data individually and then compared the results. For discrepancies between their results, they discussed to reach an agreement.

Multiple statistical analyses were adopted for quantitative analysis, such as descriptive analysis that describes the basic properties of data, "ANOVA/MANOVA" that compares students' different performance in different grades and in different skills, "linear regression" that examines the predictive effects of various factors on students' integration performance and "hierarchical regression" that tests whether there is grade difference in the predictive effects. The tool used for quantitative data analysis was SPSS20.0 application.

Data analysis methods are shown in Table 3-4.

Table 3-4 Data analysis matrix

| Reporting item | Data | Methods |
|---|---|---|
| Validity and reliability of the test paper | (1) Score of reading integration test | Exploratory Factor analysis<br>Cronbach's Alpha coefficients analysis |
| | (2) Score of school test | Correlation analysis between (1) and (2) |
| | (3) Score of PIRLS test | Correlation analysis between (1) and (3) |
| Difficulty of test | (1) Score of reading integration test | Descriptive Analysis |
| Discrimination of test paper | (1) Score of reading integration test | Spearman & Pearson correlations analysis |
| Validity and reliability of questionnaire | (4) Data of student questionnaire | Exploratory Factor analysis<br>Cronbach's Alpha coefficients analysis |

| Reporting item | Data | Methods |
|---|---|---|
| Grade characteristics of students' integration ability | (1) Score of reading integration test | Descriptive Analysis<br>t-test<br>ANOVA /MANOVA |
| | (5) Students' levels of performance in integration skills | Descriptive analysis |
| | (6) Student interview<br>(7) Teacher interview | Content Analysis |
| Gender difference in students' integration ability development | (1) Score of reading integration test | Descriptive Analysis<br>ANAOVA/MANOVA |
| | (7) Teacher interview | Content Analysis |
| Factors influencing students' integration ability development | (1) Score of reading integration test | Linear Regression |
| | (4) Data of student questionnaire | Hierarchical Regression (Moderating effect) |
| | (7) Teacher interview | Content Analysis |

## 3.6 Data quality analysis

### 3.6.1 Difficulty of reading integration test

To analyse the difficulty of test items, multiple methods were employed for different types of items. For multiple-choice items, the difficulty equals to the number of students with right answers divided by the total number of participants. And for short-answer items, the difficulty is the result of mean value divided by the full marks. As shown in Table 3-5, the difficulty degrees of test items are at the intermediate level (0.284-0.77). The easiest item is item 2, and the most difficult one is item 12. Generally, most items are suitable for students and can be completed within 45

minutes.

Table 3-5 Difficulty of items

| Item | Skill | Degree |
|---|---|---|
| 1 | IMI1 | 0.75 |
| 2 | IRS1 | 0.756 |
| 3 | ASI1 | 0.325 |
| 4 | IRPN1 | 0.661 |
| 5 | IRP1 | 0.342 |
| 6 | SWT1 | 0.62 |
| 7 | IRPN2 | 0.596 |
| 8 | IRP2 | 0.447 |
| 9 | ASI2 | 0.353 |
| 10 | IMI2 | 0.599 |
| 11 | IRS2 | 0.71 |
| 12 | SWT2 | 0.284 |

### 3.6.2 Discrimination of reading integration test

The correlations of the score of each individual item with the total score can indicate the discrimination of the test paper (Ebel & Frisbie, 1991). The results are shown in Table 3-6.

Table 3-6 Discrimination of items

| Item | Skill | Discrimination |
|---|---|---|
| 1 | IMI1 | .367 |
| 2 | IRS1 | .621 |
| 3 | ASI1 | .509 |
| 4 | IRPN1 | .608 |
| 5 | IRP1 | .258 |
| 6 | SWT1 | .340 |
| 7 | IRPN2 | .297 |

| Item | Skill | Discrimination |
|---|---|---|
| 8 | IRP2 | .600 |
| 9 | ASI2 | .600 |
| 10 | IMI2 | .593 |
| 11 | IRS2 | .451 |
| 12 | SWT2 | .546 |

As shown in Table 3-6, though Item 5 and Item 7 range from 0.2 to 0.3, most test items' values of discrimination are higher than 0.4, indicating these items are employable (Ebel & Frisbie, 1991). In general, the test paper used in the present study has a good discrimination.

### 3.6.3 Validity of reading integration test

The reading integration test is validated by multiple methods.

#### 3.6.3.1 Expert comments on the test

Content validity refers to adequacy of the sampled content, indicated by expert teachers' comments. In the focus group discussion, six experienced teachers agreed that "the test is usable because it includes most typical types of items to assess integration ability and the texts selected are close to primary students' lives. The difficulty of test items is appropriate to both grades, through which students' integration ability could be assessed."

Meanwhile, three experienced researchers who have worked in The Hong Kong Polytechnic University for more than 3 years examined the structure of integration ability and the test paper. They reached an agreement that "Six integration skills cover most of aspects of integration ability and are appropriate to be the basis for developing integration tests."

### 3.6.3.2 Correlation between the total score of reading integration and scores of PIRLS test and other school reading tests

Since integration ability in reading is regarded as an important reading ability, it is assumed that the better is the performance students achieve in integration test, the better they will perform in general reading test. So we conducted a correlation analysis between the total scores of integration test of students in School D and their scores of PIRLS test and found that there exists a significant positive correlation ($r = +0.402$, $p<0.01$, $n=120$). Additionally, we collected 190 students' scores of school reading tests from School B, School D and School E and found a significant positive correlation ($r = +0.548$, $p<0.001$, $n=190$) between total score of integration test and scores of school reading tests after controlling the variable of school level of education. In all, this assumption is proved by the correlation analysis between students' total score of integration test and scores of PIRLS test and school reading tests as we expected, which provides evidence of criterion-related validity to present study.

### 3.6.3.3 Factor analysis of scores of integration skills

Exploratory Factor Analysis is commonly used to examine construct validity of the test. In the present study, KMO value for the sample data was 0.819, indicating that the correlations among different integration skills were good for factor analysis (Tabachnick & Fidell, 2007). For the Bartlett's test of sphericity, $\chi 2 = 725.094$, $df=15$, $p<.05$, which indicated that the correlation matrix among different integration skills was not an identity matrix and the factor analysis is meaningful.

Thus, one factor was extracted from the principal components analysis, which accounts for 43.263% of the variance. As shown in Table 3-7, the loading of each item is greater than 0.40, ranging from .617 to .722. This indicates that these six integration skills represent one underlying factor, and the skills are internally

connected.

Table 3-7 Factor analysis of reading integration skills

| Skills | Factor 1 |
|---|---|
| Identifying a Referent of pronoun(IRPN) | .633 |
| Identifying relationship between adjacent sentences (IRS) | .678 |
| Identifying relationship among paragraphs (IRP) | .620 |
| Identifying main ideas (IMI) | .671 |
| Abstracting Specific Information (ASI) | .722 |
| Summarising the whole text (SWT) | .617 |

Note: Extraction Method: principal components analysis

### 3.6.4 Reliability of reading integration test

As shown in Table 3-8, the Cronbach α value of reading integration test is 0.72. According to DeVellis (2003), it means quite a good reliability.

Table 3-8 Reliability of reading integration test

| | Cronbach's Alpha | N of Items |
|---|---|---|
| All items of integration | .722 | 12 |

### 3.6.5 Validity of student questionnaire

The KMO value of the questionnaire was 0.926, and for the Bartlett's test of sphericity, $\chi 2 = 5056.998$, df=231, $p<.001$. The results indicate that the questionnaire data was good for Exploratory Factor analysis.

As shown in Table 3-9, questions in the questionnaire can be classified into three factors: reading strategy, extensive reading and reading attitude. The loadings of all items are higher than 0.4. Though there are cross-loadings among item 2, Item 10 and

Item 15, the higher one still belongs to the expected factor. Three factors account for 49.38% of the variance, indicating that the questionnaire has good validity as we expected.

Table 3-9 Factor analysis of questionnaire data

| | item | Factor1 | Factor2 | Factor3 |
|---|---|---|---|---|
| Reading strategy | 1. Write a short summary after reading | .592 | | |
| | 2. Understanding the cause and effect of the events in the text | .505 | .311 | |
| | 3. Pay special attention to the title and subtitles | .615 | | |
| | 4. Delete some unimportant sentences to understand the main idea when the paragraph is too long | .721 | | |
| | 5.Skip some content that is not closely related to the main idea | .659 | | |
| | 6. Summarise the paragraph in your own words | .647 | | |
| | 7. Understand the main idea of the text by connecting the main ideas of each paragraph | .703 | | |
| | 8. Draw a mind map according to content of different parts | .646 | | |
| | 9. Pay attention to words such as “firstly”, “then”, “generally” | .623 | | |
| | 10. Understand the sentences according to key words | .674 | .302 | |
| Extensive reading | 11. Biography | | | .794 |
| | 12. Fairytale | | | .616 |
| | 13. Detective novel | | | .585 |
| | 14 Historical story | | | .730 |
| | 15. News report | .322 | | .405 |
| Reading attitude | 16. Reading is interesting | | .657 | |
| | 17. Daily reading helps a lot to improve my Chinese | | .743 | |

| item | Factor1 | Factor2 | Factor3 |
|---|---|---|---|
| 18. The content of textbooks is interesting | | .758 | |
| 19. I like reading some extra-curricular books chosen by myself | | .715 | |
| 20. I like reading with my family | | .587 | |
| 21. I am affected by the text when I am reading | | .677 | |
| 22. I like participating in the extensive reading activities in school | | .668 | |

Extraction Method: Principal Components Analysis.

Rotation Method: Varimax with Kaiser Normalisation.

a. Rotation converged in 5 iterations.

### 3.6.6 Reliability of student questionnaire

As shown in Table 3-10, the values of Cronbach's Alpha of student questionnaire range from 0.712 to 0.869, indicating that the questionnaire is quite good.

Table 3-10 Reliability of student questionnaire

| Factor | Cronbach's Alpha | N of Items |
|---|---|---|
| Reading strategy | .869 | 10 |
| Extensive reading | .712 | 5 |
| Reading attitude | .846 | 7 |

## 3.7 Limitations

Due to the fact that the developmental characteristics of students' integration ability in reading and relevant influencing factors are complex, the present study has some limitations:

1. Students' performance in the reading tests might be influenced by their language proficiency since students were required to write down the answers.

2. Due to the tight teaching schedules in Hong Kong schools, we were not able to conduct the test and survey with a larger sample. In order to decrease the effects, we have tried our best to ensure the validity and reliability of all research instruments.

3. The present study only investigates the developmental characteristics of Grade 4 and Grade 6 students' integration ability in reading, and is unable to present the integration ability of students in Grade 5. However, because Grade 4 and Grade 6 are located at the starting and ending points of "read to learn" phase, the absence of Grade 5 should not influence the research findings significantly.

4. Due to the limited number of participants, the research results represent situations in only the sampled schools. Caution is required to generalise the results to other schools in Hong Kong.

# Chapter 4 Integration ability development in grades

## 4.1 Main results

In order to assess students' integration ability in reading, a test paper of reading integration was assigned to 723 Grade 4 and Grade 6 students. The test paper was designed based on six reading integration skills: Identifying a Referent of pronoun (IRPN), Identifying relationship between adjacent sentences (IRS), Identifying main ideas (IMI), Identifying relationship among paragraphs (IRP), Abstracting Specific Information (ASI) and Summarising the whole text (SWT).

All test papers were scored and scores of each integration skill and the total score have been sorted out in Table 4-1.

Table 4-1 Descriptive statistics of the scores of reading integration test paper (n=723)

| Item | Mean | Std. Deviation | Skewness | Kurtosis |
|---|---|---|---|---|
| Identifying main ideas(IMI)1 | 2.25 | 1.30 | -1.16 | -0.67 |
| Identify relationship between sentences(IRS)1 | 5.29 | 2.59 | -1.09 | -0.47 |
| Abstracting specific information (ASI)1 | 2.28 | 2.19 | 0.56 | -0.77 |
| Identify referent of a pronoun (IRPN)1 | 4.63 | 2.61 | -0.75 | -0.90 |
| Identifying relationship among paragraphs(IRP)1 | 1.02 | 1.42 | 0.67 | -1.56 |
| Summarising whole text (SWT)1 | 1.86 | 1.46 | -0.49 | -1.76 |
| Identify referent of a pronoun (IRPN)2 | 1.79 | 1.47 | -0.40 | -1.85 |
| Identify relationships among paragraphs (IRP)2 | 3.13 | 1.93 | 0.41 | -0.20 |

| Item | Mean | Std. Deviation | Skewness | Kurtosis |
|---|---|---|---|---|
| Abstracting specific information (ASI)2 | 2.47 | 1.96 | 0.31 | -0.89 |
| Identifying main ideas(IMI)2 | 4.20 | 2.40 | -0.43 | -1.29 |
| Identifying relationship between adjacent sentences (IRS)2 | 2.13 | 1.36 | -0.93 | -1.13 |
| Summarising whole text (SWT)2 | 1.99 | 1.60 | 0.84 | -0.01 |
| Integration Total | 31.69* | 10.74 | -0.40 | -0.19 |

*Note: Total score for the items of each integration skill is 10.

As shown in Table 4-1, the absolute value of skewness of students' scores in each integration skill as well as in total is around 1, which can be counted as normal distribution (Curran, West & Finch, 1996). Further statistic analysis is introduced in the next section.

### 4.1.1 Grade difference in integration total score

Table 4-2 shows the results of an analysis of variance (ANOVA) with integration total score as the dependent variable and grade and gender as independent variables.

Table 4-2 ANOVA result of integration total score

Dependent Variable: integration total

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Corrected Model | 9747.554[a] | 3 | 3249.185 | 31.756 | .000 | .117 |
| Intercept | 723693.554 | 1 | 723693.554 | 7072.948 | .000 | .908 |
| Grade | 6753.480 | 1 | 6753.480 | 66.004 | .000 | .084 |
| Gender | 3150.126 | 1 | 3150.126 | 30.787 | .000 | .041 |
| Grade * Gender | 1.285 | 1 | 1.285 | .013 | .911 | .000 |
| Error | 73567.014 | 719 | 102.319 | | | |
| Total | 809282.265 | 723 | | | | |
| Corrected Total | 83314.567 | 722 | | | | |

a. R Square = .117 (Adjusted R Squared = .113)

As shown in Table 4-2, the main effect of grade on integration total score is significant and the integration total sore in Grade 6 (M=34.63, SD=10.47) is significantly higher than that in Grade 4 (M=28.59, SD=10.15), F (1,719) =66.00, p=<0.001, $\eta^2$=0.084. Moreover, the main effect of gender on integration total score is also significant. Integration total score of girls (M=33.93, SD=9.98) is significantly higher than that of boys (M=29.87, SD=11.01), F (1,719) =30.79, p=<0.001, $\eta^2$=0.041.

In Grade 4, girls (M=30.81, SD=9.58) significantly outperform boys (M=26.69, SD=10.25). Similarly, girls' integration total score (M=37.04, SD=9.40) is 4.28 higher than boys' (M=32.76, SD=10.89). Table 4-2 also shows that there is no significant interaction between grade and gender, F (1,719) =0.013, p >0.05, $\eta^2$=0.000. Hence, it indicates that there is no gender difference in the development of students' integration total score. In other words, gender does not statistically influence grade difference and grade does not statistically influence gender difference (Figure 4-1).

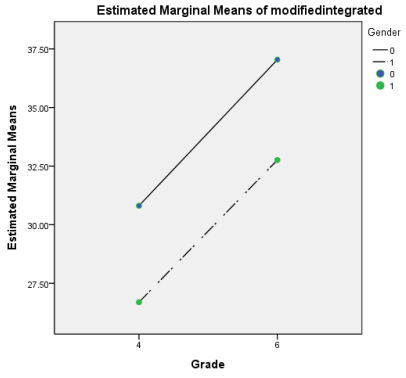


Figure 4-1 Interaction effect between grade and gender (0=girl; 1=boy)

### 4.1.2 Grade difference in scores of six integration skills

**1. Differences of students' performance of six integration skills**

As shown in Table 4-3, students performed better in identifying relationships between adjacent sentences (IRS)(M=7.43, SD=3.19), identifying a referent of

pronoun (IRPN) (M=6.42, SD=3.09) and identifying main ideas (IMI) (M=6.45, SD=2.86) whereas they performed comparatively worse in abstracting specific information (ASI) (M=3.39, SD=2.38), summarising the whole text (SWT) (M=3.85, SD=2.29) and identifying relationships among paragraphs (IRP) (M=4.15, SD=2.49).

Furthermore, the result of one way repeated measures ANOVA analysis of scores of six integration skills shows that each individual skill is significantly different, $F=396.133$, $df=5$, $p<0.001$, $\eta^2=0.354$. The post hoc analysis results show that the scores are significantly different in four skills, except IRPN and IMI ($p>0.05$). It indicates that students' performance in different skills greatly varies.

Table 4-3 Students' scores of six integration skills (n=723)

| | Mean | Std. Deviation |
|---|---|---|
| IRPN | 6.42 | 3.09 |
| IRS | 7.43 | 3.19 |
| IRP | 4.15 | 2.49 |
| IMI | 6.45 | 2.86 |
| ASI | 3.39 | 2.38 |
| SWT | 3.85 | 2.29 |

**2. Grade difference in students' performance of six integration skills**

Table 4-4 shows results of the MANOVA analysis conducted with grade and gender as independent variables and six integration skills as dependent variables.

Table 4-4 MANAOVA of six integration skills

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|---|
| Corrected Model | IRPN | 239.797[a] | 3 | 79.93 | 8.65 | 0.000 | 0.035 |
| | IRS | 381.066[b] | 3 | 127.02 | 13.13 | 0.000 | 0.052 |
| | IRP | 214.878[c] | 3 | 71.63 | 12.06 | 0.000 | 0.048 |
| | IMI | 221.909[d] | 3 | 73.97 | 9.33 | 0.000 | 0.037 |
| | ASI | 429.831[e] | 3 | 143.28 | 28.07 | 0.000 | 0.105 |
| | SWT | 231.375[f] | 3 | 77.13 | 15.54 | 0.000 | 0.061 |

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|---|
| Intercept | IRPN | 29644.13 | 1 | 29644.13 | 3206.88 | 0.000 | 0.817 |
| | IRS | 39659.22 | 1 | 39659.22 | 4098.23 | 0.000 | 0.851 |
| | IRP | 12429.13 | 1 | 12429.13 | 2092.00 | 0.000 | 0.744 |
| | IMI | 29771.18 | 1 | 29771.18 | 3753.58 | 0.000 | 0.839 |
| | ASI | 8393.23 | 1 | 8393.23 | 1644.22 | 0.000 | 0.696 |
| | SWT | 10761.37 | 1 | 10761.37 | 2168.63 | 0.000 | 0.751 |
| Grade | IRPN | 174.83 | 1 | 174.83 | 18.91 | 0.000 | 0.026 |
| | IRS | 227.93 | 1 | 227.93 | 23.55 | 0.000 | 0.032 |
| | IRP | 168.76 | 1 | 168.76 | 28.40 | 0.000 | 0.038 |
| | IMI | 185.38 | 1 | 185.38 | 23.37 | 0.000 | 0.031 |
| | ASI | 276.54 | 1 | 276.54 | 54.17 | 0.000 | 0.07 |
| | SWT | 112.87 | 1 | 112.87 | 22.75 | 0.000 | 0.031 |
| Gender | IRPN | 69.48 | 1 | 69.48 | 7.52 | 0.006 | 0.01 |
| | IRS | 120.59 | 1 | 120.59 | 12.46 | 0.000 | 0.017 |
| | IRP | 49.93 | 1 | 49.93 | 8.41 | 0.004 | 0.012 |
| | IMI | 36.84 | 1 | 36.84 | 4.64 | 0.031 | 0.006 |
| | ASI | 158.03 | 1 | 158.03 | 30.96 | 0.000 | 0.041 |
| | SWT | 123.28 | 1 | 123.28 | 24.84 | 0.000 | 0.033 |
| Grade * Gender | IRPN | 2.14 | 1 | 2.14 | 0.23 | 0.631 | 0 |
| | IRS | 24.50 | 1 | 24.50 | 2.53 | 0.112 | 0.004 |
| | IRP | 1.64 | 1 | 1.64 | 0.28 | 0.599 | 0 |
| | IMI | 0.25 | 1 | 0.25 | 0.03 | 0.860 | 0 |
| | ASI | 11.60 | 1 | 11.60 | 2.27 | 0.132 | 0.003 |
| | SWT | 0.19 | 1 | 0.19 | 0.04 | 0.847 | 0 |
| Error | IRPN | 6646.38 | 719 | 9.24 | | | |
| | IRS | 6957.87 | 719 | 9.68 | | | |
| | IRP | 4271.77 | 719 | 5.94 | | | |
| | IMI | 5702.68 | 719 | 7.93 | | | |
| | ASI | 3670.26 | 719 | 5.11 | | | |
| | SWT | 3567.89 | 719 | 4.96 | | | |
| Total | IRPN | 36690.00 | 723 | | | | |
| | IRS | 47224.00 | 723 | | | | |
| | IRP | 16968.00 | 723 | | | | |
| | IMI | 35960.00 | 723 | | | | |
| | ASI | 12416.84 | 723 | | | | |
| | SWT | 14504.00 | 723 | | | | |

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|---|
| | IRPN | 6886.18 | 722 | | | | |
| | IRS | 7338.94 | 722 | | | | |
| Corrected | IRP | 4486.65 | 722 | | | | |
| Total | IMI | 5924.59 | 722 | | | | |
| | ASI | 4100.10 | 722 | | | | |
| | SWT | 3799.26 | 722 | | | 0.000 | |

a. R Squared = .035 (Adjusted R Squared = .031);b. R Squared = .052 (Adjusted R Squared = .048);c. R Squared = .048 (Adjusted R Squared = .044);d. R Squared = .037 (Adjusted R Squared = .033);e. R Squared = .105 (Adjusted R Squared = .101);f. R Squared = .061 (Adjusted R Squared = .057)

Based on the results shown in Table 4-4 and statistical data mentioned above, it is safe to draw the following conclusions:

(1) The main effect of "grade" is significant on each individual integration skill as $p<0.001$ in all six skills. In addition, taking results in Table 4-4 and Table 4-5 (students' scores of six integration skills) together, students in Grade 6 performed significantly better in all six skills than students in Grade 4.

Table 4-5 Descriptive statistics of students' performance of six skills

| | Grade | Mean | N | Std. Deviation |
|---|---|---|---|---|
| IRPN | 4 | 5.93 | 352 | 3.13 |
| | 6 | 6.89 | 371 | 2.98 |
| IRS | 4 | 6.84 | 352 | 3.33 |
| | 6 | 7.99 | 371 | 2.95 |
| IRP | 4 | 3.67 | 352 | 2.40 |
| | 6 | 4.62 | 371 | 2.50 |
| IMI | 4 | 5.93 | 352 | 2.99 |
| | 6 | 6.94 | 371 | 2.66 |
| ASI | 4 | 2.78 | 352 | 2.12 |
| | 6 | 3.97 | 371 | 2.48 |
| SWT | 4 | 3.45 | 352 | 2.16 |
| | 6 | 4.22 | 371 | 2.35 |

With regard to scores of each individual skill in Grade 4, students performed best in IRS, while they showed worst performance in ASI. There is a significant difference

in scores of individual skills, F=177.335, df=5, p<0.001, $\eta^2$=0.336. The post hoc analysis indicates that students achieved same scores in IRPN and IMI, and there is no significant difference between scores of IRP and SWT, F=177.335, df=5, p<0.001, $\eta^2$=0.336.

Students in Grade 6 performed best in IRS while worst in ASI, which is congruent with results of Grade 4 students. Scores of individual integration skills are significantly different, F=221.669, df=5, p<0.001, η2=0.375. The results of post hoc analysis show that there is no significant difference between scores of IRPN and IMI and between ASI and SWT (P>0.05).

As shown in Figure 4-2, students in Grade 4 and Grade 6 demonstrate a similar trend in their performance. Students in Grade 4 performed better in IRS, IRPN and IMI, and so did students in Grade 6, and vice versa. This result is in accordance with the analytical results in Table 4-5.

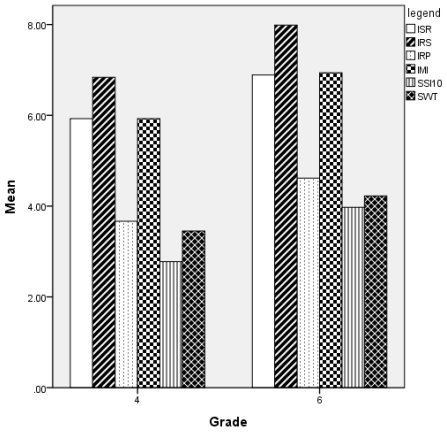


Figure 4-2 Grade difference in students' scores of six integration skills

(2) The main effect of gender is significant on students' performance in each individual skill, P< 0.05. According to Table 4-6, girls significantly outperformed boys in all six integration skills.

Table 4-6 Gender difference in students' performance of six integration skills

| | Gender | N | Mean | Std. Deviation |
|---|---|---|---|---|
| IRPN | Female | 324 | 6.75 | 3.03 |
| | Male | 399 | 6.15 | 3.11 |
| IRS | Female | 324 | 7.86 | 2.86 |
| | Male | 399 | 7.08 | 3.40 |
| IRP | Female | 324 | 4.44 | 2.49 |
| | Male | 399 | 3.93 | 2.48 |
| IMI | Female | 324 | 6.68 | 2.67 |
| | Male | 399 | 6.25 | 3.01 |
| ASI | Female | 324 | 3.90 | 2.43 |
| | Male | 399 | 2.98 | 2.26 |
| SWT | Female | 324 | 4.30 | 2.24 |
| | Male | 399 | 3.48 | 2.28 |

Boys performed best in IRS but worst in ASI. There is a significant difference among boys' scores of different individual skills, F=221. 557, df=5, $p<0.001$, $\eta^2=0.358$. The results of post hoc analysis show that scores of IRPN and IMI are not significantly different ($P>0.05$).

Similarly, girls performed best in IRS while worst in ASI. Moreover, there is a significant difference among girls' scores of each individual integration skill, F=175. 864, df=5, $p<0.001$, $\eta^2=0.353$. And post hoc analysis confirms that there is no significant difference between girls' scores of IRPN and IMI, and between girls' scores of IRP and SWT ($P>0.05$).

Figure 4-3 shows that boys and girls performed in a similar way in different integration skills. Both performed better in IRS, IRPN and IMI and performed worse in IRP, ASI and SWT. This result is also proved by statistics in Table 4-6.

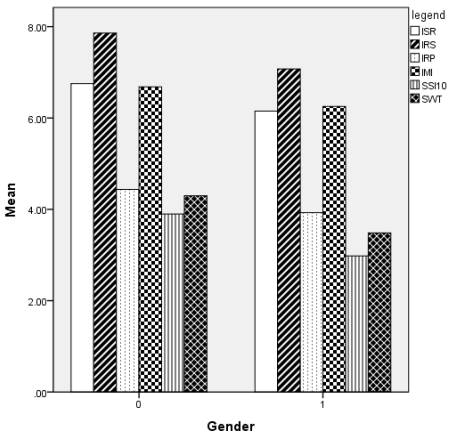


Figure 4-3 Gender difference in students' performance of six integration skills (1=boy, 0=girl)

(3) No interaction was found between grade and gender effects on students' performance in six integration skills, $P<0.05$. This indicates that there is no significant gender difference in students' individual integration skill development.

**3. Intra-grade gender difference in students' performance of six integration skills**

Though the MANOVA analysis (Table 4-4) shows no interaction between grade and gender effects on students' performance in six integration skills, it does not explain whether there is gender difference in performance of students in the two grades. Therefore, intra-grade t-test analysis was conducted to investigate boys' and girls' performance in each individual integration skill (Table 4-7).

Table 4-7 Intra-grade gender difference in students' performance of six integration skills

| | Grade | Gender | Mean | Std. Deviation | t | df | sig |
|---|---|---|---|---|---|---|---|
| IMI | 4 | Female | 6.19 | 2.85 | 1.542 | 350 | .124 |
| | | Male | 5.70 | 3.09 | | | |
| | 6 | Female | 7.17 | 2.38 | 1.536 | 366.93 | .125 |
| | | Male | 6.76 | 2.85 | | | |
| IRS | 4 | Female | 7.48 | 2.95 | 3.450 | 349.85 | .001 |
| | | Male | 6.29 | 3.53 | | | |
| | 6 | Female | 8.24 | 2.72 | 1.464 | 369 | .144 |
| | | Male | 7.79 | 3.11 | | | |

| | Grade | Gender | Mean | Std. Deviation | t | df | sig |
|---|---|---|---|---|---|---|---|
| ASI | 4 | Female | 3.15 | 2.18 | 3.063 | 350 | .002 |
| | | Male | 2.46 | 2.02 | | | |
| | 6 | Female | 4.65 | 2.45 | 4.746 | 369 | .000 |
| | | Male | 3.45 | 2.37 | | | |
| IRPN | 4 | Female | 6.20 | 3.21 | 1.539 | 350 | .125 |
| | | Male | 5.69 | 3.05 | | | |
| | 6 | Female | 7.30 | 2.74 | 2.406 | 363.35 | .017 |
| | | Male | 6.57 | 3.12 | | | |
| SWT | 4 | Female | 3.88 | 2.17 | 3.508 | 350 | .001 |
| | | Male | 3.08 | 2.09 | | | |
| | 6 | Female | 4.71 | 2.23 | 3.557 | 369 | .000 |
| | | Male | 3.85 | 2.38 | | | |
| IRP | 4 | Female | 3.90 | 2.42 | 1.692 | 350 | .092 |
| | | Male | 3.47 | 2.37 | | | |
| | 6 | Female | 4.97 | 2.45 | 2.407 | 369 | .017 |
| | | Male | 4.34 | 2.50 | | | |

Note: For fourth graders, N (female) =162, N (male) =190; For sixth graders, N (female) =162, N (male) =209

It can be seen in Table 4-7 that four types of gender differences emerge:

(a) Gender difference exists in Grade 4 students' performance but is not found in Grade 6 students.

Grade 4 girls performed significantly better in IRS than boys, but there is no such difference among Grade 6 students. This indicates that girls may develop this skill first but boys can catch up gradually.

(b) Gender difference exists in Grade 6 students' performance but is not found in Grade 4 students'.

Performance of Grade 4 girls and boys is not significantly different in IRPN and IRP but in Grade 6, girls performed significantly better than boys in these two skills. This result indicates that girls can master this skill better than boys with the increase of learning experience.

(c) Gender difference exists in both grades.

In both Grade 4 and Grade 6, girls performed significantly better than boys in

ASI and SWT. Considering these two skills are highly demanding in cognition, it can be inferred that girls are more capable of completing complicated integrating tasks.

(d) No gender difference is found in both grades.

In both Grade 4 and Grade 6, no significant gender difference is found in performance of IMI. It is thus inferred that both boys and girls have gained the ability to identify main ideas.

## 4.2 Discussion

Previous research on integration ability in reading has been mainly focused on characteristics of development of particular integration skills (van den Broek, Lynch, & Naslund, 2003). However, characteristics of development of diversified integration skills are yet to be systematically studied. Therefore, the present study investigates the characteristics of integration ability in reading of students in Grade 4 and Grade 6.

### 4.2.1 Students in Grade 4 and Grade 6 attained preliminary integration ability

In terms of integration total score, students in both Grade 4 (M=28.59, SD=10.15) and Grade 6 (M=34.63, SD=10.47) did not achieve high scores. The scoring rates of students in Grade 4 and Grade 6 are 47.7% and 57.7%, respectively, while the full score is 60. This indicates that students only attained preliminary integration reading ability.

The post-test questionnaire asked students to report the degree of difficulty of the test, compared with their semester tests. There were four options ranging from “today’s test is easier” to “today’s test is much more difficult”. The result shows that 56.9% of students reported that the investigation test is “a little more difficult than semester tests” or “much more difficult than semester tests”. From these results, it can be inferred that students find it difficult to answer integration questions in reading.

In line with students' reports, teachers identified "integration ability" is a difficult task for students regardless of grade.

"Integration is really difficult. Maybe Grade 6 students' performance is better, but it is far to say good. Now we are trying our best to improve their ability to integrate, because the tasks assessing integration ability holds the largest proportion in our reading tests. " (PK-D)

In all, the data from different sources confirm the conclusion that integration ability of students in Grade 4 and Grade 6 is not yet fully developed.

### 4.2.2 Students in Grade 4 and Grade 6 performed differently in six integration skills

As stated earlier, there exist significant differences between performance in each individual integration skill. Generally speaking, they performed comparatively better in IRPN, IRS and IMI while worse in IRP, ASI and SWT. This trend within each grade remains the same. This could be possibly attributed to the different cognitive complexities of each integration skill.

Students basically rely on "straightforward inference" when completing IRPN, IRS or IMI tasks (Mullis et al., 2009), which only requires them to locate two pieces of relevant information and to connect them. In most cases, the target information for these tasks is given explicitly or labeled with signal words, which is easy for students to figure out. For example, when students were completing IRPN tasks, the referent of target pronouns could often be found near those pronouns. And also, when students were completing IMI tasks, they could locate the information with the help of some "hints", such as "in all", "generally speaking" and so on. Regarding this claim, teachers provided relevant details as follows.

"I feel students do best in "mastering the central idea" or "finding topic

sentences". They can always give correct answers in summarising main idea of one paragraph if there is a topical sentence". (PK-D)

"If you ask them (students) why they could find it, they will say that there were hints, or concluding sentences, all followed by explanation or examples. They (students) would answer in this way". (PK-B)

It was the same when students were completing IRS tasks. Usually some connectives are used to indicate the sentence relationships in texts. Even though there were no explicit hints (such as connectives), students only needed to compare adjacent sentences, infer their relationships, and build local coherence in text, which does not require too much in cognition.

On the other hand, more complex cognitive abilities such as inference and transformation are required when students are completing IRP, ASI and SWT tasks (Kintsch and van Dijk, 1978). For instance, IRP tasks are more difficult because paragraph is an intuitive element in text structure, which expresses a comparatively complete idea and always includes multiple pieces of information. Hence, demands for logical thinking are higher when students are making inferences from sentence relationships. Some teachers made a point as:

"IRP is the most difficult (task) …it requires a macro-understanding of the whole text, and not many students have achieved it". (PK-A)

"It is not a simple matter of one or two sentences when we refer to understanding the paragraph relationships. Students need to summarise first to infer paragraph relationships due to the rich information of paragraphs. This is a dual-process of integration. First of all, students need to summarise what each paragraph says, and then judge whether these paragraphs are talking about the same thing. It requires substantive synthesis and analysis of information. I think Grade 4 students are not able to complete it, and I guess it is possibly difficult for Grade 6 students, too".

(PK-B)

Summarising teachers' comments, students' poor performance was closely related to the difficulty of IRP.

With regard to ASI and SWT, they require students not only to identify the relationships among multiple pieces of information in text, but also to paraphrase the information to make a summary. So students have to consider the text at a macro level and transform the text in their own words. Since all abilities mentioned above develop slowly and gradually, it is hard to expect primary students to achieve a very high level.

Additionally, the post-tests show that 28.91% of participating students chose item12 (SWT) as the most difficult item, which is far higher than other items (between 0.99%-8.65%).

In general, primary students have developed various skills of integration ability to some extent, but they are more capable of making "straightforward inference" integration tasks, which reflects that students have developed such skills of integration ability earlier than skills requiring complex inference and language transformation.

### 4.2.3 Grade 6 students exceed Grade 4 students in every single integration skill

Since Grade 6 students performed better than Grade 4 students in every single integration skill (Figure 4-2), it can be inferred that Grade 6 students have gained certain development in integration ability. In following sections, more characteristics of students' integration ability development are discussed with reference to interview data and students' answers in the test.

#### (1) IRPN

In the present study, Grade 4 students' mean score of IRPN is 5.93, while Grade 6 students' mean score is 6.89. In both grades, IRPN is the second best performed skill. The findings show that students in Grade 4 and Grade 6 have obtained fair

ability to identify referents of pronouns, but still have much room to improve. This is in line with some prior research findings. For example, Chai (1967) discovered that Grade 5 students are still unable to fix the issue of ambiguities in identifying the referents of pronouns; and Chapman (1983) pointed out that students are not capable of identifying the referents of pronouns effectively before secondary school. However, most researchers have asked students to identify the referents of pronouns in separate sentences instead of a specific text. Therefore, how students perform in such a context is under researched. In order to elaborate students' IRPN developmental characteristics, Item 4 has been selected as the example to analyse students' performance in IRPN. In this item, students are required to find out a distant referent of the pronoun, which is a sentence.

**Item:** In paragraph 7, the manager said Wyra's smile "is not that kind of smile that is from the bottom of heart", what is the specific meaning of "that"? Please find referred sentences in Paragraph 8 and 9 and write them down.

**Answers:** This kind of smile is from the bottom of heart, like a baby's smile, innocent, adorable which customers are unable to resist.

Students' performance can be categorised into three levels:

Level 1: Locate complete information of referents

Students could find out all the information referred by pronouns accurately in text. For this item, students could identify what "this kind of smile" covered and presented it completely. The original sentence is comprised of two pieces of important information: (1) "like a baby's smile" "innocent" (appearance) and (2) "adorable and make customers unable to resist" (effect). For example:

e.g.1 This kind of smile is from the bottom of heart, like a baby's smile, innocent, adorable and makes customers unable to resist. (E4C10).

Level 2: Locate part of the information referred by pronouns

Students could identify what the pronoun covered by comparing adjacent sentences but were unable to present completely and clearly.

e.g.2 A glimpse of a charming smile finally appeared on the serious face of the former baseball star. The smile comes from the bottom of heart and is like a baby's smile. (D6A25)

In addition, some students only copied part of the complete sentences. For example:

e.g.3 The smile is like a baby's smile, which is innocent. (E4C18);

e.g.4 The smile is like a baby's smile that is from the bottom of heart. (E6A9)

Also, some students paraphrased the original sentences but with incomplete information. For example:

e.g.5 Natural and sincere smile. (E6B26)

Level 3: Unable to locate the referents of pronouns

Students were unable to figure out the sentences related to the pronoun, and answered with wrong sentences or left it blank.

e.g.6 A smiling face that is not born to be but resulted from hard practice. (E4C11);

e.g.7 He was not frustrated and asked his friends to judge his smile again. (D4E20)

Table 4-8 shows the distribution of Grade 4 and Grade 6 students' performance at these three levels. In Grade 6, most students achieved Level 1, whereas most students in Grade 4 only achieved Level 2 or 3. It indicates that Grade 6 students are more capable of locating information in text completely and accurately. Regarding this item, conclusions discussed above support Barnitz (1980) who pointed out that primary student in Grade 2 could already understand the referents of intra-sentence noun

phrases. However, students were not able to comprehend the intra-sentential sentence pronominal structures until they entered Grade 6.

Table 4-8 Students' distribution of different levels of performance of Item 4

| | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Grade 4 | 122(34.7%) | 141(40.1%) | 89(25.3%) | 352(100.0%) |
| Grade 6 | 202(54.4%) | 98(26.4%) | 71(19.1%) | 371(100.0%) |

Note: Pearson Chi-Square=29.035, df=2, $p<0.001$。

Teachers' interview data confirm that there was differentiation between students' performance in IRPN in Grade 4 and Grade 6. They believed that Grade 4 students were capable of locating some short referents, but Grade 6 students were able to identify more complex ones with teachers' aid.

"They (Grade 4 students) do have the ability to find out the referents of pronouns. We usually ask questions like "What does she refer to" in class and they could answer correctly. In these cases, referents of pronouns are mostly simple ones, such as a name of a person, a place, or an object. Students can locate it very quickly by scanning the text. However, we seldom ask students to find pronominal sentences because the texts are not that complicated to do so, after all, if the text is too difficult, how can we expect students to understand?". (KT-A)

"In most cases we (in Grade 6) do not explain the referents since most students are able to find them or even guess correctly. In particular cases, for example, students need to read more sentences to determine the referents, therefore we need to explain it. Also, when there is more than one referent in text (need to select the exact one), students may get confused. …… Sometimes when the referent is not explicit, we also remind students of it". (PK-B)

From teachers' perspective, students' performance is affected by the attributes of a referent, such as the length and the degree of abstraction.

Besides, some students expressed their psychological process when they were completing the test. One Grade 4 student expressed his difficulty in locating the referent of the pronoun: "[I] need to read a lot. It was difficult to find among many answers. I don't know which sentence to copy from Paragraph 8-9" (B4B8). This indicates that Grade 4 students couldn't find suitable subjects within large units of text. Another student replied as "I thought about how I smiled from the bottom of heart" (E4C24). This indicates that students tend to turn to their life experiences in order to solve the problem when they are not able to find answers in text. This phenomenon could be explained by memory-based reading process theory. According to this theory, once there appear contradictions in text or difficulties in understanding, readers might subconsciously activate their background information to maintain the coherence of understanding (Collins & Loftus, 1975; McKoon &Ratcliff, 1992).

Some Grade 6 students said they understood how to locate referents of pronouns according to language clues in text. For example, one student recalled his thinking process as: the item asked us to find sentences from Paragraph 8 and 9. I didn't know how to find it at the very beginning. But I found "from the bottom of heart" in Paragraph 9, and I guess here it was. …… Because both of them mentioned "from the bottom of heart" (E6A24). In this case, the repetition of "from the bottom of heart" provided students with clues for locating the referent. Therefore, it could be seen that students in Grade 4 and Grade 6 tend to apply different thinking strategies in coping with complicated referents of pronouns.

In sum, the present study finds that Grade 4 students' ability to identify pronominal objects of pronouns remains to be developed. When the referents of pronouns are specific and short, Grade 4 students could identify them; on the other hand, when the referents of pronouns become complex such as abstract concepts or distant from the pronouns, Grade 4 students are only able to identify partial

information. In contrast, Grade 6 students are able to locate complete information of referents of pronouns, even when they become more complex. These findings extend the previous research results.

Moreover, the present study finds out that Grade 4 students tend to ignore the requirement of context and turn to personal experiences to locate the referents of pronouns when the referents are complex. Instead, Grade 6 students stick to the text and are able to locate the information more completely and accurately.

**(2) IRS**

As mentioned in Chapter 3, identifying the relationship between adjacent sentences is one of the important integration skills. Magliano & Millis (2003) emphasised that one of the differences between skilled readers and less-skilled readers is whether they can identify relationships between adjacent sentences. Irwin & Pulver (1984) also pointed out that explicit connectives in text could help senior primary students understand causal relations better.

Prior research supports that 7-year-old students are already able to transfer separate sentences into abstract, meaning-based representations, rather than specific words or sentences (Paris and Carter, 1973). This indicates that primary students in lower grades have already attained primary IRS ability. Liu (2013) proposed that children could recognise relationships between different things better along with development of vocabulary pool and semantic ability. In the present study, Grade 4 students' mean score is 6.84 and Grade 6 students' mean score is 7.99. Students in both grades scored higher in this skill than in others. It shows that Grade 4 students have obtained the basic ability of identifying relationships between adjacent sentences, and Grade 6 students have developed it further. This finding is consistent with the previous research findings.

To illustrate Grade difference in students' performance of IRS, Item 2 has been

selected for further discussion. The needed information for this item locates in the middle of the text. Students need to insert appropriate words between "Wyra went to the manager and smiled to him one month later" and "The manager only replied with 'No, still not enough'" to make the text coherent.

**Item:** What word fits best in ( ) in Paragraph 3 to link the two sentences? Please write it down.

**Answer:** But

Students' performance could be classified into three levels:

Level 1: Identify the semantic relationship between sentences accurately

Students could identify the semantic relationship between the two sentences through comparison and choose an appropriate word to fill in the blank to make the text coherent. Generally, two types of words were found:

Firstly, words representing adversative relationship. In the text, this kind of words are most suitable because Wyra's efforts in practicing smile and the manager's cold reply were sharply contradicted.

e.g. 1 however (E6A16)

e.g. 2 nevertheless (E6A1)

e.g. 3 but (A6c19)

Some students selected parentheses instead of connectives, which also indicates the adversative relationship:

e.g. 4 it turned out (A6C10)

e.g.5 unexpectedly (E4C22)

e.g. 6 sadly (E6A12)

e.g.7 unfortunately (B4D23)

Secondly, words expressing temporal relationships. Some students chose words

that represent “past perfect tense”, which could also connect the two sentences meaningfully. For example,

e.g. 8 at that time (E6A7)

e.g. 9 and then (E4C18)

e.g.10 then (A4C23)

e.g.11 when he smiled (C6B3)

Level 2: Identify partial inter-sentence relationships in the context

Students could roughly obtain the relationship between adjacent sentences according to their life experiences. They could find a way to connect the sentences and maintain coherence at the same time. However, this relationship only partially fits the context.

Students at this level answered in different ways:

a. Conversational language. Students imagined conversational words or phrases for characters to connect the text. For example:

e.g. 12 OK? (C4B30)

e.g. 13 I am ready now. (C4B6)

e.g. 14 Is this enough, Sir? (A6C30)

By creating contextual conversations, students indeed make sentences connected, however, some students were confined by “word” in test item and neglected the subject and verb (such as Wyra said), which resulted in incoherence.

b. Words related to time. The selected words indicate students thought about the relationship between sentences from a perspective of time, but because they lacked an appropriate reference point of time, the selected words caused incoherence of text. For example,

e.g.15 At the moment (A6C14)

e.g.16 This time (E4C15)

e.g.17 Then (E4C16)

e.g.18 Later (E6A9)

Words listed above indicate the present perfect tense instead of past perfect tense and, therefore, they cannot fully meet the requirements of context because the event had ended in the past. Nevertheless, students showed that they had recognised the temporal relationships between the two sentences.

Level 3: Unable to identify relationships between adjacent sentences

Students were unable to identify the relationships between sentences. It was mainly reflected in wrong selection of words that did not fit the context and caused incoherence of text. For example,

e.g.19 It is to say (A4B17)

e.g.20 Go and find it (D6A1)

e.g.21 reluctantly (B4B31)

Table 4-9 show that most students in Grade 4 and Grade 6 achieved Level 1 (more than 60%), which provided deeper insights into students' performance of IRS. Past studies found that students were not aware of conjunctions (connectives) (Geva, 2006). In addition, Irwin & Pulver (1984) pointed out that Grade 3 students were not able to understand the use of connectives. The present study further explains that Grade 4 students have already acquired the ability to identify relationships between adjacent sentences and use connectives properly.

Table 4-9 also shows that 76.8% of Grade 6 students achieved Level 1, which is higher than the portion (66.2%) of Grade 4 students that achieved Level 1. It is safe to say that Grade 6 students could identify the semantic relationships between sentences more accurately. Similarly, Cain, Patson and Andrews (2005) found that 10-year-olds

were more likely than 8-year-olds to choose the correct connectives to signal temporal, causal and adversative relationships, but they found no age differences for additive relationships. The results of this research prove that this development characteristic is also applied to older students, i.e., Grade 6 students.

Table 4-9 Students' distribution of different levels of performance of Item 2

| Grade | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| 4 | 233(66.2%) | 60(17.0%) | 59(16.8%) | 352(100.0%) |
| 6 | 285(76.8%) | 45(12.1%) | 41(11.1%) | 371(100.0%) |

Pearson Chi-Square =10.111, df=2, $p<0.01$

Teachers confirmed Grade 4 students' ability to identify relationships between adjacent sentences in the interview. For example,

"[Grade 4 students] don't have problems with identifying familiar relationships such as progressive and coordinate relations. We do teach them in class. …… Usually we demonstrate with several sentences and ask students to choose appropriate connectives to connect the sentences. …… They can do pretty well. ……" (KT-A)

One reason accounting for the different performance of these two grades, some teachers proposed that IRS draws more attention in sixth grade classroom.

"Before Grade 4, we rarely teach students to discriminate layers of meaning in a text, but from Grade 4 we add more practice on this, because the texts in the textbook become more complicated. By practicing on this skill, students can understand the text. In the class, we often discuss how many layers are included in one paragraph and which one is the most important or whether they are coordinating. If they are, then you need to connect them". (PK-B)

On the other hand, Grade 4 students still face challenges. Many students claimed that they "never did tests like this before" (C4B10), or felt it was very difficult to

complete it. One possible reason is that Grade 4 students don't have enough vocabulary, especially connectives to use. For example:

"Usually the teachers provide us with some words and sentences for selection and we don't need to think of some possible words by ourselves. Now you ask me to think of the words by myself. Actually I can't think of any words, and have no idea how to think of them (without clues)". (E4A7)

"To fill proper words, I can think of many words, but I don't know which one to choose". (E4A6)

"I don't understand what this paragraph is talking about, and I don't know what to fill there". (B4D20)

From students' interviews, it is thus summarised that Grade 4 students can identify a few familiar relationships or rely on some signaling words to complete the task. Their challenge may be accounted for by insufficient teaching in the classroom and limited vocabulary.

Instead, Grade 6 students were found inclined to think of questions based on the context. For example,

"I read this paragraph several times. …… It says that Wyra learned how to smile and smiled to the manager first, and then he was rejected. I thought these two things happened in sequence, so I filled the blank with "then". (D6B25)

In sum, the present study finds that Grade 4 students performed well in IRS. However, Grade 4 students still have difficulties in identifying relationships between sentences. In contrast, Grade 6 students could identify relationships between adjacent sentences more accurately.

**(3) IRP**

Identifying relationships between paragraphs goes beyond local understanding of sentences and reaches the level of global understanding. In the present study, students in both grades are less skilled in IRP, with Grade 4 students' mean score of 3.67, and Grade 6 students' mean score of 4.62. Since previous research has revealed a few characteristics of students' ability in IRP, this finding extends the knowledge on this topic.

Grade difference in students' performance of ability to identify relationships between paragraphs is elaborated with Item 8 in the following sections.

**Item:** Please use one sentence for Paragraph 14 to summarise the aforementioned content (Paragraph 13) and educes following content (Paragraph 15).

**Answer:** The house was very sad. He went out of town and arrived at the countryside.

Students' performance could be categorised into three levels:

Level 1: Identify semantic relationships between paragraphs accurately

Students could understand the organisation of the whole text and the cohesion between paragraphs after understanding each paragraph. For this item, students could write down one sentence that summarised the content aforementioned (such as the house's feeling or summary of what have been mentioned), as well as educes the locations of the subject "house" to connect the text properly. For example,

e.g.1 "I couldn't enter the downtown houses, maybe the houses in the coutryside welcome me", the house thought. (F6A15)

e.g.2 The house didn't give up and walked all along to the countryside. (E6B27)

e.g.3 The house had no choice but to come to the countryside. (A4B13)

e.g.4 The house felt disappointed, and went to look for new houses. (B4D10)

e.g.5 [The house] went to the countryside reluctantly. (C6A1)

Level 2： Identify some relationships between paragraphs that fit the context in text

Students gave a summary of prior content from the house's perspective only. It means that students could roughly identify the boundary of ideas but were unable to identify the exact relationship between paragraphs in a complete and accurate way. For example,

e.g.6 [The house] had to find a new home elsewhere. (C6B26)

e.g.7 [The house] was very sad. (C6B4)

e.g.8 [The house] was very disappointed and continued to find his home. (B6A15)

e.g.9 [The house] left unwillingly. (A6C38)

Level 3: Unable to identify relationships between paragraphs

Students wrote down some inappropriate comments, added some conversations that were not congruent with the situation, or misunderstood the prior content, so the sentences they wrote caused misunderstanding and confusion. Students were unable to understand how to maintain the coherence of the text and misunderstood the relationship between paragraphs.For examples,

e.g.10 Very big (B6A32)

e.g.11 Why is it so small as always? (C6B33)

e.g.12 Hey, house, you don't listen to me. Nothing left! (D6B4)

e.g.13 The house was very envious.( C4A7)

Table 4-10 shows that a majority of students in Grade 4 and Grade 6 achieved Level 2. However, in terms of proportion of students who achieved Level 1, Grade 6 performs far higher than Grade 4. This indicates that Grade 6 students are better at analysing the relationships between paragraphs at a macro level and with more accuracy.

Table 4-10 Students' distribution of different levels of performance of Item 8

| | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Grade4 | 70(19.9%) | 217(61.6%) | 65(18.5%) | 352(100.0%) |
| Grade6 | 117(31.5%) | 206(55.5%) | 48(12.9%) | 371(100.0%) |

Pearson Chi-Square= 14.167, df=2, p=.001<0.05

One of the reasons that possibly contribute to students' differentiated performance in IRP is cognitive development. Recent studies have found that although primary students in lower grades have already attained the ability of analysing, comparing and classifying ordinary things, they do not develop the ability to organise, analyse and classify through language until Grade 3 or Grade 4 (Zhu, 1993; Lin, 2001). In this sense, it is not surprising that Grade 4 students' ability to deal with IRP tasks is underdeveloped. More capable of dealing with IRP though, Grade 6 students still need practice for improving their ability of identifying relationships between paragraphs.

Teachers mentioned in interviews that Grade 4 students were only able to identify a few kinds of relationships between paragraphs, but Grade 6 students performed better in IRP since they had received more training. For example,

"As I said, (Grade 4 students) are able to sequence sentences or insert connectives. But the ability to identify relationships between paragraphs (more difficult) may depend on the complexity of paragraph. They could identify relationships between adjacent paragraphs that consist of only one or two sentences. If the paragraphs are too long or too complicated, students find it difficult to follow, thus feel difficult to group different paragraphs". (KT-C)

"Talking about this issue, it reminds me that Grade 4 students still write long paragraphs instead of dividing them into different segments in their composition. In this sense, it is also difficult for students to divide the text into different segments in

reading". (KT-A)

"We teach little about identifying relationships between paragraphs in Grade 4, because our textbooks don't emphasise such training. On the other hand, it exceeds students' learning ability. However, more expository essays appear in our teaching in Grades 5 and 6 and students' thinking ability has been enhanced. Therefore, we increase the training where we ask students to analyse relationships between paragraphs in the expository essays in Grade 6; it is also helpful to improve their logical thinking". (KT-B)

In line with teachers' opinions, some Grade 4 students expressed their opinions such as "I don't know what to say; I think it makes sense with a blank here" (A4B22), "I don't know why we need to connect them" (B4D26). It indicates that Grade 4 students lack awareness of the connections between paragraphs within the text.

On the contrary, Grade 6 students were aware of the connections between paragraphs. "Well, firstly the story told us she has already been rejected by downtown house. Secondly, the story goes on to tell us that she found that the houses in the countryside are too small to live. So I think to connect these two parts, I should write down these two things, that's why I answer that the house tried to find her own house in the countryside after being turned down by the downtown house" (B6D14).

In sum, students in both Grade 4 and Grade 6 are not good at dealing with IRP, but Grade 6 students are able to identify relationships between paragraphs more accurately.

**(4)IMI**

Extant research on students' reading process (Goldman & Varnhagen, 1986; Johnson & Mandler, 1980; Yussen & Ozcan, 1996; Richards & Singer, 2001) has explained that students should understand the paragraph or text first and then figure out the relations among different units and comprehend the structure of the text, based

on which they can identify the topic sentence. In the present study, Grade 6 students' mean score of IMI is 6.94 and Grade 4 students' mean score is 5.93, so IMI is comparatively one of the best-performed skills in both grades. It indicates that Grade 4 students have already obtained the ability to identify the topic sentence to some extent, based on which Grade 6 students have developed the ability further. This result is congruent with some studies in western countries. For instance, van den Broek, Lynch & Naslund (2003) proposed that 8-year-old primary students have already been able to identify topic sentences. Yussen (1982) pointed out that students' ability to identify the main idea develops along with grades, particularly from Grade 2 to Grade 6. Students' ability of identifying main idea developed rapidly in this period. However, some studies have found that students in lower grades were hardly capable of identifying topic sentence (Brown & Day, 1983; Hare et al., 1989). The disparities between these research results show thee unstability of its development.

Following sections demonstrate the grade difference in students' performance of IMI with Item 10.

**Item:** Please find out the topic sentence of Paragraph 24.

**Answer:** In the end, she has found herself a big and beautiful house and became the house that felt happy every day.

Students' answers could be categorised into three levels:

Level 1: Identify topic sentence accurately

Students were able to identify the topic sentence of one paragraph or of the whole text accurately. It required general understanding of the whole text though the topic sentence was explicit in text. For example, students needed to understand the relationship between the topic sentence and its subordinate content.

Level 2： Identify key sentences partially summarising the text

Students could identify some important sentences in the text, which could only summarize part of the paragraph or the text instead of the main idea.

e.g.1 The house felt happy as well as sad when she heard what the tree said. (B6A20)

e.g.2 [The house] thought about how she spent the whole night: walking over various kinds of houses and experienced all kinds of emotions. (A4C15)

Level 3: Unable to identify the topic sentence

Students focused on some trivial information. The sentences they selected could not summarise the paragraph or the text. Some students failed to find a correct sentence and wrote some words instead.

e.g.3 The sun is rising; go and welcome the new day with your friends, said the tree. (B6A35)

e.g.4 It is worthy. The answer found by our own efforts is the perfect one. (B6A32)

As shown in 4-11, 46.4% of Grade 4 students achieved Level 2, which is the highest proportion among all three levels. On the contrary, the proportion of students who achieved Level 1 is the highest in Grade 6 (48.1%). This indicates that students' ability to IMI developed from Grade 4 to Grade 6. Hare, Rabinowitz and Schieble (1989) asserted that Grade 4 students had difficulties in identifying the main idea of texts, especially when the topic sentence located at the medial or final position in the paragraph. They tended to choose the opening sentence as the topic sentence, even when it denotes details. Nevertheless, Grade 6 students are able to find the topic sentence in the medial or final position. Thus the present study supports the conclusions since the topic sentence locates at the end of the paragraph in this study.

Table 4-11 Students' distribution of different levels of performance of Item 10

| | 1 | 2 | 3 | total |
|---|---|---|---|---|
| Grade 4 | 108(33.4%) | 150(46.4%) | 65(20.1%) | 323(100.0%) |
| Grade 6 | 173(48.1%) | 130(36.1%) | 57(15.8%) | 360(100.0%) |

Pearson Chi-Square=15.028, df=2 $p<0.01$

Teachers expressed their perception that Grade 6 students were more capable of identifying topic sentences accurately.

"Both Grade 4 and Grade 6 students can find the topic sentence. The difference lies in their ability to find some specific topic sentences. We train our students in Grade 4, but the topic sentences are very obvious in the training materials. ……For forth graders, students can easily find them at the beginning or end of the paragraph, and sometimes there are clues such as "in sum", and "So". ……However, the textbooks in Grade 5 and Grade 6 include more exercises on identifying topic sentences with varied degrees of difficulty, so we teach this ability more in daily teaching. Sometimes there are no clues or more than one key sentence. In this case, we teach them how to distinguish the most important sentence and how to identify the range one sentence has covered. In general, students' ability develops gradually with the training". (KT-A)

Some students held similar ideas, in line with teachers'. Some Grade 4 students confessed that they were not able to distinguish the importance of the opening and ending sentences. For example,

"I couldn't know which sentence summarises the content better. In this paragraph, the opening sentence said the house was happy and sad, I thought it's the required sentence, because the following part explains why she was happy and sad.

But I felt the ending sentence was right, too. I thought very hard and couldn't decide which one to take down". (E4A11)

Instead, Grade 6 students were more confident when choosing the topic sentence. For instance,

"I chose the last sentence as the topic sentence because it is the ending sentence. Usually the ending sentence summarises the whole content. Also, the text already mentioned that she had found a new house. Of course she was happy. So this sentence could be the result of the story". (C6A35)

In all, the present study shows that Grade 4 students are constrained by their weak ability for analysing and comparing, and are unable to construct a macro structure of what they read. In contrast, Grade 6 students perform better in associating different ideas of the text and are more precise and confident in identifying the topic sentence.

**(5) ASI**

The information in "abstracting specific information" (ASI) tasks could be located in either one specific place in the text, or in different places in the text. The present study asked students to abstract information in different places in the text and organise it into a complete statement. Grade 4 students scored 2.78 and Grade 6 students scored 3.97. Generally, students performed worst in ASI among all six integration skills, which shows that students in both grades were weak in abstracting and organising information. The reason lies in students' working memory because they have to retain both the information being processed and the information reactivated from previous text, which requires students to have enough capacity of working memory (Orrantia et al., 2014), thus this ability is highly demanding to the elementary students.

The difference between the performance of students in two grades is further

demonstrated with Item 3.

**Item:** Please summarise what methods Wyra used to practise his smile.

**Answer:** Wyra practised loudly in the living room first, imitated smiling faces of celebrities; at the same time, he bought a mirror to check his smile, and at last, asked his friends to comment on his smile.

Students' answers could be categorised into three levels:

Level 1: Summarise information concisely and completely

Students could summarise the target information completely and concisely in their own words. Regarding this item, students needed to find out the methods that Wyra used to practise his smile. Level 1 student answered such as:

| Original sentences (underlined parts need summarising) | Examples of students' answers |
|---|---|
| 2. Neighbors thought he was mad because of having lost his job since he laughed loudly hundreds of times a day in his living room. So he had to practise in the bathroom.<br>4. Wyra didn't feel pessimistic or disappointed. He collected lots of pictures of smiling celebrities and put them on the wall of his bedroom and then imitated those faces all the time. In addition, he bought a mirror as tall as himself, and put it in his bathroom, so he could check his own performance.<br>8. He didn't feel disappointed, and went to his friends for help by asking them to judge whether his smile was attractive enough. At last, Wyra finally got recruited by the insurance company. | e.g.1 He laughed loudly hundreds of times in the living room, collected charming smiling faces to imitate, bought a mirror to do self-check, and asked friends to judge his smile. (C6B6) |

Level 2: Summarise partial information briefly

Students were able to summarise some key points, but their answers included some trivial information, or even original sentences copied from the text.

e.g.2 He practised in the bathroom; he collected lots of pictures of smiling celebrities, put them on the wall and imitated them all the time; went for friends to judge his smile. (C6B2)

In this case, "practised in bathroom" is not the key information, and "he collected pictures of smiling celebrities, put them on the wall and imitated them all the time" needs further condensing.

e.g.3 He collected pictures of celebrities' smiles, bought a mirror as tall as himself, and went to friends for help by asking them to judge whether his smile was attractive enough. (C4B8)

This example (e.g.3) summarises less important information and copied original sentences from the text.

Level 3: Retell information without abstraction

Students were able to find information related to one or more key points, but unable to summarise them concisely. The following underlined sentences are copied from text by students.

e.g.4 He laughed loudly hundreds of times a day in his living room. He collected lots of pictures of smiling celebrities and put them on the wall of his bedroom and then imitated those faces all the time. In addition, he bought a mirror as tall as himself, and put it in his bathroom, so he could check his practices. He didn't feel disappointed, and went to his friends for help by asking them to judge whether his smile was attractive enough. (E4C15)

e.g.5 He collected lots of pictures of smiling celebrities and put them on the wall of his bedroom and then imitated those faces all the time.. (E4C15)

e.g.6 He bought a mirror as tall as himself, and put it in his bathroom, so he could check his practices.(C4B7)

Level 4: Unable to locate relevant information for summary

Students were unable to locate specifically relevant information for summary, for example:

e.g.7 [He] trained his smiles through hard practices. (B6A27)

e.g.8 [He] practised smiling continuously. (B6A12)

e.g.9 [He] kept practicing until he was satisfactory. (E4C16)

Some students even found some wrong information to summarise:

e.g.10 Wyra asked the manager for help with methods to practise smiles. (D4E20)

Table 4-12 shows that students of Grade 4 who achieved Level 4 are more than students at any other Level. 61% of Grade 4 students achieved only Level 3 or Level 4. Hence, it is safe to say that most students in Grade 4 can only retell information or are even unable to identify relevant information for summary.

Meanwhile, most Grade 6 students achieved Level 2, with 12.5% of students in Grade 6 achieved Level 1, which doubled the proportion of students who achieved the same level in Grade 4. It indicates that most Grade 6 students are able to "summarise information completely and briefly" and "summarise only some information briefly".

This result once again confirms the previous findings that students in middle grades can hardly connect distant information in the text (van den Broek, 1989). Moreover, from Table 4-12, we can also understand that with the increase of age,

students have more of working memory to process the tasks of ASI.

Table 4-12 Students' distribution of different levels of performance of Item 3

| | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| Grade 4 | 19(5.4%) | 118(33.5%) | 67(19.0%) | 148(42.0%) | 352(100.0%) |
| Grade 6 | 48(12.9%) | 169(45.6%) | 47(12.7%) | 107(28.8%) | 371(100.0%) |

Pearson Chi-Square=31.238, df=2, $p<0.05$

Teachers emphasised that Grade 6 students are more capable of locating information in different places in the text in interviews. For example,

"With respect to abstracting information, Grade 4 students know that they can't copy original sentences and need to paraphrase. They are aware of these basic requirements, but have difficulties in locating the relevant information in more than one place. In other words, they can hardly locate all the information and sometimes located in wrong places. We usually teach this skill in Semester 2 of Grade 4, because students can understand our instructions better". (PK-D)

"When we ask them (Grade 4 students) to summarise a paragraph, they frequently paraphrase the written language in textbook into spoken language. …… If the information appeared in different places, it is even more difficult". (KT-B)

"We arrange some practice of summarising specific information for Grade 6 students. There are some items in TSA (The Territory-wide System Assessment), so we have to make preparations for daily teaching. Students used to be afraid of this kind of test items, so we tell them to calm down and underline relevant sentences first, then paraphrase these sentences in their own words briefly. Now they are more capable of dealing with such tasks than before". (PK-A)

On the other hand, students in Grade 4 and Grade 6 faced different types of difficulties. Grade 4 students expressed their concern that ASI tasks were very

difficult, especially in locating information in more than one place in text:

"There are many pieces of information that need to be included, and it is very easy to miss one." (E4A21)

"It is fairly difficult to find different methods of practicing smiles". (C4A16)

Grade 6 students expressed similar difficulties and some also mentioned that summarising was more difficult:

"We need to summarise instead of using the original sentences". (B6D21)

"It is quite difficult to summarise the text". (C6A28)

From students' interview data, we can see that Grade 4 students have difficulties in locating all relevant information, whereas Grade 6 students feel it is tough to summarise the information they had found. It shows that Grade 6 students are aware of summarising but unable to practise it thoroughly.

In general, students in both Grade 4 and Grade 6 performed poorly in ASI. Grade 6 students were able to summarise all or part of information, while Grade 4 students tended to copy or retell the reading materials. Some students in Grade 4 are even unable to locate relevant information in text.

**(6) SWT**

Summarising the whole text is an important indicator of students' ability to establish a macrostructure of the text (Kintsch, 1988, 1998). In the present study, Grade 4 students' mean score of SWT is 3.45, and Grade 6 students' score is 4.22, which indicates that Grade 6 students' ability of dealing with SWT was found more developed compared with Grade 4 students'.

In following sections, we demonstrate the different performance of students in two grades with Item 12.

**Item:** Please write a summary of the story with no more than 100 words.

**Answer:** The house felt sad when she heard the pigeon said she didn't have a home.

She started to look for her home. She went to houses in the city, in the countryside and in the wild field but did not find her home. Finally a tree told her that the earth was her home.

With reference to Spörer, Brunstein & Kieschke's (2009), students' performance could be categorised into five levels.

Level 1: Summarise the text concisely and accurately in students' own words

Students were able to sort out the structure of the text, identify key events and connect these events in their own words.

e.g.1 The house felt sad when she heard the pigeon say she didn't have a home. And then the house decided to find her own home. However, she went to the city, the countryside and the wild fields but still couldn't find her home. A tree told her that the earth was the house's home. So the house finally found her home after she heard the tree's words. (A6A12)

e.g.2 One day, the pigeon was discussing what a nest the house had and then the house found that she didn't have a home. Therefore, she looked for her home everywhere: in town, in countryside, and in the wild fields, but still found nothing. A tree told the house that the earth was her home, and the house felt very happy. (C6B4)

e.g.3 A beautiful house was said to be homeless, but she wanted a home. So she looked for her home. She went to buildings in the city, went to villages and went to the country yard, but still didn't find it. When she was very sad, a tree told her that the earth was her home, so she became a happy house. (B6D18)

Level 2: Summarise most of the key information in text

Students' summary included most important information but missed some key points. Three sub-levels were included in this level.

a) Summarise the beginning and the ending. Students summarised the

beginning and the ending of the story but missed part of the process.

e.g.4 The house told the kids a story about how she found her home. She found she was homeless one day and decided to look for her home. But she couldn't find a suitable one. And then a tree told her that the earth was her home. She became happy ever after. (C6B2)

e.g.5 After chatting with the pigeon and the car, the house found out that she was unhappy about being homeless, and then she started to look for her home. She spent a lot of time and finally met the tree in the wild fields. The tree told her that the earth was her home, and she became happy again. (E6A4)

e.g.6 This story talks about a house who was sad because she had no home. She went out to look for her home but couldn't find anything. At last, the tree told her that the earth was her home and she became the happy house again. (B4D23)

b) Summarise the process and the ending. Students summarised the process and the ending of the story, but neglected the beginning.

e.g.7 The house told a story that once she wanted to look for her home but failed though she looked everywhere including the city, the village, and the wild field. At last a tree told her that the earth was her home, and she felt happy as well as sad. (F4B10)

e.g.8 This story describes a house's experience of looking for her home in city, in village and in the wild fields. Though she didn't find it, she was finally told that the earth was her home, by the tree. (A4C19)

e.g.9 A kid asked the house why she was so happy, and the house began to tell the kid a story about looking for her home. She looked in city, in village and in the wild fields but couldn't find her home. At last a tree told her that the earth was her home. She became a happy house ever after. (E6A5)

e.g.10 The house went to the city, the village, and the wild field to look for her

home, but unfortunately she didn't find it. At last, she came across a tree and the tree told her that the earth was her home. She became happy ever after. (C6B4)

c) Summarise the beginning and the process. Students summarised the beginning and the process of the story, but didn't include the ending correctly.

e.g.11 The text tells a story that a house found out that she was homeless by talking to the pigeon, and then she decided to look for her home. She went to the city, the village and the wild field and met a tree there. She finally knew that the sky and the earth were her home. (D6A25)

e.g.12 The house decided to look for her home after she heard what the pigeon said. She went to the city, the village and the wild field, but found nothing. She finally felt relieved after she heard a tree's explanation. (F6B11)

Level 3: Summarise a small portion of key information

Students summarised a small portion of key information and included a large part of less important or unimportant information.

e.g.13 The house lived a very happy life at first, but suddenly she started to look for a home. She looked for her home in city, in village and in the wild field, but found nowhere to live. The house felt very sad, but finally she found her own home, so she was very happy. (D4E31)

This case (e.g.13) describes the process of the story but does not properly narrate the beginning and the ending of the story.

e.g.14 The house wanted to find her own home and started to look for it everywhere. However, she did not find it after she looked into many places. At last a tree told her: "the earth is your home". She became a happy house ever after. (B6A19)

This above case (e.g.14) describes the ending of the story, but does not include key information in the summary, such as the places to where the house has been.

e.g.15 The house began to dream about having her own home after she talked with the pigeon and the car. She started looking for her own home. Unfortunately, the houses she met were not suitable for her. She didn't realise that she owned a good home already until she met the tree. (A4B32)

This case (e.g.15) summarises the beginning of the story, but does not include the key information in the summary of the process and the ending.

e.g.16 The house thought she should have a home of her own and began to look for it. She went to a tall building but it was not suitable for her to live. And then she found a cave, but the tiger had occupied it. She cried in the street finally, and a tree told her that the earth was her home. She left happily. (C6B12)

This case (e.g.16) summarises the ending of the story but includes too many details in the description of the beginning and the ending without summarisation.

e.g.17 The house looked at people and cars passing by everyday and felt very happy. When a kid felt confused about her happiness, she began to tell a story about her. One day, a pigeon talked to her arrogantly, "I have built a beautiful nest". The house began to feel sad and went to the city, the village and the wild field to look for her own home. But she didn't find a suitable one. Then a tree said, "The whole earth is your home". She became a happy house ever after. (E6A12)

It includes the complete plot of the story and summarises the process, but includes much less important information in the summary of the beginning and the ending.

Level 4： Identify some characters, concepts, or repeat parts of the text

Students were unable to summarise key information in the text. Instead, they could only list some less important concepts or events, or copied original materials from the text.

a) Retell partial information of the text

e.g.18 A beautiful house stands by the street and looks very happy everyday. A kid asked her why she was so happy, and she said because she had the biggest and the loveliest home. The kids were confused and she started to tell a story about how she found her home. One day, a pigeon flied onto the roof of the house and said he had built a nest when the house was chatting with the car. The house didn't understand and the pigeon explained that the nest is his home. And then the story about a house looking for her home unfolded. (D4E28)

b) Write down main characters and some less important events.

e.g.19 She was looking for her own home and went to many places such as the building and the cave. And then she met a tree and the tree told her something. (E4C2)

e.g.20 The story explains why the house was happy by narrating how she looked for a place to live. (B6A11)

e.g. 21 This text tells a story that a house wanted to find her own home but couldn't find a suitable place since they were too small. When she was crying, a tree came to tell her something and then she became happy. (D4E30)

e.g.22 It describes a story that a house looked for a place to live but found every place was occupied. However, an old tree helped her to solve the problem. (D4E21)

e.g.23 The house was looking for her home and finally found it. (D4E33)

c) Identify the attributes of the story. Students could only identify some basic structural elements of the text, but failed to provide specific events described in it.

e.g.24 The story talks about: the beginning, process and ending of a story that a house was looking for her home. (D4E2)

e.g.25 [It is] about the process of how a house was looking for her home.

(C6A5)

e.g. 26 [It] talks about the process of a house looking for her home. The events and objects he came across and the reason why she found it at last.(B6A8)

d) Write comments.

Students wrote down some additional information that was not stated in the text such as students' comments and feelings about the story.

e.g. 27 We should treasure things around us. (D4E27)

e.g. 28 You can get what you want if you looked carefully. (D4E23)

e.g.29 The main content is "house" instead of "houseless". It does have one, and it is she that thought about where her home was. I understand that I need to think carefully before I do everything. (D4E20)

e.g.30 The house shouldn't be upset since the earth is her home. The earth is so beautiful, and shouldn't the house be happy? The house could be the home for people, but can cars and pigeons? No, they can't. So the house is very useful! (E4C1)

Level 5: Write irrelevant messages or misunderstand the text

e.g.31 The features of the house. (D4E7)

e.g.32 The house is not able to have a home. (B6A2)

Table 4-13 shows that more than 60% of students in Grade 4 achieved Level 4 and Level 5, which indicates that most students in Grade 4 were unable to summarise important information in text. Though in Grade 6 also Level 4 is the largest proportion in students' performance (35.8%), the 52.3% of all students achieved Level 1 or Level 2 or Level 3, which exceeds the similar proportion of students in Grade 4 (38.1%). It indicates that Grade 6 students are better at identifying important information in text and summarising the information briefly and accurately.

Students' performance of summarising the whole text is in line with previous research findings. Brown and Smiley (1977) required students in Grade 3, Grade 5 and Grade 7 and university students to judge the importance of each conceptual unit in the text according to a 4-point scale. It was found that only university students were able to identify conceptual units at different layers. Williams, Taylor and Ganger (1981) discovered that only 43% of Grade 4 students and 57% of Grade 6 students were able to summarise the main idea of the text correctly. Brown, Day and Jones (1983) found that only 16% of students in Grade 5 and Grade 7 were able to summarise the main idea of the text in their own words. Most students copied the original text word by word or parts of the text.

Table 4-13 Students' distribution of different levels of performance of Item 12

| | 1 | 2 | 3 | 4 | 5 | Total |
|---|---|---|---|---|---|---|
| Grade 4 | 3(0.9%) | 32(9.1%) | 99(28.1%) | 164(46.6%) | 54(15.3%) | 352(100.0%) |
| Grade 6 | 15(4.0%) | 57(15.4%) | 122(32.9%) | 133(35.8%) | 44(11.9%) | 371 (100.0%) |

Pearson Chi-Square=21.188, df=4, $p<0.05$

Teachers considered "summarising the whole text" as a highly demanding task for Grade 4 students and pointed out the need to train students in SWT because of immature thinking ability. For example,

"For summarising the text, students need to be familiar with the text first, and then divide it into several parts and summarise the content in each part. In the end, they need to express the content in their own words. Each step I mentioned just now is very difficult, and this is a linear process. Mistakes at any stage might lead to a failure. …… I think Grade 4 students are weak in these aspects and cannot follow these steps. As I said just now, it is already difficult to understand relationships

between paragraphs, and it is even more difficult to write them down. Now we train them by using some short and simple texts. …… Start the practice from the easy one". (KT-C)

"Although we have reminded them many times, the most common mistake for Grade 4 students in summarising is copying the original text. I don't think they are capable enough for going beyond the text to see how the content is arranged. It is really very challenging for them. Therefore, they could only copy from the text". (KT-B)

"If I ask students (in Grade 4) what the characters did, they are not able to answer correctly and sometimes mistake one for another. They sometimes take what A did for what B has done. However, it is interesting that if you ask them what lesson it teaches us, they can answer correctly…..The reason, maybe because to infer the theme, they can refer to similar experiences of their own and have something to say, but to summarise, if they don't understand the text thoroughly, they have nothing to say. They can't rely on their experience or imagination". (PK-C)

"According to my teaching experience, they often forget using connectives or use "and" from the beginning to the end when they summarise text. In this way, the content is not well connected. I think students' ability to summarise the text is associated with writing ability. In this sense, Grade 6 students definitely perform better. After all Grade 6 students can express the idea in a more logical way". (KT-A)

Teachers' perceptions suggest that Grade 4 students seem unable to summarise the whole text because they have difficulties in understanding and connecting different parts of text. Beside, their writing ability is still under developed, thus they can hardly transform the text into a coherent text. On the contrary, Grade 6 students can summarise the text more logically and completely.

Teachers' opinions were also confirmed by students' responses. Generally,

Grade 4 students considered the events in the story too complex, which hindered their understanding of the main plot for summary.

"The text is too long and difficult to summarise". (D4D 20)

"The plot of this story has many twists and tells that the house went to a lot of places to look for her home. It took me quite some time to figure out the process of looking for her home, it is really difficult to write them down". (D4D 3)

Some students reported the effects of writing ability on performance of summarising the text.

"I am not very confident with writing, so I felt very difficult to summarise the text in one paragraph. (Why?) Because it needs me to write a lot". (A4B18)

As to Grade 6 students, though they reported similar difficulties, they seemed to become more strategic when selecting and transforming the textual information to produce a summary.

"I felt it was difficult because I needed to understand the text in a short time. I read the text three times. The first time was quick reading and figured out that the story was about a house's experience of looking for a home. Well, it was actually the title. The text was too long and I couldn't understand some places. During the second time, I underlined some important characters such as the pigeon, the building and the tree. And during the third time of reading, I looked for topic sentences. …… I skipped parts that I could not understand. Meanwhile, I was afraid of exceeding the 100 words limit when I was writing, so it was really difficult". (B6A9)

In sum, students in both Grade 4 and Grade 6 are not competent in SWT. Most Grade 4 students are unable to summarise key information in text, whereas Grade 6 students perform better in summarising textual information briefly and accurately.

### 4.2.4 Students' performance of their integration ability differentiates in gender, but intra-grade gender differences in individual skills vary

(1) Students' performance of integration skills varies with gender in general

The test results show that girls' integration total score is significantly higher than boys. Compared with the literature, this result is not surprising, because in primary schools, girls' academic performance has exceeded boys' worldwide (Brozo, et al., 2007; Logan and Johnston, 2009). For instance, girls' mean score was 520, and boys' was 504 in PIRLS 2011 test (Mullis et al., 2012). In addition, Lin et al. (2003) discovered that girls' academic performance in Chinese subject was generally better than boys' in primary school, but boys' learning ability begins to develop rapidly and exceeds girls' in high school.

Therefore, the gender difference in integration ability is consistent with the general learning pattern. Nevertheless, we still need to figure out effective ways to enhance boys' performance in integration ability.

(2) No significant gender difference in students' development of integration ability

Table 4-2 and Table 4-4 show that there is no significant interaction between gender and grade on students' integration total score and the six integration skills. It means that students' development of integration ability is not significantly influenced by gender difference.

Recent studies have explored the periodical change of students' reading performance in a specific grade. For instance, PIRLS2011 identified that the gap between Hong Kong boys' and girls' performance in reading increased compared with PIRLS 2006 in primary school. However, few of the researches have mentioned the gender difference during students' development of reading ability. Hence, the present study enriches the understanding of gender difference in students' reading ability.

(3) Students' performance in terms of individual skills is not necessarily differentiated by gender in each grade.

As shown in Table 4-7, gender differences in students' performance in each skill varied within each grade. Except for ASI an SWT where gender difference existed in both grades, some cases are worth mentioning.

Firstly, no significant gender difference in students' performance of IMI was found in both Grade 4 and Grade 6. IMI is one of the strongest skills among students in Grade 4 and Grade 6. It shows that both girls and boys are able to complete IMI easily. Though students' ability does develop with grade, the trend remains the same.

Secondly, girls perform significantly better than boys in IRS, but there is no significant gender difference in Grade 6. It is safe to infer that girls develop IRS ability earlier than boys, but boys catch up later.

Thirdly, no gender difference was found in students' performance in IRPN and IRP in Grade 4, but the gender difference emerged in Grade 6. It could be explained by the increased cognitive requirement in upper grades. Taking IRPN for example, teachers teach students to identify some more complex pronominal referents in Grade 6, as mentioned in interviews. Similarly, as the texts became longer and more complicated after Grade 4, the difficulty of IRP tasks increased as well. The present study shows that girls master integration skills with high degree of difficulty better.

However, as Logan & Johnston (2010) pointed out, reasons accounting for the gender differences in reading have still remained unexplored, but the major way to mitigate the gender difference in reading is to improve teaching. Chapter 6 further discusses some suggestions for teaching methods.

In all, this chapter could be summarised as:

(1) In terms of integration ability development, students in Grade 4 and Grade 6 only

attained preliminary ability. Grade 6 students performed better in the total score as well as in scores of individual skills than Grade 4 students, indicating that the integration ability of students in Grade 6 has developed to certain degree compared with that of Grade 4 students.

(2) With regard to students' performance in each individual integration skill, students performed better in identifying relationship between adjacent sentences (IRS), identifying referents of pronouns (IRNP) and identifying main idea (IMI), which indicates that they can integrate through "straightforward inference". However, students performed poorly in identifying relationships among paragraphs (IRP), abstracting specific information (ASI) and summarising the whole text (SWT), which denotes that they have difficulties in acquiring some complex skills involving complicated inferences and language transformation.

(3) Significant gender differences were observed in students' performance of integration ability, but no significant gender difference exists in students' development of integration ability.

(4) Both teachers and students reported that students still had many difficulties in developing various integration skills. Typically, Grade 4 students are not able to handle complicated materials. Thus the improvement of reading instructions is needed.

# Chapter 5 Factors influencing students' integration ability

## 5.1 Main results

All 723 students participated in a survey after completing the reading integration test. 687 questionnaires were returned and 661 valid questionnaires were obtained after the deleting questionnaires containing missing values. Table 5-1 shows the descriptive statistics of each item.

Table 5-1 Descriptive statistics of questionnaire (N=661)

| Item | Mean | Std. Deviation | Skewness | Kurtosis |
|---|---|---|---|---|
| Reading strategy | | | | |
| 1. Write a short summary after reading | 2.44 | 0.96 | -0.07 | -0.97 |
| 2. Understanding the cause and effect of the events in the text | 3.27 | 0.94 | -1.18 | 0.42 |
| 3. Pay special attention to the title and subtitles | 2.66 | 1.06 | -0.25 | -1.17 |
| 4. Delete some unimportant sentences to understand the main idea when the paragraph is too long | 2.71 | 0.97 | -0.35 | -0.81 |
| 5.Skip some content that is not closely related to the main idea | 2.83 | 1.00 | -0.45 | -0.87 |
| 6. Summarise the paragraph in your own words | 2.79 | 0.97 | -0.39 | -0.81 |
| 7. Understand the main idea of the text by connecting the main idea of each paragraph | 2.80 | 0.99 | -0.45 | -0.81 |

| Item | Mean | Std. Deviation | Skewness | Kurtosis |
|---|---|---|---|---|
| 8. Draw a mind map according to content of different parts | 2.37 | 1.03 | 0.17 | -1.11 |
| 9. Pay attention to words such as “firstly”, “then”, “generally” | 3.05 | 1.02 | -0.73 | -0.66 |
| 10. Understand the sentences according to key words | 2.85 | 1.07 | -0.50 | -1.01 |
| Extensive reading | | | | |
| 11. Biography | 2.00 | 0.94 | 0.55 | -0.69 |
| 12. Fairytale | 2.42 | 1.01 | 0.05 | -1.09 |
| 13. Detective novel | 2.70 | 1.07 | -0.23 | -1.21 |
| 14 Historical story | 2.21 | 1.00 | 0.34 | -0.96 |
| 15. News report | 3.12 | 1.11 | -0.87 | -0.73 |
| Reading attitude | | | | |
| 16. Reading is interesting | 2.81 | 0.97 | -0.32 | -0.93 |
| 17. Daily reading helps a lot to improve my Chinese | 3.06 | 0.94 | -0.77 | -0.31 |
| 18. The content of textbooks is interesting | 2.94 | 0.93 | -0.56 | -0.53 |
| 19. I like reading some extra-curricular books chosen by myself | 3.31 | 0.97 | -1.16 | 0.13 |
| 20. I like reading with my family | 2.56 | 1.04 | -0.11 | -1.14 |
| 21. I am affected by the text when I am reading | 2.90 | 1.04 | -0.52 | -0.94 |
| 22. I like participating in the extensive reading activities in school | 2.82 | 0.97 | -0.35 | -0.89 |

Table 5-1 shows that absolute values of skewness of most items are between 0 and 1, which can be considered as normal distribution (Curran, West & Finch, 1996). Detailed discussion on the statistics is carried on later.

### 5.1.1 Reading strategy

The questionnaire investigates the frequency of students' use of integration strategies in daily reading. Ten reading strategies are included in this survey .The options range from "Never" (1) to "always" (4). Table 5-2 shows students' total score of reading strategy. It shows that there is no significant difference in students' use of reading strategies between Grade 4 and Grade 6.

Table 5-2 Grade difference in students' use of reading strategies

| Grade | N | Mean | Std. Deviation | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| 4 | 326 | 27.27 | 7.570 | | | |
| 6 | 335 | 28.26 | 5.898 | -1.872 | 613.958 | .062 |

Table 5-3 shows the results of the regression analysis (method=ENTER) conducted with integration total score and six integration skills as dependent variables and reading strategy total score as independent variable.

Table 5-3 Regression analysis of reading strategy on integration total score and six integration skills

| **Integration** | Total score | IRPN | IRS | IRP | IMI | ASI | SWT |
|---|---|---|---|---|---|---|---|
| $R^2_{Total}$ | .307 | .151 | .168 | .139 | .124 | .123 | .096 |
| F | 292.092 *** | 116.976 *** | 133.027 *** | 106.540*** | 93.650*** | 92.589*** | 69.893*** |
| *df* | 1, 659 | 1, 659 | 1, 659 | 1, 659 | 1, 659 | 1, 659 | 1, 659 |
| $\beta_1$ | .554 *** | .388 *** | .410 *** | .373 *** | .353 *** | .351 *** | .310 *** |

Note: $R^2$total=the contribution of reading strategy to the dependent variables. ***p< .001;**p<0.01; *p< .05.

Table 5-3 shows that reading strategies have significant predictive effects on six integration skills and the explained variance of reading strategies on integration total score is 30.7%. The predictive effects of reading strategies on each integration skill range from 9.6% to 16.8%, with the lowest being on SWT (9.6%). Furthermore, in order to examine whether there are grade differences in predictive effects, we performed a hierarchical regression analysis to analyse the moderating effects of Grade. As shown in Table 5-4, there exist grade differences in the predictive effects of reading strategies on the integration total score and ASI.

Table 5-4 Examination of the moderating effect of grade on the relationship between reading strategy and integration overall performance as well as performance on different skills

| **Integration** | Total score | IRPN | IRS | IRP | IMI | ASI | SWT |
|---|---|---|---|---|---|---|---|
| $R^2$main effect | .372 | .168 | .192 | .174 | .155 | .172 | .121 |
| F | 194.846*** | 66.557*** | 78.020*** | 69.321*** | 60.278*** | 68.136*** | 45.397*** |
| $R^2$interaction1 | .006 | .003 | .000 | .009 | .000 | .017 | .004 |
| F change | 6.871 | 2.029 | .216 | 7.601 | .047 | 14.115 | 2.451 |
| $R^2_{Total}$ | .378 | .171 | .192 | .183 | .155 | .189 | .125 |
| $F_{total}$ | 133.347*** | 45.117*** | 52.024*** | 49.211*** | 40.143*** | 51.035*** | 31.148*** |
| *df* | 3, 657 | 3, 657 | 3, 657 | 3, 657 | 3, 657 | 3, 657 | 3, 657 |
| $\beta_{1\ Grade}$ | .556*** | .391*** | .403*** | .384*** | .338*** | .368*** | .312*** |
| $\beta_{2\ readingStrategy}$ | .254*** | .132*** | .154*** | .186*** | .175*** | .218*** | .159*** |
| $\beta_3$ ZGrade*ZreadingStrategy | .083** | .052 | .017 | .100 | -.008 | .136*** | .059 |

Note: $R^2$main effect=the contribution of grade and reading strategy on dependent variables, $R^2$interaction= the effect of interaction between grade and reading strategy on the dependent variables. ***p< .001;**p<0.01; *p< .05.

Consequently, a regression analysis was conducted in two grades with integration total score and ASI as dependent variables and reading strategies as independent variables (Table 5-5). In Grade 4, the explained variance of reading strategies on the integration total score is 31.5%; while in Grade 6, the explained variance is 32.3%. In addition, the explained variance of reading strategies on ASI is 8.6% in Grade 4. But in Grade 6, the explained variance is 17.2%. It is obvious that Grade 6 students' reading strategies can better predict their integration total scores and ASI, which explains the developing trend of the impact shed by reading strategies on students' integration ability with the increase of grade.

Table 5-5 Grade difference in reading strategies' predictive effects on integration total score and ASI

| | **Integration** | Total score | ASI |
|---|---|---|---|
| **Grade 4** | $R^2_{Total}$ | .315 | .086 |
| | F | 149.164*** | 30.465****** |
| | *Df* | 1,324 | 1,324 |
| | Β | .561*** | .293*** |
| **Grade 6** | $R^2_{Total}$ | .323 | .172 |
| | F | 159.071****** | 69.035*** |
| | *Df* | 1,333 | 1,333 |
| | β | .569*** | .414*** |

Note: $R^2$total=the contribution of reading strategy to dependent variables. ***p< .001;**p<0.01; *p< .05.

### 5.1.2 Extensive reading

The present study also investigates the frequency of students' reading of different genres of narratives, including biography, fairytales, detective novels, historical stories and news reports (Table 5-1). The frequency ranges from "never or rare" (1) to "everyday or almost everyday" (4). It is clear to see that there is no significant difference between the integration total scores of extensive reading of two grades (Table 5-6).

Table 5-6 Grade difference in students' extensive reading

| Grade | N | Mean | Std. Deviation | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| 4 | 326 | 12.57 | 3.810 | | | |
| 6 | 335 | 12.36 | 3.174 | .788 | 631.804 | .431 |

We ran a regression analysis (method=ENTER) with the integration total score and six integration skills as dependent variables and total score of extensive reading as independent variables (Table 5-7).

Table 5-7 Regression analysis of extensive reading on integration total score and six integration skills

| **Integration** | Total score | IRPN | IRS | IRP | IMI | ASI | SWT |
|---|---|---|---|---|---|---|---|
| $R^2_{Total}$ | .172 | .085 | .098 | .049 | .097 | .070 | .050 |
| F | 137.214*** | 61.273*** | 71.803*** | 33.660*** | 71.186*** | 49.521*** | 34.796*** |
| *df* | 1, 659 | 1, 659 | 1, 659 | 1, 659 | 1, 659 | 1, 659 | 1, 659 |
| β | .415 | .292 | .313 | .220 | .312 | .264 | .224 |

Note: $R^2_{Total}$= the contribution of reading exposure to dependent variables. ***p< .001;**p<0.01; *p< .05.

As shown in Table 5-7, extensive reading can significantly predict the integration total score as well as performance of six integration skills. The explained variance on integration total score is 17.2%. The predictive effects of extensive reading on six integration skills range from 4.9% to 9.8%, among which IRP holds the lowest one (4.9%).

Moreover, the results of moderating effects analysis (Table 5-8) indicate that there is no significant grade difference in the predictive effects of extensive reading

on the integration total score and integration skills.

Table 5-8 Examination of the moderating effects of grade on the relationship between extensive reading and integration overall performance as well as performance on different skills

| **Integration** | Total score | IRPN | IRS | IRP | IMI | ASI | SWT |
|---|---|---|---|---|---|---|---|
| $R^2$main effect | .267 | .114 | .136 | .097 | . .141 | .134 | .086 |
| F | 119.703*** | 42.230*** | 51.614*** | 35.397*** | 54.153*** | 50.916*** | 30.819*** |
| $R^2$interaction1 | .000 | .001 | .001 | .000 | .000 | .003 | .000 |
| F change | .209 | .578 | 1.322 | .214 | .013 | 2.419 | .318 |
| $R^2_{Total}$ | .267 | .115 | .137 | .097 | .141 | .134 | .086 |
| $F_{total}$ | 79.776*** | 28.328*** | 34.867 | 51.658*** | 36.052*** | 34.824*** | 20.631*** |
| *Df* | 3,657 | 3,657 | 3,657 | 3,657 | 3,657 | 3,657 | 3,657 |
| $\beta_{1\ Grade}$ | .427*** | .302*** | .312*** | .230*** | .318*** | .283*** | .234*** |
| $\beta_{2\ Extensive\ reading}$ | .308*** | .170*** | .193*** | .221*** | .209*** | .254*** | .189*** |
| $\beta_{3\ ZGrade*Zscore(Extensivereading)}$ | .016 | .028 | -.042 | .017 | -.004 | .057 | .021 |

Note: $R^2$main effect=the contribution of grade and extensive reading to dependent variables, $R^2$interaction= the effect of interaction between grade and extensive reading to the dependent variables.
***p< .001;**p<0.01; *p< .05.

### 5.1.3 Reading attitude

Seven items regarding students' reading attitudes are included in the questionnaire. A four-point scale is used for students to evaluate reading frequency for applying reading strategies. Specifically, "1" refers to "never", "2" refers to "rarely", "3" refers to "sometimes" and "4" refers to "always". Students should choose from 1-4 according to their own conditions. Table 5-9 shows that Grade 6 students performed more positively in applying reading strategies than Grade 4 students.

Table 5-9 Grade difference in students' reading strategy

| Grade | N | Mean | Std. Deviation | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| 4 | 326 | 19.81 | 5.153 | | | |
| 6 | 335 | 20.97 | 4.673 | -3.030 | 648.946 | .003 |

We ran a regression analysis (method=ENTER) with integration total score and six integration skills as dependent variables, and total score of reading attitude as independent variables. The results are shown in Table 5-10.

Table 5-10 Regression analysis of reading attitude on integration total score and six integration skills

| **Integration** | Total score | IRPN | IRS | IRP | IMI | ASI | SWT |
|---|---|---|---|---|---|---|---|
| $R^2_{Total}$ | .425 | .220 | .231 | .129 | .216 | .171 | .138 |
| F | 486.521*** | 186.062*** | 197.758*** | 97.456*** | 181.878*** | 135.818*** | 105.902*** |
| *df* | 1,659 | 1,659 | 1,659 | 1,659 | 1,659 | 1,659 | 1,659 |
| β | .652*** | .469*** | .480*** | .359*** | .465*** | .413*** | .372*** |

Note: $R^2_{Total}$=the contribution of reading attitude to the dependent variables. ***p< .001;**p<0.01; *p< .05.

Results of the regression analysis show that reading attitudes can predict the integration total score as well as students' performance of six integration skills. The explained variance on integration total score is 42.5%. The predictive effects of reading attitude on six integration skills range from 13.8% to 23.1%.

Furthermore, results of moderating effects analysis (Table 5-11) indicate that there are significant grade differences in predictive effects of reading attitude on the integration total score, IRPN, IRP and ASI.

Table 5-11 Examination of the moderating effect of grade on the relationship between reading attitude and integration total score as well as six integration skills

| **Integration** | Total score | IRPN | IRS | IRP | IMI | ASI | SWT |
|---|---|---|---|---|---|---|---|
| $R^2$main effect | .473*** | .231*** | .247*** | .159*** | .238*** | .210*** | .158*** |
| F | 295.120*** | 99.054*** | 108.042*** | 62.010*** | 102.556*** | 87.462*** | 61.594*** |
| $R^2$interaction1 | .011 | .007 | .002 | .008 | .002 | .019 | .000 |
| F change | 14.615 | 5.852 | 1.275 | 7.261 | 2.364 | 16.391 | .593 |
| $R^2_{Total}$ | .484 | .238 | .249 | .168 | .240 | .229 | .158 |
| $F_{total}$ | 205.689*** | 68.474*** | 72.483*** | 44.153*** | 69.300*** | 65.136*** | 41.235*** |
| *df* | 3,657 | 3,657 | 3,657 | 3,657 | 3,657 | 3,657 | 3,657 |
| $\beta_{1\ Grade}$ | .636*** | .465*** | .469*** | .348*** | .453*** | .404*** | .358*** |
| $\beta_{2\ Readingattitude}$ | .220*** | .106*** | .129*** | .173*** | .147*** | .198*** | .139*** |
| $\beta_{3\ ZGrade*Zreadingattitude}$ | .108*** | .083* | .038 | .096** | .053 | .139*** | .028 |

Note: $R^2$main effect=the contribution of grade and reading attitude to dependent variables, $R^2$interaction= the effect of interaction between grade and reading attitude to the dependent variables. ***p< .001;**p<0.01; *p< .05.

Furthermore, we conducted a regression analysis of two grades with the integration total score, IRPN, IRP and ASI as dependent variables and the total score of reading attitudes as the independent variable based on the results shown in Table 5-11. As shown in Table 5-12, reading attitudes have more power to predict the performance of integration total score, IRPN and ASI in Grade 6 than Grade 4 students'.

Table 5-12 Grade difference in the predictive effects of reading attitude on integration total score, IRPN, IRP and ASI

| | **Integration** | Total score | IRPN | IRP | ASI |
|---|---|---|---|---|---|
| Grade 4 | $R^2$Total | .343 | .153 | .076 | .097 |
| | F | 169.041*** | 58.330*** | 26.824******* | 34.698******* |
| | *df* | 1,324 | 1,324 | 1,324 | 1,324 |
| | β | .586*** | .391*** | .277*** | .311*** |
| Grade 6 | $R^2$Total | .519 | .289 | .171 | .236 |
| | F | 358.659*** | 135.480*** | 68.911*** | 102.914 |
| | df | 1,333 | 1,333 | 1,333 | 1,333 |
| | β | .720*** | .538*** | .414*** | .486*** |

Note: $R^2_{Total}$=the contribution of reading attitude to the dependent variables. ***p< .001;**p<0.01; *p< .05.

# 5.2 Discussion

A large mass of literature has pointed out that the development of reading ability is influenced by the readers and many other factors (such as society, school and teacher) (Bell & McCallum, 2008; Mullis, et al., 2009). However, few researchers have further discussed whether the development of integration ability in reading is affected by these factors. Therefore, this section discusses the factors influencing the development of integration ability in reading.

### 5.2.1 Predictive effects of reading strategy on students' performance of integration

As shown in Table 5-3, the explained variance of students' reading attitude on the integration total score is 30.7%. In line with the previous research, this result confirms the important impact on students' reading comprehension shed by reading strategies. For instance, Cromley & Azevedo (2007) identified that background

knowledge, vocabulary, word reading, reading strategy and inference are closely related to reading comprehension. Also, they point out that though reading strategy is not one of the main factors contributing to reading comprehension, it does have significant influence on reading comprehension. The present study further delineates that students' use of reading strategies is highly associated with the development of their integration ability.

Research on reading psychology may explain the predictive effects of reading strategy on students' performance of integration. Reading strategies enable students to actively search for interrelationships among various information (Graesser, Singer & Trabasso, 1994; vanden Broek, Lorch, Linderholm & Gustafson, 200l) in order to establish a stable and coherent textbase instead of relying on the passive spreading of activation of information passively when they are completing integration tasks. Such psychological features have made the integration process more efficient.

Some teachers proposed that students could judge the importance of information in text more quickly and were easier to experience success when they applied some reading strategies. For example,

"Just as I said, many students have had the awareness to look for topic sentences to summarise texts. Based on this, this year I taught students to delete some unimportant information when summarising. For example, cutting off some examples which are used to support an idea and keeping the key sentences. After practising it with different types of text, students have gradually mastered this skill. They can identify which parts are examples and which part is the focus very quickly when they read a new text. For example, in a text we taught recently, there were several characters in it. Students could identify that the important characters were "son", "Mom", "teacher", "classmate" and identified "teacher" and "classmate" as unimportant characters. Though this strategy is not used in every single text, I still

think it is useful for students to understand the importance of distinguishing important information while reading, especially to understand the main idea of the text". (PK-C)

"Generally speaking, I think reading strategies are useful, especially for test items that require students to reproduce the text. Students need to know how to find the important elements first, and then connect them into a complete passage. The "six-H" (who, what, when, where, why and so what) method helps them to read the text quickly". (KT-A)

"Students used to leave it blank when they encountered some items that they didn't know how to answer in reading comprehension exercises. …… Sometimes they even gave up on "summary" test items. After teaching them reading strategies, now they can partially solve the problem, and they have tasted the feeling of success." (KT-B)

Therefore, it is necessary to teach students some integration reading strategies, especially for the highly complexed skills such as IRP, ASI and SWT. However, the Curriculum Guidelines for Chinese education (2002) in Hong Kong only list a few integration strategies such as "identifying key words and sentences", but do not identify other related strategies, which need further exploration. Also, it is found in PIRLS2006 that the teaching of integration reading strategies in Hong Kong gets less attention in daily teaching than the international average ratio. Although this situation has been mitigated in PIRLS2011, the teaching of some strategies such as "make generalisations and draw inferences" is still comparably weak (see Table 5-13). Hence, teachers can introduce more strategies in classroom teaching and help students to comprehend how to use them.

Table 5-13 Teaching of reading strategies in different countries' classrooms (according to Mullis, 2007, 2012)

| Strategy | year | Hong Kong | Singapore | Taiwan | International |
|---|---|---|---|---|---|
| Identifying main ideas | 2006 | 89% | 95% | 87% | 90% |
| | 2011 | 96% | 95% | 87% | 95% |
| Make generalisations and draw | 2006 | 64% | 83% | 66% | 71% |
| Inferences | 2011 | 84% | 90% | 62% | 80% |
| Describe text style or structure | 2006 | 51% | 64% | 55% | 53% |
| | 2011 | 77% | 78% | 52% | 66% |

On the other hand, some teachers mentioned that they encountered various difficulties in teaching integration strategies in classroom. For example, the limited time to provide more training, lack of high quality worksheets and the difficulty of group work in class. These difficulties are similar with previous findings (Liu & Chen, 2003; Fuchs & Fuchs, 2001; Dewitz, et al., 2006; Hilden & Pressley, 2007). However, there is no one-shot solution for these problems and teachers, schools and educational administration need to work together for the solutions.

### 5.2.2 No grade difference in the frequency of students' use of integration strategies, but Grade 6 students performed more effectively in using the strategies

As shown in Table 5-2, there is no significant grade difference in the frequency of students' use of integration strategies. This is consistent with National Reading Panel (2000)'s finding that reading strategies are applicable for children after they can read independently, that is to say, after Grade 3. However, Grade 6 students' use of reading strategy has more power to predict their integration total score and ASI than

Grade 4 students' (see Table 5-4, Table 5-5). In this sense, we suggest that though there is no significant grade difference in the frequency of students' use of integration reading strategies, Grade 6 students were better at using strategies, which enhanced the performance in integration.

Teachers mentioned that they actually taught students some reading strategies in Grade 4, but they could use them effectively for reading comprehension only after reaching Grade 6. For instance,

"We have taught students with reading strategies such as imaging the picture and guessing word meaning since Grade 2. These strategies are easier to operate and understandable for students. We started to teach some strategies related to summarising the text in Grade 4, such as abstracting main idea and connecting key points, but I have found that they are not very skillful at using them; may be Grade 6 students understand how to use them in practice better". (PK-B)

"For Grade 4 students, we tell students how to do it, but don't expect too much about how well they could do. For example, 'abstracting the main idea' requires students to do two things: 1. Find out key information in the text, such as six main elements of narrations; and 2. Connect key information with their own words. Grade 4 students are able to find key information very quickly but can not connect and paraphrase them. Grade 6 students are better at the second step. They are aware of finding superordinate concept". (KT-B)

"Grade 4 students can comprehend some reading strategies related to words and sentences. This semester I taught them how to select sentences and they learned quickly. Though some students gave wrong answers in class, others did figure out the right one." (KT-C)

Students' opinions also provide more evidence. On one hand, some Grade 4 students mentioned that they used what they had learned in the tests. One student

claimed:

"The teacher asked us to underline some important sentences while reading in exams, and I did it in exams." (E4C27)

On the other hand, Grade 4 students could not use reading strategies effectively in practice. For example, one student used "writing abstract according to the title" strategy when he was writing the summary. Unfortunately, he could only write the title without necessary elaboration on the content of the text. He thought the title was already enough. (D4D1)

It cross references the findings in Chapter 4 and confirms that Grade 4 students have limited ability to integrate and use reading strategies. The reason attributed to the phenomenon may lie in the fact that using reading strategies demands high cognitive thinking, in which readers not only monitor their reading process, but also take corresponding actions to implement these strategies effectively (Cohen, 1994; McNamara, 2009). Grade 4 students may have the awareness that they shoud use reading strategies but they lack the relevant ability to perform these strategies well. For example, some integration strategies such as "understand the main idea of each paragraph and conclude the main idea of the text", and "summarise the paragraph in your own words" are difficult for Grade 4 students since the processing requires students to connect and transform language. Grade 6 students are more capable of performing reading strategies because their language ability and thinking ability have developed to some extent after longer practice.

In all, teaching Grade 4 students to use reading strategies is helpful for improve performance in integrating, but Grade 6 students can implement these strategies more effectively. This result indicates that students need to practise using reading strategies persistently in order to better use them.

### 5.2.3 Treat influences of extensive reading on integration ability properly

Past research has discovered the predictive effects of extensive reading on students' reading comprehension ability. For instance, Anderson, Wilson & Fielding (1988) found that the amount of Grade 5 students' extra-curricular reading explains 16% of variance of students' reading comprehension. Cipielewski & Stanovich (1992) also suggested that the amount of students' extra-curricular reading can predict students' performance in reading examinations. A similar conclusion was drawn in PIRLS2006 (Mullis, Martin, Kennedy & Foy, 2007). The present study further provides evidence that extensive reading improves students' performance in integration. Students' narrative reading explains 17.2% of variance in the integration total score, which indicates that the more extensive reading students do after school, the better they would perform in integration. This extends the research on extensive reading and deepens the understanding of relationship between extensive reading and reading comprehension performance.

However, it is worth pointing out that extensive reading has limited influence on students' integration ability compared with reading strategy and reading attitude. Variance of the integration total score explained by extensive reading is 17.2%, which is lower than the variance explained by reading strategy (30.7%) and reading attitude (42.5%). In addition, the prediction of extensive reading on six integration skills only ranges from 4.9% to 9.8%. It could be explained by students' extensive reading for fun and specific purposes such as finding some useful information, therefore they don't need to conduct conscious and complete integration of information.

Though the predictive effects are limited, teachers still considered extensive reading as an inevitable part that sheds long-term influence on students' integration ability. For example,

"Of course, the more, the better. Extensive reading helps students indeed and

we'd like to motivate students to read more. I think the biggest benefit of reading more is to raise students' interests in reading. And their vocabulary and language sense get improved as well. Regarding the relationship with integration, the most relevant one is possibly students' identification of the main idea or the best written part of a story. I think students' integration ability must be enhanced when they read more and think more. However, we cannot say that one students' integration ability exceeds others' because he or she read more in one semester since it is a long-term influence". (PK-A)

Generally extensive reading is positive in terms of influencing the development of students' integration ability. But it is not the major way of enhancing students' integration ability in primary school.

### 5.2.4 Influences of reading attitude on students' integration ability

The variance of the integration total score explained by reading attitude has reached 42.5% (see Table 5-10), which indicates that students who have more positive reading attitudes tend to perform better in integrating in reading.

According to Table 5-9, Grade 6 students demonstrated more positive reading attitudes than Grade 4 students in the present study. Meanwhile, as shown in Table 5-11 and Table 5-12, there are significant grade differences in the predictive effects of reading attitudes on the integration total score, IRPN, IRP and ASI. Since vast research have pointed out that students' reading attitudes influence their reading ability (e.g. Roettger, Szymczuk & Millard, 1979; Quinn & Jadav, 1987; McKenna, Conradi, Lawrence, Jang & Meyer, 2012), it is safe to assert that Grade 4 and Grade 6 students' reading attitudes do shed impact on the development of their reading ability.

With respect to how reading attitudes influence students' integration ability, we conclude two aspects to illustrate its effects. The first aspect is that good attitude is helpful to improve students' efficiency of learning reading strategies. As one teacher

mentioned:

‘‘There do exist influences, especially when we are doing integration practices. Exercises such as summarising and deleting redundant sentences are boring. If students do not have interests in reading, they would find it boring and hard. In contrast, students who like reading consider it as new methods or tools for reading, so they are more concentrated”. (KT-A)

The effect of reading attitude on students’ learning of reading strategies has been reported in the literature. Dole, et al. (1996) pointed out that primary students’ beliefs and interests, when they are learning reading strategies, influence their use of these strategies in practice. Paris, Lipson & Wixson (1994) also asserted that the application of reading strategies reflects the combination of skill and will. Dahl, et al. (2005) proposed that students’ self efficacy influences application of reading strategies. In this sense, good reading attitudes help students to treat strategy learning and integration training in a positive way, which helps develop the integration ability better.

Secondly, positive attitudes facilitate active and extensive reading. As is documented in literature, good reading attitudes help enhance students’ extensive reading (Sainsbury & Schagen, 2004; Morgan & Fuchs, 2007), and extensive reading also produces positive effects on reading comprehension (McKenna, Kear & Ellsworth, 1995; Baker & Wigfield, 1999). Moreover, students with good reading attitudes participate in various follow-up activities after reading, such as grasping the structure of content, drawing pictures based on the content, discussing with classmates, teachers and parents, and participating in school reading activities. By doing so, students have more opportunities to integrate information and to practise the integration skills they learned in class (Wang & Guthrie, 2004). Hence, reading attitudes help students to connect their classroom learning and daily reading outside

school.

To sum up, this chapter finds out that primary students' integration ability is influenced by their reading strategy, extensive reading and students' reading attitude. Reading strategy and reading attitude contribute most to the development of integration ability. These findings enrich the research literature on reading comprehension and provide some implications for Chinese teaching (see Chapter 6).

# Chapter 6 Conclusions and Implications

Reading integration refers to the identification of relationships within the text and summarisation of textual information in the present study. As found in literature (Davis, 1968; Smith, 1969, 1969; Rosenshine, 1980, 1980; Mayer, 2003; Irwin, 2007; Gunning, 1998; OECD, 2009; Mullis et al., 2009; Zhu, 2005), reading integration is deemed as an important ability. However, there is no definite understanding on the developmental characteristics of students' reading integration ability.

This study selected 723 students in Grade 4 and 6 randomly from six primary schools in Hong Kong to complete a reading integration test. After the test, 24 students and 7 teachers from these schools were invited to attend interviews. By analysing the collected data, the study has summarised a few developmental characteristics of students' reading integration ability, which shed light on curriculum development and teaching design.

## 6.1. Major conclusions

### 6.1.1 Skills of reading integration

According to available literature (in Chapter 3), this thesis proposes six skills in reading integration ability: (1) Identifying the referent of a pronoun (IRPN); (2) Identifying relationships between a series of adjacent sentences (IRS); (3) Identifying relationships among paragraphs (IRP); (4) Identifying main ideas (IMI); (5) Abstracting specific information (ASI); and (6) Summarising the whole text (SWT). The result of factor analysis in Chapter 3 indicates that the above six skills can be

explained by one factor and the test paper constructed to measure these skills has high construct validity.

Since previous research provides little in-depth and empirical analysis of the reading integration ability and the existing reading ability structures within Chinese language teaching background (e.g.Gagné, 1993; Zhu, 2005; Irwin, 2007; OECD, 2009; Mullis, et al., 2009), the proposed six reading integration skills complement the research in this area. It provides researchers a validated framework to analyse this ability and can be used as a reference for designing comprehensive assessment on students' integration ability (Oakhill, et al., 2003).

### 6.1.2 Developmental characteristics of students' integration ability

Regarding students' integration ability, previous research has mostly measured students' skills separately by means of psychological experiments (e.g. Chai, 1967; Richek, 1976; Brown and Smiley, 1977; Stein, 1979; Brown & Day, 1983; Irwin & Pulver, 1984; van den Broek, Lynch & Naslund, 2003; Cain & Nash, 2011), while this thesis analyses the developmental characteristics of students' integration ability systematically based on their performance in the test.

**1 · Grade difference in integration ability development**

(1) Generally, students in Grade 4 and 6 have been equipped with preliminary reading integration ability but there is still room for further development.

(2) Students' performance in six skills of integration ability varies significantly. Students perform best in IRS and perform worst in ASI. In general, students' performance of Grade 4 and 6 in the skills based on straight inference (IRS, IRPN, and IMI) is significantly superior to their performance in the skills requiring complex inference and language transformation (IRP, ASI, SWT). This conclusion has

extended the previous studies.

(3) With respect to the performance in IRPN skill, students in Grade 4 fail to identify all the information covered in the pronoun while most students in Grade 6 are able to do that. Besides, students in Grade 4 can only find specific and short referents while Grade 6 students can locate more complicated referents. Since most of the previous studies are based on isolated sentences, this thesis has revealed more characteristics of students in the context of reading narrative texts.

(4) In regard to the performance in IRS, most students in Grade 4 have been equipped with the ability to identify the relations between adjacent sentences, performance of using connectives has surpassed the level indicated in western studies (Geva's, 2006; Irwin & Pulver, 1984). Relatively, students in Grade 6 can identify the relations between adjacent sentences more accurately.

(5) As to the performance in IRP, most students in Grade 4 and 6 fail to identify the relationships among paragraphs accurately. However, Grade 6 students perform better, possibly because students begin to acquire the ability of language combination, analysis and classification in Grade 3 or 4 (Zhu, 1993; Lin, 2001).

(6) With regard to the performance in IMI, students in Grade 4 and 6 have attained certain ability to identify topic sentence. Students in Grade 4 have difficulty in identifying topic sentence in the middle and end of passage while students in Grade 6 can do this better, which is consistent with previous research conclusions.

(7) With respect to the performance in ASI, students in Grade 4 and 6 demonstrated weak ability. However, students in Grade 4 mainly retell information and fail to locate relevant and complete information for brief summary, although most students in Grade 6 can include relevant information, they still have difficulty in summarising information briefly.

(8) In the performance of SWT, most students in Grade 4 and 6 can not make an

accurate and brief summary of text.

In brief, students in Grade 4 have developed certain ability to integrate textual information, but they are inferior to students in Grade 6 in accuracy and comprehensiveness whether it is identifying relationship within the text or summarising the content. When confronting difficulties in summarising text, students in Grade 4 are likely to infer and interpret the text information based on their personal experiences, which may lead to deviation from accurate understanding of textual information. Students in Grade 6 possess relatively higher integration ability but they also have poor performance in integration skills (IRP, ASI and SWT) which are difficult for students in Grade 4. It indicates that students need more training in these skills.

**2. Gender difference of students' reading integration ability development**

As mentioned in Chapter 5, girls perform significantly better in the total score and six integration skills than boys, which indicates that girls develop the integration ability earlier than boys. Since many international studies have found gender difference in the overall performance in reading (Brozo, et al., 2007; Logan & Johnston, 2010), the present study further concludes that gender difference also exists in the integration ability.

However, further analysis demonstrates that not all integration skills show significant gender difference in different grades. For example, there is no significant gender difference between students in Grade 4 and 6 in IMI, and neither for students in Grade 6 in IRS. It indicates that boys may catch up with the level of girls at primary school level in some less difficult skills.

### 6.1.3 Influencing factors of students' integration ability development

The present study reveals that students' development of reading integration ability is affected by several factors. Firstly, use of reading strategies plays an important role. In this study, reading strategy can account for 30.7 % of variance of total score of integration test, which conforms to previous understanding on reading strategy (Pressley & Afflerbach, 1995; Lau, 2006; Cromley & Azevedo, 2007). In addition, this study reports that Grade 4 students use reading strategy as frequently as Grade 6 students do, revealing that Grade 4 students have developed a sense to use reading strategy while Grade 6 students can employ various strategies more effectively.

Secondly, students' attitude towards reading also has an important effect on the development of integration ability. Good reading attitude can stimulate students to study integration skills and engage extensive reading more actively. As past studies indicate that good reading attitude has a positive impact on students' overall performance (e.g. McKenna, Kear & Ellsworth, 1995), this study also emphasises its positive impact on integration ability. Moreover, the present study reveals that reading attitude has more impact on Grade 6 students than Grade 4.

In addition, the present study confirms that extensive reading also has a predictive effect on students' integration ability development, namely, students who read more and more frequently can achieve better performance in reading, which also aligns with previous finding on the effect of extensive reading (Anderson, Wilson & Fielding, 1988). Furthermore, this study has found that extensive reading has a smaller predictive effect than reading strategy and attitude towards reading do, which is rarely mentioned in the previous studies. These findings provide insights into the internal relationship among different factors in influencing students' development of

integration ability.

To sum up, this study has drawn some empirical conclusions on the developmental characteristics of students' integration ability within the context of Chinese teaching. These conclusions not only confirm and extend the previous research but also bring about some new understandings and thus can help teachers better understand nature of integration ability and its development.

## 6.2 Implications

To promote students' reading ability is the common goal held by all educators, thus students' integration ability should be more emphasised in Chinese curriculums, teaching and assessment in Hong Kong. Based on the findings of this study, this thesis has generated some suggestions for fulfilling this goal.

### 6.2.1 Implications for curriculum

Since 2001, Hong Kong has launched an ability-oriented curriculum reform (Curriculum Development Council of Hong Kong, 2002). Conforming to the general direction of the reading ability cultivation internationally (Perfetti, 1995; Biancarosa & Snow, 2006; Zhu, 2003), this curriculum requires students to develop comprehensive reading ability, especially the higher order abilities. Since the implementation of curriculum reform, Hong Kong has witnessed an exciting leap in students' performance in PIRIS (Tse, 2006; Tse & Ko, 2009; Tse, 2009). However, improvement is still needed for the requirement of curriculum.

1. Incompleted skills are included in Chinese curriculum.

The progressive requirements on students' reading integration ability stated in the Chinese curriculum document are as follows (Curriculum Development Council of Hong Kong, 2008).

| | |
|---|---|
| Compre-hension | Comprehending the cohesive relation between two sentences<br>Comprehending paragraphs(the main idea of paragraph)<br>Comprehending passages/books and periodicals(main idea and key point) |
| Analysis and synthesis | a. Analysing and Synthesing Content of text (summarising the meaning of paragraph)<br>b. Analysing organisational structure |

Compared with the "six skills of integration ability" proposed in the present study, the curriculum actually embodys some of integration ability, such as summarising the whole text and identifying relations between adjacent sentences. However, other integration skills have been ignored, i.e., abstracting specific information.

In order to provide greater guidance to the teaching, curriculum documents should pay more attention to integration ability and list out complete integration skills clearly.

2. Insufficient integration skills are imparted in Chinese class

Previously, Chinese teaching in Hong Kong used to lack sufficient teaching on integration skills because it was dominated by vocabulary teaching and laid particularly stress on knowledge (Lau, 2006; Tse, 2009). As a result, few integration skills are included in school based curriculum. Even now this issue still remains. Although quite a few teachers ask students to find the main idea of text, this is not enough for students to develop this ability. For example, some teachers admit they pay little attention to the IRS and IRP teaching at ordinary times.

"I think this is a matter of habit. Students have not formed such a habit of understanding the text sentence by sentence and then paragraph by paragraph and figuring out the relations among paragraphs or sentences. Instead, they get accustomed to the overall understanding at the very start. It can be said that there is no such concept of integration in the whole educational structure in Hong Kong at all,

neither do textbooks. So teachers tend to ignore the idea to develop students' integration ability which leads to students' failure to do so." (PK-D)

Thus, the results of this study can serve as implications for curriculum design. It is necessary to cultivate this kind of ability at the primary school level in a well-grounded way. The curriculum should encourage school principals and teachers to pay more attention to the skills which students didn't perform well, such as IPR, ASI and SWT. As to some integration skills with relatively better performance, the cognitive requirement can be increased as students enter higher grades.

### 6.2.2 Implication for teaching

In order to achieve curriculum objectives and develop students' reading ability, effective teaching is indispensible (Brenner, 2009; Moore, 2008). According to the conclusions drawn in this study, it should attach more importance to the following aspects when teachers plan and implement teaching.

**1. Implement strategy instruction**

According to Torgesen (2006), students in Grades 4 to 6 undergo the transition from learning to read to reading to learn, which requires students to develop various kinds of higher-level reading skills. As these skills involve processing more complex ideas, reading should be more strategic. This study further confirms that using reading strategy plays an important role and students in Grade 4 have developed an awareness of using reading strategy to some extent. For this reason, it is necessary to conduct effective instructions to make them understand how and when to use the reading strategies.

Among the countless documents on reading strategy, National Reading Panel of US (2000) proposes some strategies whose effects in promoting students' reading comprehension ability have been verified according to nearly 500 research publication

on reading strategy during 1975 to 2000, among which the following points involve integration ability: (1) drawing graphic organiser: to present the content of text by means of graphics, for example, graphics of story structure; (2) comprehending the story structure; (3) Multiple strategy instruction: to impart four strategies on students simultaneously, including abstracting, forecasting, questioning and clarifying; (4) Summarisation. The above four strategies are just general strategies, and some other strategies relevant to certain integration skill can be adopted in class, for example, selecting the signal words is a good strategy for identifying the topic sentence and the relationship among paragraphs.

In order to lead students to master reading strategy better, teachers should relate them to students' daily life and learning interest. For example:

"Usually, we teach students special strategies in the class, such as compacting sentences and selecting sentences because we think they are helpful to improve students' integration ability. Why? Because students can know which words are important and which can be omitted in this process. To make self understood by students, I often use the metaphors of Christmas tree in the class. Since Christmas tree is very beautiful and decorated with various lightings, small balls and colored ribbons, so I tell students that our text is like a beautiful Christmas tree, and the ribbons in the tree are just like the adjective words in the text. Then I ask students further 'If I just want to keep the tree, what should I do'? Students usually answer me that I should get rid of ribbons, obviously, to write a summary we should remove adjectives and adverbs from the text. Gradually, students get to know how to select materials for a summary." (KT-B)

From this case, we can see that students can learn how to delete unimportant information very well by using Christmas tree that is close to students' daily lives.

**2. Improve students' attitude towards reading**

This study indicates that students' attitude towards reading influences their attitudes towards learning integration ability and their engagement in extensive reading as well. Therefore we should try to enhance students' attitude to reading. As suggested by PIRLS 2011, it is an urgent task. PIRLS2011 survey has reported that Grade 4 students of Hong Kong lagged behind in the following four indexes related to reading attitude, reading interest (ranks 39), reading motivation (ranks 45), reading confidence (ranks 44) and engagement in the reading class (ranks 42). Thus it can be seen that most students in Grade 4 of Hong Kong are not reading for interest (Mullis, et al., 2012).

During teaching, one can adopt various means to do this, for instance, providing students with reading materials which are closely related to students' lives and are attractive to students. Then, autonomy should be given to students, so they can choose learning tasks according to their own level. By doing so, students are more willing to take responsibility towards study (Lesesne, 2003; Guthrie & Humenick, 2004; Gaskins, 2008).

**3. Increase the amount of extensive reading of students**

This study discovers that students' integration performance is affected by extensive reading. The training in class possibly teaches students necessary reading methods and strategies while the extensive reading can give students more opportunity in applying these strategies.

Therefore, it is necessary to increase the amount of reading of students.

At the primary school level, most reading materials of students are narratives (Symons, Mac Latchy-Gaudet, Stone, & Reynolds, 2001), which is helpful to students in promoting their integration ability of narrative writing. With the enhancement of

students' ability, it can lead them to read other styles of books.

Teachers should involve in students' extensive reading. The "extensive reading plan" has been carried out in Hong Kong since 1990s, aiming at cultivating students' reading habits and improving their reading skills, expanding their scope of knowledge, stimulating their originality and initiating their thinking. The government offers some necessary supporting resources, such as allowances for book purchasing and recommendation for reading books. Schools can organise all kinds of reading activities by themselves. However, these were mainly organised by the librarians in the past and involved low degree of participation of Chinese teachers. The current tendency emphasises that the involvement and instruction of teachers can help students gain more from extensive reading (Topping, Samuels & Paul, 2007). Teachers can organise kinds of extensive reading activities, such as literature circle, sustain silent reading and thematic reading, letting students select books and report their reading achievement freely, which has been proved to be able to promote students' reading attitude and increase their reading amount (Zhu & Liao, 2013).

### 6.2.3 Implications for assessment

**1. Emphasising assessment of integration ability**

Corresponding to ability-oriented courses, schools should highlight the integration ability in the reading assessment. Recently, lots of schools in Hong Kong have introduced the idea of hierarchical ability in test papers. In public examination and school test, six question types in different levels proposed by Zhu (2005) have been the most widely used. Furthermore, the present study proposes six skills concerning integration, which can provide more reference for teachers in developing test items on integration ability.

**2. Implementing classroom assessment**

The function of formative assessment of facilitating learning has been emphasised in recent years (Zhu, 2011; Zhu & Liao, 2012). To do so, teachers should pay more attention to some common approaches of classroom assessment, such as questioning, feedback and so on, With the integration skills and its influencing factors proposed in the present study, teachers can design more effective questions and provide constructive feedback to students, improving the quality of classroom assessment in order to improve students' reading ability in the end.

## 6.3 Future research

Comprehension development is a promising area for future research. Based on this study, the further study with following themes can be carried out:

1. Developmental characteristics of students' reading integration ability in other literary genres.

This study mainly explores students' integration ability developmental characteristics in narrative writing. On this basis, it can carry on further discussion on students' developmental characteristics in argumentative reading and expository reading with the aid of the theoretical framework of this study.

2. Relationship between integration ability development and other reading abilities' development. This study focuses on the developmental characteristics of integration ability, so other reading abilities (retelling, explanation and evaluation etc.) and the interaction between these abilities' development and integration ability development are worth further discussion in the future.

3. To explore more developmental characteristics of integration ability of different genders. This study reveals that the total score and scores in individual skills

of girls are superior to male students. The future research can discuss the interior mental mechanism of female and male students during integration (for example, by means of thinking aloud) and developmental characteristics of integration ability of female and male students in different levels and so on.

4. Comparative study of integration ability devlopmental characteristics of students in Hong Kong and other Chinese speaking areas. Hong Kong, Taiwan and Chinese Mainland implemented curriculum reform at the beginning of the 21st century. Under this background, the comparison of different developmental characteristics of students' integration ability in different regions is beneficial for better understanding of the overall structure of students' Chinese reading ability.

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# Appendices

## 1. Texts used in Integration test paper

**閱讀篇章一《懷拉應聘》**

①威廉·懷拉是美國一位享有盛名的職業棒球明星。40 歲時因體力不支而告別體壇另找出路。他原以為憑自己的知名度去保險公司應聘推銷員不會有什麼問題，可結果卻出乎意料之外，人事部經理拒絕道：「您沒有保險行業的工作經歷，更重要的是，吃保險這碗飯必須笑容可掬，您做不到，無法錄用。」就這樣，懷拉剛邁出找工作的第一步，就碰到了重大的困難。

②面對冷遇，懷拉的熱情未受絲毫影響，他下決心要像當年初涉棒球場那樣從頭開始苦練笑臉。由於他天天要在客廳裏放開聲音笑上幾百次，因此使鄰居產生誤解，認為失業對他刺激太大，以至於發起神經來了。為此，他只好把自己關進廁所裏練習。

③過了一個月，懷拉跑去見經理並當場展開笑臉。（　　），經理只是冷冰冰的回答道：「不行！笑得不夠。」

④懷拉沒有悲觀失望。他到處尋找搜集有迷人笑臉的名人照片，然後貼在居室的牆壁上，隨時進行揣摩模仿。另外，他還購置了一面與自己的身體一樣高的鏡子，擺在廁所裏，以便訓練時更好地檢查糾正。

⑤一段時間之後，懷拉又來到經理辦公室，露出了笑容。「有進步，但吸引力不大。」經理說。

⑥懷拉生來就有一副倔脾氣，回到家裏繼續苦練起來。一次，他在路上遇見一個熟人，非常自然地笑著打招呼。對方驚歎道：「懷拉先生，一段時日不見，您的變化真大，和以前判若兩人了!」

⑦聽完熟人的評論，懷拉充滿信心地再次去拜見經理，笑得很開心。「您的笑是有點意思了。」經理指出，「然而還不是真正發自內心的那一種。」

⑧他不氣餒，又找來親朋好友幫忙，請他們對自己笑的效果做評判。最後，懷拉終於如願以償，被保險公司錄用。

⑨此時，這位昔日棒球明星嚴峻冷漠的臉龐上，終於綻放出動人的笑容。這種笑容發自內心，像嬰兒般的笑容那樣，天真無邪，使人無比喜歡，令顧客無法抗拒。就是靠這張並非天生而是苦練出來的笑臉，懷拉成了全美推銷壽險的高手，每年收入突破百萬美元。

**閱讀篇章二《房子找房子》**

①一幢美麗的房子挺立在街道旁。她每天都快樂地看著來往的人們和汽車，從來不覺得煩惱。小朋友們問她為什麼這麼快樂，她說：「因為我有一個最大最可愛的家呀。」正當小朋友們疑惑的時候，她就開始講她之前找房子的故事。

②那天，她正同門口的一輛紅汽車聊天聊得高興，一隻鴿子飛來停在屋頂上。「咕咕，我造了一個漂亮的窩。」鴿子十分驕傲地說。

③「窩是什麼？」房子問。

④「傻瓜，窩就是我住的地方，就是我的家。」

⑤「那麼，我該住什麼地方，哪兒是我的家？」房子問。

⑥鴿子同情地說：「咕咕，房子是不能住房子的，你不會有家。」

⑦「為什麼？」可憐的房子瞪大眼睛問。

⑧「就因為你是房子呀，你只能給別人做房子，我真為你感到難過。」鴿

子拍拍翅膀說，「咕咕，咕咕，再見，我得回窩裡去了。」

⑨紅汽車也說：「嘀——嘀——再見，我得回我的車房去了。」

⑩房子開始悶悶不樂起來。在此之前，房子從來都沒有想過這個問題。以后天黑了，别人可以在我这里开开心心地吃饭、玩耍，我却只能孤零零地看着人家开心，那得多可怜呀。「不行，我一定得為自己找一幢房子，找一個屬於自己的家。」房子找房子的念頭，缠绕在心头挥之不去。

⑪趁著半夜人們都睡著了，她把自己的身體從地上拔起來。

⑫房子走上大街，她看見一幢很高的樓房。「唔，這幢樓房不錯，又高又大，做我的房子正合適。」房子站住了，她滿懷希望地叫道：「高樓，你好，請你當我的房子好嗎？」

⑬高樓說：「我雖然長得高大，但我的房間都是十分矮小的，只給城市的人們居住你進不來呀！」

⑭房子_____。

⑮鄉下的房子比城市少多了。房子好不容易找到一個村莊，天哪，她倒抽了一口氣，這兒的房子個頭還不如自己大呢！

⑯她在野外繼續走呀，走呀。哈，發現一個大山洞，洞口好大好大，「哈哈，這下我找到自己的房子了！」房子高高興興往裡走，突然，一個可怕的聲音吼道：「哇呀呀，出去，出去，怎麼能隨隨便便住到我家裡來呢？真不像話！」

⑰天哪，原來這是老虎的家！她趕快退了出來。

⑱怎麼辦呢，山洞都成了野獸們的家。

⑲房子找了一晚上，走得又累又疲倦，一個適合自己住的地方也尋不到。

⑳房子傷心極了：「嗚嗚嗚，我要是人就好了，人有房子住；我要是鳥就

好了，鳥有自己的窩；我要是蜜蜂，也有一間小小的蜂房呀。可是，我是倒楣的房子，永遠都沒有自己的家，嗚嗚，當房子可憐呀……」

㉑「房子呀，你哭什麼？」一棵蒼老的大樹問道。

㉒「我沒有家，沒有一座屬於自己住的房子。」

㉓聽了房子的訴說，大樹哈哈大笑，說：「誰說你沒有家，沒有房子呀？(a)整個地球家園就是你的家。(b)瞧，天空是你的屋頂，大地是你的房間。(c)在你的家裡，什麼東西都應有盡有，上有太陽月亮星星，下有城市山水森林。擁有這樣的家，難道還不能使你快樂嗎？」

㉔聽了大樹的話，房子既高興又懊惱。高興的是她原來是有房子的。懊惱的是，原來自己的房子就在身邊，怎麼沒有早一點發現呢。房子接著心想：雖然找了一晚上很辛苦，但自己辛苦找到的答案，才是最完美的。「太陽快出來了，快快回去跟夥伴們迎接新的一天吧」，大樹說。房子開心了：「嗯」。就這樣，她給自己找到了一個又大又亮的房子，成為了一個每天都快快樂樂的房子。

## 2. Items of integration reading test (Chinese Version)

學生編號：(只供內部填寫)

# 中國語文科　閱讀能力測試
# 答題簿

學校名稱：_____

學生姓名：_____

年　　級：_____

班　　別：_____

班　　號：_____

1. 完成時間：45分鐘
2. 本試卷共6頁，請閱讀篇章，在本試卷上完成答題。
3. 作答說明：

選擇題 – 選出正確的答案，並用HB鉛筆把正確選項前的〇塗黑和塗滿。如：B項為正確答案，則

〇 A
● B
〇 C
〇 D

填充/短答題 – 在橫線上填寫答案

2012 年 6 月

## 篇章一 《懷拉應聘》

**1・第①段內容主要講述（ ）。**

○ A・懷拉是美國一位享有盛名的職業棒球明星

○ B・懷拉 40 歲時因體力不支而告別體壇另找出路

○ C・吃保險這碗飯必須笑容可掬

● D・懷拉找工作的第一步，就碰到了很大的困難。（參考答案）

**2・你覺得第③段（　　）處最適合填入什麼詞語可以把前後句子連結起來？寫在下面的橫線上。**

參考答案：但是

**3・綜合全文，請你簡單概括懷拉用了哪些方法來訓練自己的笑容。**

參考答案:懷拉主要用了尋找搜集名人笑臉進行模仿、購置鏡子自我檢查糾正、請親朋好友幫忙三種方法來訓練自己的笑容。

**4・第⑦段經理指出懷拉的笑容「還不是真正發自內心的那一種」，「那」指的是什麼？請從篇章⑧-⑨段裏找出相應的句子寫下來。**

參考答案：發自內心，像嬰兒般的笑容一樣，天真無邪，使人無比喜歡，令顧客無法抗拒

5・本文內容可分為三大部分（結構段），每部分包括若干自然段。請選擇劃分正確的一項（　）。（參考答案：C）

| | 第一部分 | 第二部分 | 第三部分 |
|---|---|---|---|
| ○ A | 第①自然段 | 第②③④⑤⑥⑦自然段 | 第⑧⑨自然段 |
| ○ B | 第①②自然段 | 第③④⑤⑥⑦⑧自然段 | 第⑨自然段 |
| ● C | 第①自然段 | 第②③④⑤⑥⑦⑧自然段 | 第⑨自然段 |
| ○ D | 第①②自然段 | 第③④⑤⑥⑦自然段 | 第⑧⑨自然段 |

6・這篇文章主要講述（　）

○ A・懷拉在退役之後為了尋找新的工作機會，不斷地練習笑容，得到了熟人的稱讚，讓懷拉對未來充滿了信心。

○ B・懷拉第一次應聘保險員時被經理拒絕了，後來又被經理拒絕了幾次。懷拉堅持過一段時間就去請求經理，終於打動了經理獲得職位。

● C・懷拉在應聘保險推銷員的工作時碰到很大困難，他採用多種辦法，堅持不懈地練習笑容，成功應聘並取得事業的輝煌。（參考答案）

○ D・懷拉找工作過程中碰到種種困難卻不氣餒，通過自己的苦練，成為全美知名的棒球明星，同時也靠自己的笑容成為了全美推銷售險的高手。

## 篇章二 《房子找房子》

7・第⑩自然段說房子從來沒有想過「這個問題」，請問「這個問題」指以下哪一個問題？（　）

○ A．窩是什麼

● B．哪兒是我的家 （參考答案）

○ C．房子是不能住房子的。

○ D．為什麼房子不會有家

**8．第⑭自然段不完整，請寫上一句話，要求既總結前面內容，又可以引出後面的內容。**

參考答案：房子很失望，走出城外，來到鄉下。

**9．請列出城市、鄉下和野外「房子」的不同特點。**

參考答案：因為城市的高樓只給人們居住，房間矮小；鄉下的房子又少又矮；野外的山洞則是給野獸居住的。

**10．请写出体现㉔段主要意思的句子。**

參考答案：她給自己找到了一個又大又亮的房子，成為了一個每天都快快樂樂的房子。

**11．在第㉓自然段中，劃線的 a、b、c 三個句子間是什麼關係？**

○ A．a、b、c 三句話說的意思是相同的；

○ B．a、b、c 三句話是按時間先後排列的；

● C．a 句說的意思，由 b、c 兩句進行解釋說明；（參考答案）

○ D．a 句是事情的原因，b、c 兩句是事情的結果。

**12．請用不超過 100 字，歸納本文的主要內容。**

參考答案：房子聽到鴿子說自己沒有家後十分煩惱，開始去找房子。在找過城市、鄉下和野外的房子之後依然沒有找到，最後大樹告訴她說她的房子就是地球的家園。

閱讀理解測試題已經完畢，現在請翻到后一頁，完成《小學生閱讀調查問卷》

**-完-**