PhD THESIS

Chinese and English Language Readers’ Text

Comprehension Processes

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A thesis submitted in total fulfilment of the requirements for the degree of Doctor of Philosophy

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Abstract

The study aimed to test two hypotheses: Hypothesis 1. The differences between Chinese and English orthographies and their readers’ conceptual and cultural knowledge influence the ways they process the text information, use strategies and construct a mental representation. How are the text comprehension processes - construction of a textbase and a situation model described by Kintsch (1998; 2004) - used by Chinese and English language readers when they read-to-learn at Grade 5 and Grade 8? Hypothesis 2. If the effects of text coherence were universal then the manipulations of text coherence would influence each reader’s text comprehension regardless of their language. Does local text coherence also influence the performance of Grade 5 and Grade 8 Chinese language readers?

Seventy-two Chinese and English students from Grade 5 and Grade 8 in China and Australia (Part One: 30 Grade 5 and 30 Grade 8; Part Two: 24 Grade 5 and 36 Grade 8) participated in the study. The study is the first to compare text comprehension in English and Chinese at middle school in Australia and China. Walter Kintsch’s paradigm for reading, the ‘Construction-Integration Model’ first developed in 1988 (Kintsch, W., 1988), forms its theoretical basis. The students were asked to read two expository passages on two separate occasions. A series of text comprehension tasks were employed to examine students’ construction of text based and situational level text representations in Part One and the role of local coherence in text comprehension in Part Two. The think-aloud protocols were used as a method to examine students’ comprehension processes and constructive activities during the reading of the cloze text, Electricity and Magnets and four manipulated coherence versions of the second text, China and Australia were created to examine the influence of local coherence. Constructive Activity Scales were used for think-aloud and summarisation tasks
to measure students’ depth of understanding through their engagement in different levels of constructive activities in constructing meaning from the two texts.

The analyses indicated that across the two language groups, Grade 8 students performed better than Grade 5 students and the readers from the Above Average ability group were engaged in higher levels of constructive activities and achieved deeper levels of understanding than readers in the Average and Below Average groups. There were no statistically significant differences between English and Chinese language readers’ text comprehension. Due to their higher levels of prior knowledge, Chinese language readers and in particular, Grade 8 Chinese language readers were engaged in higher levels of constructive activities. As a result, they had constructed a higher-level macro-structure and a situational representation of the texts they read than English language readers.

The results further suggested that Chinese and English language readers use similar reading strategies when processing text and constructing meaning at multiple levels. The study confirmed that regardless of the differences in the orthographies, prior knowledge, higher levels of constructive activities and local text coherence are all required for reaching deeper levels of understanding when reading-to-learn from expository texts at school.

The findings of the study confirm Kintsch’s CI- Model of text comprehension and the role of local text coherence with middle years’ readers of an alphabetic language such as English and a logographic language such as Chinese. The study not only contributes to the broader context of theoretical research in text comprehension but also expands its educational implications for classroom learning through a proposed five level constructive activity model for text comprehension.
Declaration

This is to certify that:

• the thesis comprises only my original work towards the PhD

• due acknowledgement has been made in the text to all other material used,

• the thesis is fewer than 100,000 words in length, exclusive of tables, maps,
  bibliographies and appendices.

Signed: [Signature]

Name: Yaşar Duyal
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Chapter One: Introduction

Chapter 1 introduces the research topic and establishes the context for the study. The first section will attempt to define the ever-changing notion of literacy through the relevant existing research and the relevance of this notion for the study.

1.1 Literacy as a Cognitive Skill

What is literacy? Literacy has a broad definition, which is constantly evolving as society becomes increasingly complex. It incorporates not only the cognitive skills of speaking, listening, reading and writing, but also notions such as prior knowledge which includes cultural and metacognitive knowledge as well as critical thinking skills. In light of all this, a question that is highly relevant to this study is: ‘How do different societies, cultures and language systems represent and comprehend information in texts studied at schools and to what extent is this text comprehension dependent on cultural and language specific factors and/or cognitive skills?’

While multimodal ways of representing meaning have already resulted in production of a variety of text forms in many languages, print is still central to many of these texts (Lankshear & Knoble, 2003). This is certainly the case for educational and in particular expository texts produced for schools. It is widely acknowledged within current literacy studies that success in literacy as a cognitive skill, especially in reading and text comprehension, is a very good predictor for academic success later on at school and beyond (Ferguson, 2014; Graves, 2010; Mackenzie & Hemmings, 2014; Peregoy & Boyle, 2000). Literacy plays a key role in laying the foundation for academic learning and consequent social and economic opportunities. Nobel laureate James Heckman is considered to be one of the most influential economists in the world. His work on skill formation (Heckman, 2006)
emphasises the significance of literacy skills for economic development. Heckman highlights the influence of parents and the environment they provide on their children’s cognitive development in early childhood (Heckman, 2006). He argues that investment in skill formation in early childhood starts with parents at home and includes regular and informal reading and text comprehension activities. This must be strengthened by later investments in effective school programs, which should continue to stimulate and develop cognitive skills to transform early home-based investments into lifelong success. These skills are considered significant for any literacy development both at school and at home regardless of the language, culture and school system.

1.1.1 Reading literacy

Literacy does not merely mean one’s ability to decode, read and write. Reading literacy, as defined by the Organisation for Economic Cooperation and Development’s (OECD) new Programme for International Student Assessment (PISA), is “the ability to understand, use and reflect on written texts in order to achieve one’s goals, to develop one’s knowledge and potential, and to participate effectively in society…” (OECD, 2010; Freebody, 2007). Finally, as Freebody notes, reading literacy does not focus on ‘learning to read’ but rather on ‘reading to learn’, which is what takes place at school (Freebody, 2007). This definition of literacy is adopted by this study because of its focus on the processes involved in ‘reading to learn’ from expository texts at school.

Reading literacy and in particular text comprehension has become more significant as a cognitive skill in achieving academic success regardless of the language and culture of readers. This study takes the view that text comprehension as a cognitive skill has significant roles to play in literacy development and comparative literacy studies across different
language systems and cultures. This study aims to investigate and compare text comprehension processes developed by Grade 5 and Grade 8 students and the influence of text coherence in text comprehension across the two languages. In doing so, it aims to test the following hypotheses and asks two research questions:

1. The differences between Chinese and English orthographies and their readers’ conceptual and cultural knowledge influence the ways they process the text information, use strategies and construct a mental representation. How are the text comprehension processes - construction of a textbase and a situation model described by Kintsch (1998; 2004) - used by Chinese and English language readers when they read-to-learn at Grade 5 and Grade 8?

2. If the effects of text coherence were universal then the manipulations of text coherence would influence each reader’s text comprehension regardless of their language. Does local text coherence also influence the performance of Grade 5 and Grade 8 Chinese language readers?

This section has sketched out what constitutes literacy and reading literacy today and their significance as cognitive skills for learning and success at school. The next section provides the context for this research. This will first include an outline of the basis of the theoretical framework followed by a discussion on the expository texts and finally the overall rationale for the study.
1.2 Foundation of the Study

The study’s theoretical framework is based on van Dijk and Kintsch’s (1983) model of text comprehension and later Kintsch’s Construction-Integration (CI) Model. According to this theory, readers actively construct meaning from the text they read at multiple levels and integrate their prior knowledge with the situation presented in the text to achieve comprehension.

Reader’s cognitive architecture is formed when learning to read in a particular language with a particular script whether it is an alphabetic language or a logographic. It is assumed that a text structured in that particular language is more easily comprehended. In other words, when we read we make mental connections between the different parts of the text and our knowledge of the world, which is manifested through language (Carpenter, Miyake, & Just, 1995). Views of the world may be significantly different for different cultures and expressed differently in many languages. Therefore, the connections that readers make and the way they make these connections to comprehend text may also be culturally constrained. Additionally, reading strategies such as traditional 'summarisation' may perhaps facilitate comprehension of English expository texts due to the well-structured nature of expository texts in English. Expository texts have a more clearly defined structure and outline compared to other text types, which will be discussed in more detail in the next section. One might speculate that conventional comprehension strategies such as summarisation and text features such as local coherence may be less useful in facilitating text comprehension in some languages. One way of investigating these is to conduct a comparative study in text comprehension.

The Construction-Integration Model of text comprehension has never been applied to investigate text comprehension of middle year readers of a logographic language such as
Chinese. This is one of the main reasons why this study aims to compare text comprehension of English and Chinese middle year readers. Through this investigation, this study makes a theoretical contribution to van Dijk and Kintsch’s (1983) and Kintsch’s CI Model of text comprehension. It may suggest further avenues of investigation for a range of other similar comparative studies exploring different theories and models of text comprehension as well as reading strategies.

1.3 Learning from Expository Texts at School

The researcher created the two expository texts, *Electricity and Magnets* and *China and Australia* to study text comprehension processes and the role of local coherence in text comprehension. During the creation of the two expository texts, the researcher made use of the following guidelines. It was decided that the first expository text, *Electricity and Magnets*, would be on a science topic commonly studied in Grade 5 and 8 both in China and Australia. Likewise, the topic for the second expository text, *China and Australia*, was also selected so that the readers would have some degree of familiarity with the text content and the topic was not totally foreign to them. This is because the participants’ prior knowledge was later screened to determine the level of likely influence of prior knowledge in their comprehension of the two texts. The second text was created in a similar structure to the expository text, *Peru and Argentina* in Kintsch’s summarisation study for comparability reasons (Kintsch, 1990).

It is also important to note that the two texts were first written in English using English rhetoric before they were translated into Chinese and confirmed by two independent professional translators, both bilingual Chinese and English speakers. The translators followed the guidelines provided by the researcher in creating the texts in Chinese. These
included factors such as the number of gaps, sentence meaning, main ideas and paragraphs in both texts for both grades. The rationale behind this was to be able to create texts, which would yield more comparable results and allow identifying and examining unique characteristics of Chinese language readers reading in English rhetoric. This was to replicate the classroom environment where English is the medium of instruction such as in Australia and where many readers from Chinese language background read-to-learn through English expository texts. Although the translation may be perceived as one of the limitations of the study, with all the reasons above, it allowed for more detailed comparisons to be made in the way readers process the same information and ideas in the text and their use of prior knowledge.

1.3.1 Research studies on expository text

Children start learning to read by being exposed to the narrative style of texts with familiar topics. Once they master reading, they are then introduced to texts with more complex language and structure. This is when they also start reading-to-learn. Reading-to-learn from texts has long been considered the central activity for success at school. Plain, reader-friendly texts in science, history and other subjects are becoming more and more common in schools. There is also increasing evidence that “the task of ‘reading to learn’ is also problematic for students in higher education” (Maclellan, 1997) and even some of the most brilliant readers are not efficient macro processors of school-type, expository texts (Kintsch, 1990).

Some researchers claim that students more often work with expository, non-fiction texts than fiction or instructional texts in a variety of content areas from upper elementary level to higher education, which includes tertiary studies. Narratives display a familiar structure and content compared with expository texts. There is evidence in the literature that
children start to become familiar with narrative texts at a very early age and with expository texts late in their primary schooling when learning is focused more on learning through reading rather than learning to read (Cote, Goldman, & Saul, 1998; Snyder & Caccamise, 2010; Stein & Policastro, 1984). This, according to many recent studies on comprehension processes, may also be impeding their learning (Perfetti, 1988). Hence, the skill of reading-to-learn from a variety of texts becomes critical from Year 6 onwards, which suggests, “In the upper elementary grades, reading comprehension, or the ability to construct meaning from a variety of texts, can be the key to academic success” (Mason et al., 2006).

This study aims to investigate Grade 5 and Grade 8 readers’ text comprehension processes when reading-to-learn from expository texts. It aims to explore this not only in an alphabetic language such as English but also in a non-alphabetic logographic language such as Chinese. Both at school and outside school students encounter expository texts. Unlike narrative texts, we come across expository texts outside the school (Kucer, 2011, p. 567). These include signs, information panels, instructions, and so on. Expository texts at school include responses to literary texts in English, science reports, informative articles across all subjects and procedural descriptions and explanations.

There have been many studies of expository texts that have investigated the role of text structure, structural awareness and expository language use on students’ speaking, reading and writing skills (Christie & Dreyfus, 2007; Kucer, 2011; Melissa & Meyer, 2011; Westervels & Moran, 2011). In his study, Kucer (2011) investigated the link between 35 fourth grade readers’ processing of expository discourse and their comprehension through retelling what they remembered after reading aloud science texts on rocks and minerals. The results indicated that the readers found comprehending and building the macro-structure of the text difficult due to its content-specific nature. Similar to other studies (Best et al., 2008),
Kucer (2011 p. 580) points out that while most children develop an early understanding of the nature of narrative structure, this is not true for expository structure due to its prior knowledge demands. Kucer concludes with a need for further research on expository texts in the area of coherence and processing. This study partly addresses this area of research by investigating the role of coherence in an expository text in an alphabetic language (English) and in a non-alphabetic language (Chinese).

Melissa and Meyer also discuss studies that show the significance of structural awareness in improving comprehension. Their comprehensive review of literature on children’s structural knowledge (Melissa & Meyer, 2011) reveals how important comprehension of expository texts is in terms of learning in content areas. Melissa and Meyer (2011) further emphasise the significant role expository text characteristics play in terms of mental representation of the text during comprehension. These involve local text coherence which creates “clear relationships between and among textual ideas”. Melissa and Meyer also mention the hierarchical order of micro- (lower level ideas, details of the topic) and macro-propositions (higher level, main ideas) in expository texts (Melissa & Meyer, 2011, p. 68). Melissa and Meyer found that the more organised the structure of the text, the better the performance in comprehension and improvement in processing and memory. The more skilled and older the reader, the higher was the level of their structural awareness. Improvement of knowledge on text structure may possibly lead to improvement in text comprehension and learning from texts at school. These all confirm Kintsch’s framework of text comprehension (Kintsch, 1999; Weaver & Kintsch, 1991) adopted as the theoretical framework for this study.

In another study of young school-age children, Westerveld and Moran (2011) investigated children’s expository language skills during their favourite game or sport task to
determine how the expository genre could reveal children’s ability to use complex language structures. Early intervention was also considered to be more effective once children’s language weaknesses were identified based on their performance using the expository genre. This study concluded that using expository discourse as a language assessment protocol is beneficial even for young school-age children.

Furthermore, Christie and Dreyfus (2007) examined the teaching and learning of the text response genre in English through sample student constructions. They used the systemic functional grammar (the grammatical structures we use to organise and describe discourse (see Halliday & Matthiessen, 2004)) to study expository texts and writing skills at secondary school. Their study outlined some steps for thematic interpretive genres and, similar to other studies above, emphasised the importance of explicit teaching of generic structures to improve students’ writing skills. While the significance of text comprehension is undeniable in learning from texts at school, some researchers claim that current research does not yet provide conclusive results in explaining the processes students engage in when constructing coherent representations of different texts and in particular expository texts (e.g., Cote & Goldman, 2006; Goldman, 1996; Goldman, Varma, & Cote, 1996; Lorch & Lorch, 1996).

Comparing cognitive processing mechanisms used by competent readers of different languages may possibly inform our understanding and practice of teaching reading at school. Just as these comprehension processes and strategies have universal implications for the readers of other languages, they also have the potential to reveal language or culture-specific aspects that need to be taken into account in effective instructional practices for text comprehension. These will be clearer when the next section explains the rationale for this study in detail.
1.4 Rationale

There are many studies on text comprehension but there are few comparative studies that investigate text comprehension for school students in China and in Australia. Conducting a comparative study allows researchers to investigate the effects of different variables, which are sometimes beyond experimental control. These variables include language-specific features like the orthography of that language as well as readers’ ability, culture and school environment. This study brings a new perspective to text comprehension studies conducted in the Chinese and English languages, also adding to known and widely accepted theories and models such as van Dijk and Kintsch’s Construction-Integration Model and other models and practices in Chinese text comprehension research.

The readers of Chinese and English languages are chosen for this study. The reasons for studying the Chinese language are initially justified by 1.197 billion first language speakers of Chinese (all Chinese dialects together) in the world (Lewis et al., 2015). Chinese has more first language speakers than any other language in the world today. In addition, Chinese speakers are travelling more and an increasing number of Chinese first language speakers are learning English. There were 400 million English learners in China in 2010 (China Daily, 2010; Bolton & Groddol, 2012). On the other hand, English, as the world’s lingua franca is the most widely spoken language. All of the above put this study’s aim of comparing English and Chinese readers’ text comprehension into perspective while underpinning its importance. There are significant pedagogical implications of the possible findings of this study for an increasing number of Chinese language readers as well as English language readers reading to learn English in Australia, in China and all around the globe.
The focus of this study is to investigate and compare the nature of comprehension processes as well as the effect of local text coherence on text comprehension by native Chinese and English language readers in middle school. Through this comparison the study intends to reveal the possible similarities and differences between participants from two distinct language groups. Additionally, it aims to explore the influence of cultural and linguistic factors on text comprehension. A comparative approach of this kind, with participants from two separate orthographic languages, has not previously been used to examine text comprehension processes in expository texts for middle year (Grades 5-9) native language readers in China and in Australia.

By identifying and targeting these cognitive processes and the possible influences of the factors above, teachers will be able to not only understand the nature of comprehension for readers but will also be able to assist them more effectively and contribute to their academic success across all other subject domains in the middle years in both languages. It is assumed that if students are trained and supported more effectively in their reading-to-learn and metacognitive abilities, they could possibly transfer these skills and knowledge to their learning in other subject domains. Furthermore, it is suggested that the results of this study will provide further insight into the use of metacognitive skills, prior knowledge, summarisation and text coherence in the middle years’ classroom. It will also highlight the possible influences of culture and students’ first language in bringing about changes to develop their competencies in text comprehension.

From a personal perspective as a teacher and as an International Students’ Coordinator, the main reason and motivation behind the researcher’s interest started as an aspiration to assist students with diverse needs and backgrounds when they are reading-to-learn from texts. The researcher considers such information to be beneficial for other teachers
as all teachers use texts across the curriculum in both countries and the readers in both countries are diverse. Due to these students’ poor English language skills, diverse levels and background, it has become a greater challenge for teachers to communicate and cater for them in the same classes with local students. This is deemed more necessary and urgent with an increasing number of international students from China in Australia. Ninety-seven percent of the population of international students at the researcher’s current school (based on the 2016 school census) are from Mainland China.

This trend at government schools was confirmed by the Australian Department of Education and Training’s latest monthly summary of international student enrolment data for January 2015. According to this, amongst all international students in Australia on a student visa, students from China accounted for the largest share of enrolments at schools with 50.8 percent. The new trade agreement signed between Australia and China in September 2015, will allow Australia’s higher education institutions further access to the Chinese education market which in turn will help increase the number of international students from China. There is also an increasing number of new students from China who are not on a student visa. Furthermore, there are more English language programs and native English readers in China compared to previous years. These confirm the significant role of literacy as a cognitive skill for success at schools in both China and in Australia.

Finally, Literacy remains possibly one of the most controversial educational issues and the one that is most frequently investigated in the field of educational practice. Despite all the research, government initiatives and the goals and targets set, there still seems to be a great need for more research to further improve our understanding of language and literacy learning in our schools (Merga, 2014; Rowsell, 2014). Many previous studies of Chinese literacy focused mainly on phonological and morphological awareness and reading rate
(Chen, 1985; Frost, Katz & Bentin, 1987; Leong, 1973; Perfetti & Zhang, 1992). Only a very few studies investigated how readers processed information and constructed meaning from texts (Chan, 1992, 2003; Law, 2008). This comparative study is the first to investigate Chinese and Australian adolescents’ information-processing strategies and the role of local text coherence in their construction of meaning from expository texts. These are critical to all learning at school. The investigations will further contribute to our understanding of reading comprehension as a significant skill in learning from texts at school. The next chapter provides a context for the theoretical framework which underpins this study.
Chapter Two: Theoretical Context

2.1 Introduction

“Theories provide the philosophical grounding for research studies” (Hayes, 1997).

This chapter reviews the literature on text comprehension and presents the case for this study’s intellectual contribution to current research. First, an overview of earlier theories in understanding reading comprehension is presented before detailed descriptions of text comprehension processes and models are given. Walter Kintsch’s Construction-Integration Model, which constitutes the theoretical framework for this study is also closely examined for the purposes of the study. Three bodies of research form the basis of all the studies of reading comprehension. These are:

1. Bottom-up Studies
2. Top-down Studies
3. Studies with combination of Bottom-up and Top-down

2.1.1 Bottom-up studies

The bottom-up approach underpins all the earliest studies and the majority of studies in reading comprehension. This approach is seen as part of most reading comprehension studies, which have focused on word recognition and word level processes. The bottom-up approach assumes that comprehension processes start with the smallest linguistic units, including the recognition of visual orthographical features, morphology and pronunciation of words before larger units of meaning such as phrases or sentences, syntactic structures,
contextual cues and prior knowledge use are processed during comprehension. It is these smallest linguistic units, which activate the larger units for comprehension to occur.

2.1.2 Top-down studies

In contrast to the bottom-up approach, some studies suggest that comprehension starts with larger units or aspects of meaning such as the whole word meaning, title of the text, main ideas in paragraphs, the context and prior knowledge before the readers go into smaller units. The focus of top-down studies has been the activation and use of prior knowledge, which steers the scaffolding of meaning during comprehension. This approach assumes that readers start with the meanings of sentences or paragraphs before they move to smaller units of meaning such as words or morphology. The recent study of 130 Grade 2, 4 and 6 readers in Madrid, Spain found evidence of the presence of top-down processes even in very young children (Angosto et al., 2013). This means that children are able to use top-down processes such as integrating their prior knowledge with text information when processing the text even at a very early age.

2.1.3 Bottom-up and top-down

Recent text comprehension studies dismiss one or the other approach and suggest that both the bottom-up and top-down approaches complement each other and without one the other is not possible (Kintsch, 2005, p. 126). Evidence of top-down and bottom-up processes developing parallel to each other is reported as necessary for effective comprehension (Guéraud, 2005). Both are regarded as integral parts of comprehension. Without smaller units such as letters or phonology (bottom-up) there would be no perception or comprehension of print, and likewise, without context or knowledge (top-down) again perception or comprehension would not be achieved. They are complementary. The challenge for current
research is to explain or describe the ways in which they complement or interact with each other. This study, along with Kintsch’s Construction-Integration Model, which forms the basis of its theoretical framework, also considers bottom-up and top-down approaches as complementary in nature.

In addition to the above distinctions between different approaches in comprehension processes, one also needs to understand the distinction, which exists amongst reading comprehension theories. Theories of reading and comprehension moved from purely linguistic theories to psycholinguistic and finally to constructivist theories. While the earlier linguistic studies in reading were centred on linguistic items (word recognition) and text features only, this later changed with the influence of the psychological approach and hence the memory-based theories. More importantly, lately, comprehension is seen as an interactive process where readers’ prior knowledge plays a significant role in the way they process and comprehend the text.

Currently, there are again three schools of thought on literacy theories: memory-based theories, constructivist theories and theories which incorporate both. This study adopts the last approach where readers are regarded as active constructors of meaning who activate their memory to facilitate their comprehension processing. This is the approach adopted by Kintsch with his Construction-Integration Model. These will be further discussed later in this chapter along with current text comprehension models.

Without understanding earlier developments in reading comprehension it is difficult to understand the current research and studies. Early theories of reading comprehension provide background information and a broader context for understanding contemporary text comprehension studies and in particular, this study and its objectives. Hence, an overview of earlier theories and major studies in text comprehension follows.
2.1.4 Early theories of reading and text comprehension

For more than 50 years, research on text comprehension has been characterised by an emphasis on accuracy tested via memorisation and expressive fluency drills and other tests. Following this, studies that recognised readers as active participants in text comprehension processing became prevalent. Although one of the earliest studies on reading comprehension, by Edmund Burke Huey (1908), revealed traces of a constructivist approach to reading and the beginnings of a view of readers as active participants, it was not until Thorndike (1917) that abstract mental processes linked to comprehension were investigated in detail. Thorndike was one of the first to provide evidence for reading comprehension as a constructive activity (Pearson, 2009).

Frederic C. Bartlett’s study on memory in 1932 has influenced the current understanding of the relationship between memory and text comprehension. The terms ‘text’ and ‘discourse’ are now used in educational psychology as a result of this highly significant work (Pearson, 2009). Bartlett’s work on reconstructive memory (1932) suggested that our memory involves active processing of information rather than merely acting like a recorder of events. He also suggested that during this active processing of information readers fit this information with their personal experience or knowledge (later referred to as ‘a schemata’) to comprehend or recall. Amongst other studies at the time, this new perspective and view of memory stimulated a shift to psycholinguistic research and a moving away from behaviourist views on comprehension.

This perspective in reading research, later known as Schema Theory, suggested that our minds build schemata of knowledge organised in units in our memories even before we start school. We have schemata for every concept in our world experience (Cobb & Kallus, 2011). These schemata affect the way we interpret other information in texts. This organised
knowledge is activated by information relevant to our schemata in the text we read for us to be able to comprehend. More detailed discussion on Schema Theory follows.

### 2.1.5 Schema theory (1932)

Although it originated in Gestalt psychological work in the early 1920s, the word ‘schema’ was first used and applied to reading by Bartlett (1932). Researchers of Artificial Intelligence also adapted work on ‘schemas’ in the late 1970s. This incipiently constructivist approach of regarding a reader as an active constructor of meaning from texts accelerated from the 1970s and especially during the 1980s with the studies on text comprehension processes. With their seminal chapter Anderson and Pearson (1984) were the first to extend the application of schema theory to reading processes and reading instructions. As the research started to move away from the text as an important element in comprehension (Carrell, 1984, 1992; Carrell & Wyse, 1998; Li Zonghong, 2005; Nassaji, 2007), ‘Schema Theory’ appeared as the first major theory to investigate the active role of the readers as constructors of meaning from text. Many researchers now acknowledge the paramount importance of prior knowledge because of the earlier work done on ‘Schema Theory’ (Tracey & Marrow, 2012).

According to this theory, readers’ minds systematically store ‘schemata’ or abstract knowledge structures that are generic and are developed with their experiences and reactions, starting with experiences as a child. Hence, as we read new information in texts and our experiences change, our text schemata also change to be able to accommodate and integrate this new information (Carrell, 1984, 1992; Carrell & Wyse, 1998; Li Zonghong, 2005; Nassaji, 2007). This is why when we read the same text on different occasions, we have new interpretations each time and people with different cultural and personal experiences may
interpret the same text differently. Many research studies on learners of both English as a Second Language and English as a Foreign Language found that readers comprehend the text better if it relates to their own cultures, as they have the appropriate schema to deal with the cultural information in the text (Carrell, 1984, 1992; Carrell & Wyse, 1998; Li Zonghong, 2005; Nassaji, 2007).

For the first time, readers’ knowledge and cultural backgrounds were taken into account when looking at their understanding of a text. Studies by Johnson in 1981 and 1986 found that cultural background is more influential than text complexity when it comes to a reader’s understanding of the text. There are several other studies that investigated the influence of cultural knowledge on comprehension (Green, 2004; Hudson, 1998; Stanovich, 1990). The constructivist ‘schemata theory’ is the second most relevant theory to the structure and the aims of this study following the Construction-Integration (CI) Model of text comprehension. Although both CI and Schema Theory lead to structured mental representations, the differences lie in how they each explain the processes involved in the construction of these mental representations. The CI model involves bottom-up processes before constructing the meaning from the text and integrating it with the readers’ prior knowledge. Prior knowledge is activated in the construction phase, and prior knowledge is used strategically after the integration phase in a controlled top-down fashion. The difference between these two frameworks is described as ‘the two sides of a coin’ by Li Zonghong (2005).

This study on text comprehension purposely included participants across two different languages, orthographic systems and cultures. The two groups studied consist of English and Chinese readers from Australia and China, with varying linguistic and cultural knowledge backgrounds. If one agrees with the ideas suggested by ‘Schema Theory’, then it is plausible
that the comprehension processes or the recalls of such readers reflect the culturally or linguistically diverse knowledge shared by each group in varying degrees.

One of the most prominent researchers in the field of text comprehension, Walter Kintsch was situated at the centre of the cognitive revolution of the 1970s as a psychologist. He was also inevitably influenced by Schema Theory and the shift from behaviourist and linguistic to constructivist theories of comprehension. Kintsch’s professional and intellectual journey is valuable for any serious researcher of comprehension. His work was also what prompted the present study and made its theoretical framework possible. Thus, a brief overview of Kintsch’s journey in text comprehension is presented in the next section.

2.1.6 Walter Kintsch and text comprehension research during 1970s

As this study is mainly concerned with the model of text comprehension, both Kintsch’s earlier work with Teun A. van Dijk (1975, 1978, 1983) and his later improved Construction-Integration Model (1988, 1992, 2004, 2010) will be discussed in detail here.

In a 1995 volume of essays by former students and colleagues honouring Walter Kintsch’s seminal contribution to text comprehension research, Polson (1995) provides a biography and intellectual trajectory. Prior to what can be called the marriage of linguistics and psychology, signified by the professional collaboration between Kintsch and van Dijk, Kintsch had been working on animal learning. During the earlier part of the 1960s he tended to approach animal learning from the perspective of an experimental psychologist, with a specific interest in interactions between learning and incentive motivation (Kintsch & Witte, 1962). This went against a wider intellectual climate in which cognitive psychology was developing rapidly as a subset of the field of general psychology.

Later Kintsch (1966) began to study memory and considered himself a mathematical
psychologist working on mathematical models describing psychological processes. He continued with this approach until the mid-1970s when, along with others, Kintsch shifted his intellectual orientation to considering himself a cognitive psychologist rather than a behaviourist. Polson outlines how the focus of research for Kintsch shifted to investigating text comprehension, a change influenced by the then contemporary developments in artificial intelligence and linguistics. Particularly influential was Noam Chomsky’s (1957) work on nativity and transformational generative grammar, which helped the shift from behaviourist views and gave rise to the discipline of psycholinguistics. Kintsch’s general aim was to develop a theory of text comprehension and memory, using sentences, paragraphs and stories (Kintsch, 1974; Polson, 1995). At the time, the studies of comprehension still only focused on basic semantic units such as word lists and sentences and relied on memory and recall. These also included the study by Kintsch (Kintsch, 1972). Following the influential work of Huey, Thorndike, Bartlett and Chomsky, it was not until the early 1970s, in particular 1972, that a turning point in studies of text processing came with the advent of the multidisciplinary studies of Frederiksen and Frase (psychology), Charniak (artificial intelligence), Wunderlich (linguistic pragmatics) and Labov (sociolinguistics) (Weaver, Mannes, & Fletcher, 1995).

Even after the above-mentioned turning point, for a long time in many linguistic and psychological studies and experiments, text was still seen as only a string of sentences and propositions (idea units). As a result, all the research regarding text studies was limited to sentence recalls and the structure of propositions in both of these fields (Kintsch, 1974; van Dijk, 1995). Kintsch’s close collaborator, Teun A. van Dijk (1995), a linguist with an interest in text grammar, recalls his professional alliance with Kintsch, eventually a metaphorical alliance between text linguistics and psychology. Kintsch’s book ‘The Representation of Meaning in Memory’ in 1974, which refers to van Dijk’s 1972 dissertation on text grammar,
marks this shift. Van Dijk argued that according to the construct of grammatical relativity, the syntactic and semantic structures of a sentence ought to be explained in relation to surrounding sentences in a text. During the early 1970s, before van Dijk shifted his focus to the field of psychology and met Kintsch, there was not much discussion on text processing in either text linguistics or in psychology and the field of cognitive psychology was developing very slowly (van Dijk, 1995).

Van Dijk’s initial work on memory, conducted with his students, used short stories. Later, narratives and in particular short stories would become a standard method of looking at text structures and recall for most of the research. This included Kintsch and van Dijk’s first joint paper in 1975 (Kintsch & van Dijk, 1975). However, at around the same time, Kintsch also investigated comprehension of expository texts in his study of memory (Kintsch, 1974). Apart from the wider use of expository texts across the curriculum at schools, this study, which particularly aims at investigating Kintsch’s model, also deliberately elected to use expository texts as opposed to narratives.

2.2 Text Comprehension Models

Early theories of reading led to many models of reading and comprehension in the literature. For the purposes of this study, this section will present an overview of some of the main models of text comprehension before a more detailed description of Kintsch’s Construction-Integration Model of text comprehension.

Earlier models of reading comprehension and processing, mainly bottom-up in nature, focused on orthographic and word level processes and not so much on sentence or text level processes. These initial models did not examine the influence of readers’ prior knowledge. Around the same time that Kintsch and van Dijk were collaborating on text comprehension in
the 1970s, processing models such as Automatic Information Processing by LaBerge and Samuels (1974) were emerging. One of the well-known models of text comprehension, Automatic Information Processing, as the name implies, focused on automaticity as the ability to read and process information with little attention and regarded this as the main difference between the high and low-skilled readers.

Influenced by previous visual memory studies, the *Automatic Information Processing Model* was a bottom-up model of processing information from print. This involved recognition of the letters and letter strings through visual memory to the retrieval of word meaning from episodic memory. Attention was a critical part of achieving comprehension for this model. Hence, readers’ attention at different levels of processing information such as decoding determined their success in comprehension. Samuels, J. (2004) suggested that through continuous activation and processing, low-skilled readers could be taught to automatise their poor decoding skills for better comprehension. Hence, these poor readers would develop skills to comprehend the text successfully as they could decode and process information from the text automatically (Samuels, J., 2004).

Similar to the processing models before it, such as Gough’s Model (1972), LaBerge and Samuel’s processing model was made up of sequential input which was analysed first in visual memory, then in phonological and semantic, before ending up in episodic memory. This and other processing models at the time were somewhat limited in terms of their bottom-up approach. Hence, interaction between the different processing levels was very limited as the processes took place in isolation from each other and higher processing levels were not so much connected to the lower processing levels. It seemed that it was not possible to bypass any of the levels of processing, as the system was hierarchical. In other words, before
processing information at a visual stage or phonological stage, it was not possible to comprehend the meaning at the word or text levels.

It was not until after the emphasis in text comprehension research shifted from text processes to mental models in the 1980s (first mentioned by Johnson and Laird in 1983) following ‘schemas’, that van Dijk and Kintsch introduced the concept of ‘a situation model’ (van Dijk & Kintsch, 1983). Situation models, which have been recently one of the more frequently researched topics in text comprehension, are the ‘mental models’ of the situation described by the text (Kintsch, 1988, 1998; Zwaan & Radvansky, 1998). This is when the focus in comprehension research shifted from text features to readers’ interactions with the text and the use of prior knowledge. Readers were seen as the constructors of meaning from text utilising multiple knowledge sources and processes such as decoding as well as integrating prior knowledge.

At the start of the 1990s, research on text comprehension continued to advance and highlight the importance of bottom-up processes in comprehension. Later, studies, which integrated both bottom-up and top-down processes took place. Some of the text comprehension models from this era include ‘Bottom-up and Top-down’ Model and ‘The Simple View’. Both ‘Bottom-up and Top-down’ and ‘The Simple View’, as models of processing, still viewed reading as a multimodal activity, which combined automatised processes like decoding and word comprehension. Although the above models treated decoding as a necessary and automatised skill, which can assist comprehension, they did not claim that decoding on its own was a prerequisite for comprehension (Gough & Tunmer, 1986; Rummelhart, 1994).

Hoover and Gough’s The Simple View Model of reading comprehension combines top down and bottom-up processes by including oral language as measured through listening
comprehension. The Simple View, unlike other studies, describes reading as a language skill developed through decoding and listening comprehension. It assumes that once the reader decodes the meaning at the word level, this will lead to comprehending the meaning at the sentence and discourse levels (Hoover & Gough, 1990). Hoover and Gough argue that although the two are separate skills, without decoding there would be no text comprehension with only linguistic comprehension and vice versa. Decoding is used to mean word recognition in this context and comprehension stands for word meaning.

Following the sequential bottom-up processing models mentioned earlier, Rummelhart (Rummelhart, 1994, 2004) suggested an Interactive Reading Model where readers process the information using multiple sources of knowledge such as orthographic, lexical, syntactic and semantic knowledge simultaneously rather than sequentially. Therefore, according to Rummelhart’s model, as the reader reads through the text, both bottom-up and top-down processes occur simultaneously at all levels of analysis. Hence, the orthographic level of processing influences the lexical level of processing and lexical processing can be influenced by semantic processing. For example, letters are recognised faster in words than in random strings of letters and words are recognised and comprehended better if they relate to each other grammatically or semantically (Rummelhart, 2004).

Furthermore, Pearson’s Three-Cueing System (Pearson, 1976; Adams, 1998) is another text comprehension model, where the meaning in a text relies, as in a Venn diagram, on the interrelations of the three areas of cues in a text, namely, semantic, syntactic and graphophonic. In addition to the three types of cues above, pragmatics, which relates to the overall message and the author’s point of view within a given context, is also added to the three types of information for text comprehension. According to this system, if any one of these types of information is missing then the meaning of a text cannot possibly be
comprehended. The graphophonic cues are mainly attributed to beginning readers who are developing knowledge and skills in written language, at times making use of speech and spelling-sound correspondences. Syntactic cues relate to the rules and grammar of the language and semantic cues relate to what readers bring to the text, such as their world knowledge, to make sense of the meaning in the text. The overall aim of the three-cueing system was to warn against the pre-eminence given to the use of phonics to the extent that comprehension suffered.

Another comprehension model that regards comprehension processes as interactive and simultaneous is Adams’ word recognition model of four text processors (Adams, 1990, 1994; 2004). According to this perspective of comprehension, readers make use of four processors, again made up of both bottom-up and top-down processors, when processing the text for comprehension. These are phonological, orthographical, meaning and context processors. These interact simultaneously to form a network of different associations. The fluency and the speed of the skilled readers during processing depend on the frequency and the strength of such simultaneous and parallel interaction within and between the processors in readers’ minds.

The orthographic processor is mainly responsible for the visual recognition of letter features, processing letter order and syllabification. The context processor oversees the continuous construction of a coherent interpretation of the text through its selection of word meanings relevant for the context and the situation in the text. The meaning processor assists with the learning of new word meanings appropriate for the context and it activates certain interaction patterns with other processors, such as orthographic and context, when the reader encounters an unknown word for the first time. The phonological processor facilitates the meaning of words with auditory processing and it interacts closely with orthography and
meaning processors (Adams, 2004, pp. 1219-1243). The familiar sounds facilitate the meaning of unfamiliar words and their retrieval from memory.

Although there may seem to be many differences between these models, some of their differences merely lie in the terminology. For example, what Rummelhart calls sources of knowledge, Pearson calls cues and Adam calls processors. However, the terms such as orthographic, lexical, syntactic and semantic used to describe sources of knowledge are synonyms of, if not the same as, the terms such as syntactic, semantic and graphophonic used to describe cues and the terms phonological, orthographical, meaning and context used to describe processors. This demonstrates how essentially the above models and others share common concepts in their approach to text comprehension. Once this is identified, their differences become clear.

Following this, more recently, another model brought a rather different perspective to text comprehension studies, this time focusing on the resources competent readers draw upon and the roles they adopt during text comprehension. Luke and Freebody’s Four Resources Model (Luke & Freebody, 1990) has also been used to improve text comprehension at school level. It has been used as a tool for helping educators further improve their understanding and practices of reading and literacy (Freebody, 1992) and provides a profile of a skilled reader in today’s modern society. According to Luke and Freebody’s Four Resources Model (Luke & Freebody, 1990), the four roles which skilled readers adopt for successful text comprehension are: 1. Code breaker 2. Text participant 3. Text user and 4. Text analyst. A Code-Breaker focuses on learning about the visual aspects and the links between the sounds of the language and its graphic symbols. This includes processes such as decoding and matching sounds to letters or graphemes to phonemes. A Text Participant focuses on learning about the meaning patterns or networks of propositions when constructing the meaning of the text. A Text User
on the other hand, focuses on the social and cultural use and pragmatics of reading necessary for effective communication through different genres. Lastly, a Text Analyst aims to know about any cultural and ideological ways the texts are manipulated to influence the reader. Freebody (2007, p. 35) states that these four roles are interrelated and they aimed to aide literacy discussions in Australian context. The Four Resources Model provided an opportunity for the schools and teachers to develop strategies in teaching literacy across the curriculum.

In relation to the roles and resources described briefly above, Luke and Freebody have since acknowledged the change in the application and relevance of the text in contemporary social practices, such as the use of multimodal texts (texts with more than one mode such as articles with photography, film adaptations, and music) at school (Luke & Freebody, 1999). Other discussions around the issue of the digital and multimodal nature of texts followed. Some argued that as the meaning of text changes so should the meaning of what it means to be a skilled reader and the interpretation of texts. The evolution of digital literacy constantly places new demands on readers and the terminology used originally by Luke and Freebody had to shift to include the current social practices and the digital world of texts (Anstey & Bull, 2004).

Serafini (2012) went even further and suggested new roles appropriate for this shift in the meaning of text. Hence, according to this current view of texts, readers are now also: navigators (navigate online texts), interpreters (interpret multiple perspectives), designers (design individual path and construct the text) and interrogators (see reading as a social practice which includes cultural meaning). The implications of all this for this study are that as the role of readers and the text structure change, the ways readers process texts and the strategies they use also change during text comprehension. Hence, as the purpose of this
study is to investigate the role of cultural and linguistic factors on text comprehension, it is necessary to investigate in what ways these changes in relation to readers' roles and text mode affect comprehension by readers of different cultures and orthographies such as Chinese and English language readers. All current theories describe reading comprehension as a two-way process between the reader and the text. They require readers to actively construct meaning from the text they read and integrate this with their existing knowledge. In doing so, readers use background knowledge and familiarity with text structure to comprehend the texts they read. Hence, the interaction between the reader and the text not only depends on the reader’s qualities but also on the qualities of the text and its structure. The nature of text structure varies from one language to another (Peregoy & Boyle, 2000). Hence, Chinese translations of the original texts created for the purposes of this study, though following the same guidelines as the original cannot possibly have a completely authentic text structure as if they were originally composed in Chinese. Although this is a limitation in this study, teachers are still able to gain insight into the nature of text processing by Chinese language readers. This study not only investigates readers’ qualities but also the influence of text qualities such as the role of local coherence on comprehension, both for native Chinese and native English language readers.

The Landscape Model of reading (Van der Broek et al., 1999), considered by Kintsch (1998) as the closest to his Construction-Integration Model, is a model of text comprehension in which an array of varying degrees of activations of ideas and concepts during reading creates a landscape of comprehension. Within this landscape during reading, readers are said to make use of their attentional resources and constantly work on maintaining coherence in their comprehension of the text in cycles. The two types of coherence readers attempt to maintain, anaphoric/referential and casual coherence, are used to activate a range of concepts
at one given time. Hence, during their coherent construction of the meaning from a text, readers activate information from the current sentence, information retained from the previous cycle and information from previously read text or world knowledge. The second and most relevant part of the Landscape Model to the CI Model is how all these activations are turned into a coherent mental representation of the text.

### 2.2.1 Rationale for theoretical framework

Given its educational and pedagogical purposes, the theoretical framework of text comprehension in the Construction-Integration Model, as first described by Kintsch (1988), forms the basis of this study. Although it has been modified over the years (CI-II Model, Kintsch & Malagath, 2012; Malagath, 2010), this model of text comprehension is still the basis of most of the current research in the field of text comprehension.

Kintsch’s Construction-Integration Model of text comprehension (1988) was the first to investigate text comprehension as multilevel processing which requires semantic representation of meaning. It is multilevel as it is concerned with comprehension not only at the linguistic or surface level, but also at the conceptual and situational levels. This study takes the constructivist approach and also considers text comprehension as a two-way interaction that operates simultaneously at more than one level. As in Kintsch’s model (Kintsch, 1988, 1998), this study considers this interaction between the reader and the text as reciprocal and as involving the integration of prior knowledge and the influence of local coherence in relation to text comprehension. Hence, just like a problem-solving task, readers with limited knowledge encounter constraints in achieving a coherent representation of text meaning intended by the author. This study, similar to Kintsch’s model, inclines to describe
this knowledge to include both linguistic and world knowledge necessary for text comprehension.

Furthermore, one other reason why this study is interested in the Construction-Integration (CI) Model is because unlike the previous models discussed earlier, it is the only constructivist model which explains learning through reading comprehension processes (i.e., reading-to-learn), and learning strategies (i.e., prediction, use of prior knowledge, inferences, summarisation), and it also has implications for learning in content-based subjects and learning from expository texts in the future. All of the above are highly relevant for the objectives, theoretical structure and methodology of this study.

Finally, this study aims to investigate the text comprehension processes of middle years’ level native readers of two different orthographies, alphabetic and logographic, and the influence of local coherence on their comprehension when they are reading-to-learn at school. The main motivator for this study is the fact that Kintsch’s Construction-Integration Model of text comprehension has not before been used in this way with school students. This study argues that it will be highly beneficial for teachers and educational practitioners, as well as researchers, to discover more about the application of such an influential model of text comprehension in a comparative study of readers from two different orthographies. Additionally, the findings and the implications of this study will further contribute to the current understanding of text comprehension and the Construction-Integration Model itself, as well as future research in this area.

One needs to have a very good grasp of Kintsch’s updated model of text comprehension processes to understand the research questions and the background to the present study. It will be necessary to further clarify the recent changes made to Kintsch’s model as well as further explaining the theoretical framework underlying my study. Hence, to
place such a constructivist theoretical framework in a comprehensive perspective and demonstrate its relevance to my study, the next section will provide a more detailed description and a closer analysis of Kintsch’s Construction-Integration Model of text comprehension (Kintsch, 1998).

2.3 Construction-Integration Model of Text Comprehension

Kintsch (1998, 2004) elaborated The Construction-Integration (CI) Model of text comprehension in a two-phased model. The first phase is principally concerned with the construction of text representations through information processing to identify information related to the text at varying levels of complexity. Hence, these representations of the text differ in complexity (Munro, 2004). The second phase emphasises the effect of readers’ prior knowledge more than the first phase and its integration with the situation model presented in the text for achieving text comprehension at a deeper level of meaning.

The two cognitive processes identified during the above two phases suggest that readers first construct a textbase from linguistic input and the reader’s general knowledge base, and while this understanding is constructed, it is also integrated into the reader’s general knowledge base in a cycle (van Dijk & Kintsch, 1983; Kintsch, 1992, 2004). Prior knowledge is used throughout the cycling process and it includes knowledge of language as well as knowledge of vocabulary and later on knowledge of situation. According to van Dijk and Kintsch’s comprehension model, readers process meaning in the text through three levels. These are: a. Linguistic level b. Conceptual level (textbase) and c. Situational level (van Dijk & Kintsch, 1983; Kintsch, 1988, 1992). While the linguistic level and conceptual level are concerned with the memory for a text, the situational level relates to learning from a text (Butcher & Kintsch, 2003). Each of these levels is described in further detail below.
2.3.1 Linguistic level

The linguistic or surface level of text representations comprises exact words, phrases, sentences, paragraphs, layout of the text and the linguistic/syntactic relations between them as they are revealed by the print. If students have difficulties recognising or understanding the syntactic relations within and between the words, phrases and clauses, they are then not able to access the next level of semantic or propositional base of the text they are reading. Decoding can perhaps be seen as a process part of this linguistic or surface level of representation.

This process becomes automatised for able readers after a while and they move through to other deeper levels of semantic representations more rapidly than other readers who have a lesser ability to decode or less knowledge (L2 Readers) of the linguistic structures of that particular language during reading. According to Keenan and Jennings’ (1996) interpretation of the CI Model, the linguistic level includes word-level activation or word-based priming and it occurs faster as part of construction processes unlike integration processes, which mainly include text level activation and take more time. They also note that poor readers as well as patients whose right brain hemisphere is impaired are still able to access word level but not text level activation (Keenan & Jennings, 1995).

2.3.2 Conceptual level

The second level in the CI Model is called either the conceptual or the textbase level. Essentially it is all the meanings the readers derive from the information in the text. In order for readers to start effectively processing text input in their minds, they need to have more than just the linguistic forms that appear on the page. They need to have semantic representations peeled off from the surface of the text. Hence, when readers are constructing
mental representations of the text, according to this theory, they are transforming the surface level forms into a network of idea-units also known as propositions. This process is done in cycles advancing through words, sentences and phrases matching relevant concepts with the earlier processed propositions. Propositions, according to Kintsch’s propositional representation theory at the time, were defined as sets of sequenced word concepts or ideas that represent knowledge (Kintsch, 1974). Then, these propositions form a network that holds all the information necessary for the creation of the discourse and this information base as a group was then defined as a ‘textbase’.

According to this comprehension theory of multi-layered representation of text, van Dijk and Kintsch (1983) explain that a textbase is what the readers develop at the semantic/conceptual level. It is the meaning of the text, i.e. what it is about. In other words, it is the network of ideas and relations between these ideas and other various linguistic elements in a sentence and across sentences in a text. Ultimately, the textbase is the meaningful mental representation of the text, which is made up of explicit propositions, less explicit words and syntax of the text and some inferences necessary for achieving local coherence.

Propositions play a crucial role in text comprehension processes explained by Kintsch’s CI model. Propositions are idea units produced by using a group of processes known as ‘parsing’, which occurs when the parts of sentences and words in sentences are identified into grammar units. This has been used mostly in traditional grammar studies. For example,

<table>
<thead>
<tr>
<th>The</th>
<th>crying</th>
<th>baby</th>
<th>worried</th>
<th>us</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article</td>
<td>Adjective</td>
<td>Noun</td>
<td>Verb</td>
<td>Pronoun</td>
</tr>
</tbody>
</table>

(Kintsch, 1992)
Kintsch points out the importance of grammar devices in text processing. This is when particular syntactic units are employed to increase the activation level of propositions and this in turn helps improve ‘recalling’ of meaning units based on the CI model (Kintsch, 1992).

To summarise, the order of syntactic units and words in a sentence may not necessarily affect the propositional structure of the sentence, but it may still affect the meaning of the sentence, words and phrases within the sentence and hence the processing of the propositions by readers. The propositions in the sentences ‘The crying baby worried us’ and ‘We were worried by the crying baby’ are exactly the same but the way they are processed may be different (Perfetti & Britt, 1995).

The most important element that the textbase depends upon was explained as the repetition of the concepts or propositions. The lexical item used by Kintsch to explain this is the word concept of the lexical item HOUSE. Hence, if the word ‘house’ first appears as to mean ‘residence, place to live in’ then, the second time it appears in the text it would generally refer back to this concept in the original proposition again (Kintsch, 1974).

As briefly stated above, Kintsch’s theory of text comprehension involves cycles of propositional processing. While constructing a propositional network integrated with the readers’ prior knowledge, the readers each time match the new information from the text with other propositional units, which are processed and stored in short-term memory. This process uses causal relationships as the basis for developing accurate mental representations and it relies on the text input to display connections between different propositions. If there are no shared concepts found within the propositions, then the new proposition is added to the reader’s textbase alongside the other propositions and not matched. Kintsch modified this model several times and initiated a discourse about how text input may possibly activate
multiple mental representations in memory during each cycle and how, through spreading activation, irrelevant associations are dismissed and relevant ones constrained by the context are kept (Kintsch, 1988; Kintsch & Malagath, 2010). Depending on the intentions of the producer and the assumptions of the receiver, textbase can change and so each textbase is unique in this sense.

2.3.2.1 Micro-/macro-structures

Van Dijk and Kintsch (1983) adopted the terms micro-structure and macro-structure to distinguish the discourse-level meaning from the sentence-level meaning when readers form a textbase. Here van Dijk and Kintsch (1983) again discuss propositions as idea units; ways of specifying what makes up ideas in a text (Kintsch, 2004). Every word meaning usually corresponds to propositions and propositions can have embedded propositions (van Dijk & Kintsch, 1983). For example, in the sentence, ‘John has bought a computer from the market’, the atomic propositions are: P1: BOUGHT (JOHN, COMPUTER); P2: FROM (P1, MARKET) and the prime word is BOUGHT. In the example sentence above about the crying baby, WORRIED would be the prime word (see also Ratcliff & McKoon, 1978 for propositions and priming study). Hence, the micro-structure represents the idea-level format of the actual words, phrases and sentences in a text while the macro-structure is the gist of all these ideas, the topic or the theme in a given text (van Dijk & Kintsch, 1983; Kintsch, 2004).

As the macro-structures are inferred from the text and hard to show due to their abstract nature, Kintsch’s earlier work (Kintsch, 1974) initially focused on micro-structures, which provided him with more concrete evidence in terms of text structure. As mentioned earlier, this approach assumes that the text is processed in cycles due to short-term memory constraints and that a ‘textbase’, the representation of the text in episodic memory, includes
hierarchically structured propositions at the macro- and micro-level, where the former is about the abstract theme, topic and underlying motives inferred by the readers. The definition of episodic (working) memory is given as the readers’ store of experiences that are separated from their original contexts and depersonalised (Kintsch, 1974).

In the more recent versions of Kintsch and van Dijk’s model of text processing (Kintsch, 1998; Kintsch & Mangalath, 2010; van Dijk & Kintsch, 1983) this notion has been updated and the focus shifted to the significance of readers’ integration of prior knowledge (CI-1) and the context in representing textual meaning (CI-2). To further exemplify the fundamental difference between Kintsch’s CI-1 and CI-2 models in terms textbase, let us explore this through the above example of ‘crying baby’. Textbase is readers’ understanding of all the information and ideas presented in the world of the text at the micro- and the macro level. When a reader comes across the use of the word ‘baby’ and the word ‘cry’ in another sentence further on in the same text as in ‘Baby, don’t cry’ then according to the CI-1 model the readers automatically refer back to the original propositional representation (Kintsch, 1992). However, according to the new CI-2 model, the use of context meaning comes into play and the meaning of the sentence is constructed based on the contextual cues and without having to go back to the original proposition. The reader will infer that ‘baby’ in that context represents an adult rather than a child and the ‘crying’ has a different representation and a purpose within that context.

Once all above information is confirmed in the readers’ textbase and integrated with the readers’ prior knowledge (all occur continuously and parallel to each other), it is interpreted based on their world knowledge and experiences at a deeper level of textual understanding. This helps the readers to form an overall model of the events, actions, places
and people in the text also known as ‘a situational model’. This is the third layer in the CI Model of text comprehension that follows.

2.3.3 Situational level

Lastly, at the deeper, situational or interpretive level of comprehension, readers construct a mental representation, a situation model, of the events, actions and persons (van Dijk & Kintsch, 1983; Wolfe, 2005).

According to the Construction-Integration Model of text comprehension, to complete the processing of the text and for comprehension to occur, readers are continuously constructing and organising text-based information and ideas by making links between different networks and circuits of meaning and integrating these with own existing knowledge until what is called a situation model of the text is constructed. This situation model is constructed when readers integrate the textbase knowledge with their own prior knowledge to comprehend the text. They do this by creating an episodic text memory, a mental representation of a text. Readers’ prior knowledge plays a very significant role in determining their level of comprehension. Words continually activate semantic networks in LTM, and so prior knowledge is represented in some form in the ‘construction’ phase. This world knowledge also plays a top-down role in comprehension. The Construction-Integration Model is an extension of the earlier processing model described by Kintsch and van Dijk (1978; see also van Dijk & Kintsch, 1983). In the earlier model, Kintsch and van Dijk did not include knowledge use in comprehension. The emphasis according to Kintsch “…shifted to knowledge/text interaction away from the text itself…” (Kintsch, 1998). Kintsch (1988) added knowledge use when he created The Construction-Integration Model.
The model consists of two phases. The first phase is the construction of an incoherent representation model based only on the local textual input. The second phase is the integration phase, which involves shutting off the inappropriate constructions formed in the first phase and integrating the remaining constructions together as a whole within the global context. This is also described as the constraint satisfaction process. As a result, readers form mental models of the text they read by using the textual information and adding elaborations from their own knowledge and experiences. While the input from the local text itself is often considered as the textbase, the input with the readers’ elaborations is known as the situation model. The way we interpret the world in our individual, subjective way is based on our past experiences and exposure. This manifests itself in the way we perceive time and different objects, places and persons, as well as how we construct perspectives and communicate in different situations. Inevitably we develop and form a unique behaviour and knowledge structure. Similarly, when reading a text, no two people are able to interpret and understand the same text in exactly the same way and at the same level. The same person may interpret the same text differently at different points in time.

Text comprehension is a dynamic process that depends on the interaction between the reader and the world of the text at different levels. One’s knowledge structure and level of understanding of local and global language, structure and the situations represented in the text become vital at any point in time for comprehending the text. As seen in the previous section on textbase, ideas, concepts and information and the relationships between these can be elaborated and generalised to a varying extent by different readers. This indicates that the text representation, which includes the concepts and the network of relations that are usually represented hierarchically in the text, is inevitably influenced by the reader’s own knowledge
of the topic on electricity and magnets (the topic of the first text used in this study) and how this topic is represented and created in the text.

As noted by van Dijk and Kintsch (1983), imagining a particular situation whose parameters are determined by the text and working out the connections between the local and global facts are critical for understanding a text. Texts activate particular knowledge about the world that we have stored in our memory, which we have developed through our past experiences and exposure. As we have new experiences, our memories systematically make associations using clusters and add to the knowledge we stored earlier. When we read another text, the relevant part of this knowledge is activated again and retrieved from our long-term working memory. It is then used for building a new situational model or modifying an existing situational model, which relates to that particular text. Therefore, situation models are integrated frameworks made up of episodic information. Modifications of such models may lead to some form of learning (van Dijk & Kintsch, 1983).

The textbase does not include anything that is not explicitly specified in the text. The textbase is only made coherent when readers add nodes and make connections between these nodes in the network of propositions described in the textbase. Readers do this by using their own knowledge and experience, and ultimately interpret and integrate the textbase with their prior knowledge to complete the comprehension process. Readers’ prior knowledge is multifaceted and is obtained from many sources, both linguistic and non-linguistic. According to Kintsch (1998), these include readers’ knowledge of the world, knowledge about the language, and specific communicative situations.

This study argues that cultural knowledge and understanding ought to be added to the above sources. Readers need to be able to accurately interpret any cultural information or ideas in their construction of the textbase and the situational model to complete their
comprehension of the text. In constructing an appropriate and accurate situation model of the
text, these readers need to retrieve the appropriate cultural knowledge and integrate this with
the textbase for full comprehension. Although the texts created for this study did not include
specific cultural situations, it is impossible to separate cultural knowledge when interpreting
the concepts and the situation indicated in the texts. Based on the theory of linguistic
relativity, how these concepts are described or expressed by the readers is also dictated by the
structure of that language. There are some differences in the way the texts were expressed
and interpreted in this study.

Some researchers describe the meaning constructed in the situation model as
referential meaning (Côté et al., 1998) and also refer to the situation model as interpretive
(Perfetti, 1989) or as a mental model (Johnson-Laird, 1983). Johnson-Laird’s work in 1983 is
mentioned by van Dijk and Kintsch (1983) as the historical precedent for such a notion.
Kintsch, in explaining the CI Model, emphasises the fact that the construction of the third
layer of the model encourages deeper understanding of the text, which goes beyond the
textbase and merely recalling the information and the meaning units in the text, as in most
other theories of comprehension and the classroom practice of text comprehension. He
explains that the concern of such a model is to learn from the text rather than to remember it.
He also mentions, “… tests usually focus on reproduction skills of the students rather than
their learning” (Kintsch, 1994). An ‘advanced organiser’ (Kintsch, 1994) uses a situation
model to integrate prior knowledge with the information in the text. This with the structure of
the text itself facilitates learning.

To support his claims for the advanced organiser, he mentions the study of Mannes
and Kintsch (1987), which used a technical text about the industrial use of microbes. In this
study, before the participants read the text, they were given two versions of general material
on microbes. The information was essentially the same in both. However, the structure of the information of one of the background texts was organised in the same way as the target text whereas the other one was left as it appeared in the encyclopaedia from which it was drawn.

Based on the results reported through sentence verification tests, it was concluded that readers were better able to remember the target text when the background text was organised in the same way. However, the contradictory results from the inference and problem–solving tasks caused Mannes and Kintsch to conclude that if the textbase is well-organised (i.e. if it has the same organisation as the background material and the target text) the text becomes easier to comprehend, leaving no actions or gaps to be filled in by the readers. Although the readers could recall the texts because of the well-structured textbase, they could not infer or complete problem-solving activities, which were linked to the macro-structure or the situation model of the text. The contradictions between the target text and the background material forced readers to seek alternative ways of constructing the situation model or to seek a new macro-structure of the text to complete the learning process (Mannes & Kintsch, 1987; Kintsch, 1994).

For testing the second hypothesis, another reading text, China and Australia was produced together with its three manipulated versions. The local coherence structure of these three texts was manipulated and distorted to find about the effect of such manipulation of text coherence on reader performances. Like Vygotsky’s theory of learning, which describes the Zone of Proximity of learners as a necessary condition for learning, Kintsch (1994) talks about determining a text’s ‘zone of learning’ for the readers, which involves the readers’ active processing and the integration of their knowledge. Hence, if the text content and the structure are not too difficult or too easy for the reader and the reader is able to actively construct a situation model, then the learning will take place (Kintsch, 1994).
There are many studies in the academic literature on text comprehension, which support van Dijk and Kintsch’s (1983) model (Perfetti, 1989; McNamara et al. 1996; Graesser, Gernsbacher, & Goldman, 1997; MacClellan, 1997; Goldman & Rakestraw, 2000; McNamara, 2001; Wolfe & Goldman, 2005; Long, Wilson, & Hurley, 2006). This study is also interested in examining the implications of the CI Model of text comprehension that is based merely on the discourse structure of and the propositional analyses in English in relation to the readers of a logographic and morphosyllabic language like Chinese today. Therefore, it aims to look at the possible similarities and the differences on such mental representations in text comprehension offered by van Dijk and Kintsch (1983) between
Chinese and English language readers. Besides investigating the nature of mental representations and text comprehension processes, the study also aims its focus at another important aspect of text comprehension in the second phase of the research; that related to the influence of local coherence and prior knowledge on text comprehension. This follows on directly from Kintsch’s theoretical framework of the Construction-Integration Model of text comprehension (Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983; Kintsch, 1988, 1998). According to this model, prior knowledge and local coherence are very good indicators of high-level reading ability and learning from text.

Readers with prior knowledge of the text topic are more likely to comprehend and learn from the text than readers with less or no prior knowledge. At the same time, highly competent readers act like problem solvers as they read locally low coherent text and they use this more to their advantage than less competent readers who are constrained by the limited syntactic and semantic resources to draw from when reading low coherent texts (Beck & McKeown, 2001; Kintsch, 1994, 1998; McNamara, 2001). The effect of coherence on text comprehension is investigated comparatively for Chinese students reading Chinese and English students reading English in the second part of the study. The second part involves the above two groups of participants completing prior knowledge interview questions and reading one random version of a text out of four different coherence versions discussed above. The next section will provide an overview of other studies conducted on the role of text coherence and prior knowledge on text comprehension.
2.4 Text Coherence and Prior Knowledge

Some of the earliest research on text comprehension aimed to describe proficient reader profiles and looked at reader characteristics (i.e., word recognition skills, domain knowledge, active memory capacity, etc.) that would together constitute a competent reader (Bransford & Johnson, 1972; Spilich & Voss, 1979). Such studies and others that followed (Long et al., 2006; Means & Voss, 1985) reported the importance of readers’ prior knowledge in predicting reading proficiency. However, as the reading process started to be seen as a more complex, two-way interaction between reader and text, studies began to investigate the influence of the properties of the text itself (i.e., text genre, text structure, text coherence etc.) rather than merely the readers’ characteristics in explaining reading proficiency (Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983).

In other words, researchers began to incorporate an independent effect on the role of text organisation and structure as they attempted to explain the differences in performance across readers. This is also relevant to the framework and methodology of my study as the focus here is to investigate differences between Chinese first language readers and English first language readers in text processing and the role of text structure and summarisation strategies.

Typically, coherence refers to the nature of the mental representation of the text, and cohesion refers to the extent that the passage is considerate and well-constructed. Coherence is an important characteristic of texts and van Dijk and Kintsch (1983) distinguish between two levels of coherence in a text, local and global. Local coherence depends on how well the information in sentences is integrated and global coherence refers to how well the ideas in the text are understood to make sense of the underlying theme or the global idea in the text. In
recent studies (McNamara et al, 1993; McNamara et al, 1996; McNamara, 2001; Long et al., 2006) the influence of text coherence and prior knowledge was further investigated.

In a study by McNamara et al. (1993) of 6th and 8th Grade students, the participants were identified through a screening test and were divided into low- and high-level knowledge groups. These students were then given a 683-word reading text on heart disease to perform a recall of text ideas and answers to text-based questions to elicit explicit information in the text. These were chosen as the performance measures that partly reflected the textbase and the situation model of the readers. High-knowledge readers outperformed the low-knowledge readers on both tasks but the results did not provide a clear picture of the readers’ textbase or the situation models. McNamara et al. (1993) used the responses to the inferential questions as well as a key word sorting task to get a clearer picture of the readers’ situation models. As a result, high-knowledge readers once again outperformed the low-knowledge readers but compared to 50% difference in the textbase linked questions, they performed 200% better on the tasks related to the situation model.

A more important aspect of this study was related to the text coherence tasks. The authors produced a more coherent version of the text by adding more elaborations and explanations at both local and global levels of coherence. The data, not conclusive in nature, identified three separate patterns; including one finding that there is no effect of coherence on performance (McNamara & Kintsch, 1996; McNamara, 2001; Long et al., 2006). Nevertheless, it was the success of high-knowledge readers with the low-coherence version of the text that attracted more attention and confirmed the assumption that the low-coherence texts induce more active processing. This provided high-knowledge readers with an advantage in constructing their situation models because high-knowledge readers could fill in the gaps in the less-cohesive versions (Kintsch, 1993; McNamara, 1993).
According to these results and some others that followed, readers’ prior knowledge dictates the effect of text coherence on comprehension (McNamara & Kintsch, 1996; McNamara, 2001; Long et al., 2006). In addition to this study by McNamara et al. (1993), there are several other studies that link the remodelling of the text (addition, elaboration, explanation etc.) directly to improvement on comprehension levels (Britton & Gulgoz, 1991; McKeown, Beck, Sinatra, & Loxterman, 1992; McNamara, 2001; McNamara & Kintsch, 1996; McNamara, Kintsch, Songer, & Kintsch, 1996). Results from these studies support the important role of coherence on text comprehension.

In a more recent study, Long et al. (2006) used two experiments to investigate the influence of domain knowledge and text coherence on textbase and situation model representations. The study also aimed to investigate the new suggestion that the readers’ text representations can be assessed through recognition memory and the different processes involved in constructing textbase and situation model may be responsible for the differences in readers’ memories about the text ideas (Long & Prat, 2002). This recognition is also based on the dual-process model of recognition memory (Coltheart et al., 2001) and involves the two processes of recollection and familiarity. The study by Long et al. (2006) is of particular interest to this study, which also assumes that different textbase and situation model processes exist for Chinese first language readers and English first language readers and the possibility of these resulting in different qualities of memories for the text ideas. In the first experiment of Long et al.’s study, 108 undergraduates were given an initial screening test about the film *Star Trek* for the purpose of determining who were the low- and high-knowledge readers. The participants then read low-coherence and high-coherence texts about *Star Trek* and completed a recognition test in the end in which they were asked to distinguish between old and new sentences and made remember-know judgements. For the second
experiment the authors adapted Jacoby’s process-dissociation procedure (Jacoby, 1991), which included inclusion and exclusion familiarity tasks to look at the contribution of the memory on recognition and had 240 undergraduate students reading the low-coherence and the high-coherence texts from the previous experiment.

Long et al. (2006) reported a failure to find any effects of knowledge and coherence on familiarity estimates made by the participants and this result was inconsistent with the previous studies mentioned above. One explanation given was the fact that the coherence of the narrative texts they used may be easier when constructing a textbase rather than expository texts, which were used by McNamara et al. (1996). However, Long et al. (2006) did find quantitative effects of knowledge in both experiments as well as qualitative differences between low- and high-knowledge readers. High-knowledge readers again outperformed low-knowledge readers and showed a more vivid sense of memory to text ideas in reading Star Trek texts (Long et al., 2006). One explanation of such high skill in reading comprehension is that when the verbal processes are at a lower level, they free up space in memory capacity, making it possible for more conscious and effective inferential processing (Perfetti, 1985). The results point towards and confirm the different and multiple levels of understanding amongst the readers consistent with Kintsch’s Construction-Integration Model. However, researchers still disagree on the precise nature of this activation that takes place (Weaver & Kintsch, 1991). Are there any other linguistic and non-linguistic factors that influence the activation of readers’ knowledge and its integration with the text information? This study aims to reveal any such factors by studying text comprehension of readers in a logographic and morphosyllabic language who have a different cultural knowledge and background.
2.5 Reading in Chinese

As the primary objective of this study is to compare Chinese language readers’ text comprehension with English language readers, it is significant to look at the studies completed in this area of research.

It is perhaps a paradox to note that despite being a language with a vast speech community, counting the largest number of native speakers (over 1.197 billion, (Lewis et al., 2015)) and an ancient unbroken literacy tradition, there is relatively little research on many aspects of reading Chinese. This is all the more unusual given that Chinese depends on a radically different orthographic assumption from the alphabetic basis of English and most Western languages. Reading comprehension research on the Chinese language is either not reported in the literature as well as it should be, or there are not many studies completed in this area of research.

Most research undertaken on Chinese reading seem to focus on orthography, vocabulary, word identification and the unique Chinese sound system, phonology and intonation and relatively few on semantic processing (Chen, Weckes, Pen, & Lei, 2007). McBride-Chang and Chang (1995) also talk about a need for a reading comprehension study among Chinese students, which may determine if there are universal cognitive processes or whether language/orthography or culture-dependent ones predominate (see also Stevenson et al., 1985). Certainly, there seem to be no studies of a comparative nature completed using Kintsch’s model of text comprehension or on the role of coherence on text comprehension of Grade 5 and Grade 8 readers which share the aims of this study. However, there should be more comparative studies of this nature to improve our current understanding of text comprehension theories and pedagogical practices at schools. This is more crucial than it has ever been considering the rapid change in the nature of modes of language and the roles of
readers in a highly globalised environment today. Before considering the studies on Chinese language readers’ comprehension, it is first useful to examine the general characteristics of the Chinese language to better understand the text comprehension processes of Chinese native speakers discussed later in this chapter.

2.5.1 Chinese language system

Like Japanese and some other Indo–Chinese languages and languages of Asia, Chinese uses a logographic and morphosyllabic language system. This means that written Chinese uses characters, not an alphabet, as an orthography or script. There are approximately 60,000 separate characters of which many are made up of proper nouns and archaic words not used very often. Hence, it is possible to read and write 99% of modern Chinese with 2,400 characters (Guan et al., 2016). Each character in Chinese maps into a single-syllable morpheme in the spoken language, not a phoneme. A morpheme is the smallest unit of meaning in a language. In written Chinese, words are usually made up of two or more characters (Stevenson, 1984) but it is also possible to have one character representing one word (Perfetti & Liu, 2006; Cheung, Chang, & Chong, 2007). An example of a morpheme in spoken English is the –ed affix added to the end of appropriate words to create the meaning for past tense, as in ‘cook-cooked’ or ‘help-helped’.

A significant difference between the English writing system and the Chinese writing system is that Chinese characters are divided into single character units and compound characters. Compared to this, only 26 letters needed to write English and 44 sounds to read. Single characters in Chinese are of a holistic pattern of strokes and not divided into smaller units of orthography. Conversely, compound characters are made up of smaller orthographic units also known as radicals. These radicals have no correspondents in English and may carry
pronunciation and/or meaning depending on their position within the character as is shown in
the examples below (de Courcy, 2002; Perfetti & Liu, 2006; Cheung, Chang, & Chong, 2007;
Chen, Weekes, Pen, & Lei, 2007). Compound characters make up 90% of modern Chinese
characters (Li, 1993; Cheung, Chang, & Chong 2007).

Chinese has two different types of compounds, a simple compound consisting of a
single meaning unit and a phonetic compound consisting of two separate radicals; a semantic
radical and a phonetic radical. Eighty to eighty-five percent of Chinese characters are
phonetic compounds (Perfetti & Liu, 2007; Zhou, 1978). Radicals can be non-pronounceable
but still carry meaning. For example, in 江 ‘a river’, 氵 is a non-pronounceable semantic
radical indicating that the meaning of the character is to do with ‘water’ (Cheung, Chang, &
Chong, 2007).

Most radicals are structured in two ways, left-to-right or top-to-bottom. In left-to-right
radicals, the right one is the semantic radical and the left one is the phonetic radical. With the
top-to-bottom radicals, the top radical is the semantic one and the bottom radical is the
phonetic one. For example, in 花 ‘flower’ pronounced /faa1/, 芽 on the top is the semantic
radical meaning ‘plant’ and is non-pronounceable and 化 meaning ‘change’ is also
pronounced as ‘/faa1/’ and is the phonetic radical. An example of a multi-character word in
Cheung, Chang and Chong’s study (2007) is 飞, which on its own represents the verb ‘to fly’
but when it is joined with another character 机, a noun that means ‘a machine’, it forms a new
meaning 飞机 ‘an aeroplane’ as a morpheme in a multi-character word. There is also an
educational implication of this feature as some suggested that the large number of such word
formations and compounds in Chinese is also responsible for rote memorisation approach in
Chinese language acquisition (Freebody, 2007).
Based on these distinctive features of Chinese language, some researchers claim that visual memory is more important than verbal memory in Chinese reading comprehension (Chen & Wong, 1991; de Courcy, 2002, McBride-Chang & Chang, 1995). In 2007 Cheung, Chang and Chong concluded that access to meaning when reading Chinese language is not facilitated by phonology or speech as in English but by semantic radicals (Hung & Tzeng, 1981; Schmitt et al., 1994; Stanovich & West, 1989). The above distinctive features and the large number of multiple meanings of words in spoken Chinese mean that information processing in Chinese relies more on the context than perhaps in English for distinguishing homophones at this level of processing (Tavassoli, 1999). Hence, the Chinese language, along with other East Asian languages, is ‘contextual’ in nature (Nisbett, 2003).

Another important difference between the Chinese and English languages is the fact that Chinese does not distinguish clauses as finite or non-finite as in English (Tsao, 1983, p. 102). A finite clause is a clause that can stand on its own in terms of its meaning and non-finite clauses cannot. Non-finite clauses usually take to + infinitive or –ing verbs or bare infinitives without the ‘to’. Examples for non-finite clauses may include (bold letters):

1. **Having been there once**, I refused to go again. (-ing)
2. I will be there **to pick her up**. (to + infinitive)
3. Laura made me **cut it**. (bare infinitive – ‘cut it’ instead of ‘to cut it’)

One cannot deny the importance of context for comprehension. This is also why context forms a significant part of Kintsch’s theory (1998) of text comprehension. Along with the earlier study by Barclay et al. (Barclay, Bransford, Franks, McCarrell, & Nitsch, 1974), Kintsch and Malagath (2010) also emphasised the crucial role of context in constructing meaning from the text. They suggested that it is the context that determines what is relevant and not the long-term memory. As it underpins the theoretical framework for this study, this
notion of comprehension processes for Chinese readers and in particular text comprehension processes described within the context of Kintsch’s semantic model will also be discussed in detail in the section below.

2.5.2 Chinese text comprehension processes

Studies by Schmitt et al. (Schmitt, Pan, & Tavassoli, 1994) and Tavassoli (1999) comparing the temporal and associative memory use in English and Chinese propose that the structural differences such as the orthography, word formation and visual processing of text that exist between the two languages also influence the mental representation of meaning in memory for these two languages. Although the studies reported the differences based on single words, this may also have implications for text representation and comprehension when reading-to-learn in both languages.

In addition to the structural differences above, which are well established in the literature, Steffensen, Goetz and Chen (1999) mention compelling evidence from many studies that readers displayed more appropriate elaborations and comprehension when they read a text familiar to their culture than vice versa. Nisbett (2003) also reported this as evidence from a previous study with Chinese and American bilingual college students in the US, Taiwan, Singapore, Hong Kong and China. Here, the students were given word triplets to categorise and it was found that culture had a profound effect on their responses. As a result, when tested in both English and Chinese, Chinese students preferred grouping the words based on their relationships (monkey-banana) rather than taxonomic category (monkey-panda) as the American students did. Nisbett (2003) concludes that mental representations of the world, which in turn may result in making different inferences, may be different in one
language than in the other. If this is the case, this may perhaps also reflect on the inferences the students are likely to make in the present study.

After examining about 600 essays, Kaplan (1966) concluded that foreign students from different language backgrounds have different thought patterns, which explains their organisation of thoughts in paragraphs. When it comes to Chinese and English thought patterns, Kaplan claims that Chinese thought patterns tend to be indirect and this is reflected in its contrastive rhetorical model when writing, which is different compared to English (Kaplan, 1966, 1997). Kaplan’s contrastive rhetoric theory (Kaplan, 1997) which has its roots in Whorfian hypothesis on language and thought, suggests that the logic which is used in organising ideas and information in written texts is influenced by culture. Therefore, information and ideas on the same event are perceived and organised differently in writing by first language speakers of different languages. It is also relevant here to mention the well-known four-part pattern commonly used in organising paragraphs in Chinese writing. The four-part pattern, qi-cheng-zhuan-he respectively refers to:

qi: ‘beginning’; introduction of topic,
cheng: ‘hook up’; elucidation of topic,
zhuan: ‘turning; turning to another viewpoint, and
he: ‘coming together’, ‘closing’; summary of conclusion (Chen, 2007)

Mo (1982) reported in the findings of his research that the four-part pattern was the most common principle of paragraph organisation in Chinese. As this study employs summary tasks for both Chinese and Australian students, and also aims to investigate the role of coherence in comprehension, the differences in thought patterns between the two groups is of particular interest. Hypothetically, based on the above findings, the participants in this study may have different mental representations of the same text read as a result of their
cultural world knowledge structure and make different inferences in response to the tasks presented to them. These are discussed in further detail in Chapter 5. In their study of Chinese primary school students’ reading comprehension in Hong Kong, Chan and Law (2003) explored the roles of metacognitive beliefs and metacognitive strategies on reading comprehension. Chan and Law used questionnaires and text comprehension tasks to investigate 304 Grade 6 students’ beliefs about their own learning as well as the strategies they use when constructing meaning from text. They collected data from two public primary schools and found that the roles of the metacognitive beliefs of their Cantonese-speaking Chinese readers in reading Chinese were not different from the previous studies’ findings in reading English texts.

Based on the findings of their research, Chan and Law (2003) suggested that the ways in which Chinese language readers constructed the propositions (idea units) and situations in the text as well as the nature of their cognitive processes were similar to English language readers. As they also acknowledge at the end, Chan and Law’s study (2003) as well as Law’s (2008) study of Chinese children’s constructive activities there is the need for further confirmation in a comparative study, which needs to involve first language readers from Mainland China rather than from Hong Kong and which also compares students of different age groups. As a comparative study with first language readers of different age groups from Mainland China and Australia, this study does exactly that and investigates the cognitive processes and constructive efforts of Chinese and English students from Grade 5 and Grade 8, and further examines the role of local text coherence as a critical factor in text comprehension for both language groups. However, it is important to note about the cohort that although the readers are first language readers, their backgrounds naturally vary as in many other studies of this kind. Readers in Australia as a very multicultural country were all
born in Australia but had different ethnic backgrounds. It was the same with the participants in China, although all the participants were born in Mainland China and had Chinese as their first language, their ethnic background also varied. The study’s motivation for selecting Grade 5 and 8 is the need to know more about middle years readers’ literacy.

2.6 Conclusion

Reading research has come a long way since the initial studies of recitation and recall of word lists. In the reading literature, the old isolationist, bottom-up view of reading comprehension was to “proceed letter by letter to unlock sounds and combine them into words, then string words into sentences…” The more recent view of decoding is defined as “…the means to the goal not the end itself…” and the emphasis is more on “…active construction of meaning from text” (Tracy & Morrow, 2006). Although recognition of sounds, words and sentences is still seen as a necessary component of reading, the research has moved beyond this to viewing reading as an active problem-solving process strongly influenced by readers’ interests and knowledge background as well as by their problem-solving capabilities at different levels of reading.

Readers require challenging texts to actively build on their comprehension, not merely completing a mechanical translation from written to oral code. This change to studying readers as active participants rather than passive processors of information in reading commenced when Bruner’s work on Schema Theory (Bruner, 1957) shifted the emphasis to the “…crucial role of existing knowledge as the basis for organising new input and drawing inferences”. This approach, where readers are active constructors of meaning and text features play a significant role in comprehension, entails both bottom-up and top-down processes. This is the approach adopted in this study, which leads the way for future research in text comprehension.
Chapter Three: Methodology

Chapter 2 reviewed the relevant text comprehension research for both language readers and explained the rationale for the theoretical framework which underpins this study. Chapter 3 will reintroduce the two hypotheses to be tested before outlining the information about the selection of participants and materials as well as the task design and data collection.

3.1 Hypotheses Revisited

The hypotheses being investigated were noted earlier in the literature review. They will be revisited here to assist with reference in relation to the justification of methodology and analysis of the data. The two hypotheses to be tested by this study are:

1. The differences between Chinese and English orthographies and their readers’ conceptual and cultural knowledge influence the ways they process the text information, use strategies and construct a mental representation. How are the text comprehension processes - construction of a textbase and a situation model described by Kintsch (1998; 2004) - used by Chinese and English language readers when they read-to-learn at Grade 5 and Grade 8?

2. If the effects of text coherence were universal then the manipulations of text coherence would influence each reader’s text comprehension regardless of their language. Does local text coherence also influence the performance of Grade 5 and Grade 8 Chinese language readers?

Each hypothesis above was examined through a series of tasks, which are described in this chapter.
3.1.1 Hypothesis 1

The first hypothesis was tested through the investigation of two text processes:

1a. constructing a textbase

1b. constructing a situation model

This study aims to identify, describe and compare English and Chinese language readers’ text comprehension through its investigation of these two processes and readers’ levels of constructive activities. The tasks, which are used to investigate and compare readers’ construction of the textbase, were:

1) cloze task

2) think-aloud protocols

3) summarisation

The study designed the above tasks instead of T/F or short answer questions similar to other studies because T/F type of questions would not yield adequate information on reader’s mental representations and inferences thought to be stored in the situation model. In contrast the scope of selected tasks above which are mainly linked to CI model is more appropriate in terms of providing immediate information on readers’ cycles of construction of textbase and integration of prior knowledge. The responses in the cloze and summarisation tasks were scored in terms of the micro- and macro-structure of the texts. The think-aloud responses were scored based on the constructive activity scale adapted for this study from Chan et al. (1992). This scale is used for rating readers’ think-aloud responses based on the level of their constructive activity displayed in each response. The cloze, think-aloud and summarisation tasks all aim to reveal types of cognitive and metacognitive strategies readers use when processing textbase information.
The second text comprehension process investigated for testing Hypothesis 1 relates to the situation model of the text. This is the integration of readers’ prior knowledge with the textbase information to construct an overall mental representation of the meaning in the text. The tasks used to measure and compare English and Chinese language readers’ situation models were:

1) prior knowledge
2) prediction
3) adding titles
4) adding sentences

Readers’ prior knowledge of the topic ‘Electricity and Magnets’ was examined as one of the key factors which influences readers’ construction of the situation model. Readers with high level of prior knowledge are known to also achieve higher comprehension. The prediction task was used for examining the readers’ ability to predict the topic by integrating their prior knowledge and textual information on the cover page. This provides information on metaphorical concepts and the differences in their interpretation by the two language readers. Adding titles and sentences to the marked paragraphs required readers to use and integrate their prior knowledge with textual information such as the main ideas in the text which is considered necessary for forming a situation model. Readers will need to use their existing knowledge and add non-existing titles and sentences to the text.

3.1.2 Hypothesis 2

The second hypothesis relates to the influence of local text coherence on English and Chinese language readers’ text comprehension. This was achieved through comprehension
and summarisation tasks completed in response to four different coherent versions of the second text, *China and Australia*. The tasks used for measuring this were:

a) Three-level guide text comprehension questions

b) 50-word summary

Loyal to the CI Model, comprehension tasks were designed to measure readers’ understanding of textual information at different levels. The three levels roughly reflect Kintsch’s three levels namely, Linguistic, Conceptual and Situational levels. The three-level guide was used to design and score the results of the comprehension questions. These levels were Literal, Inferential and Applied, with Literal being the easiest and Applied the most difficult as it required the use of prior knowledge. The readers’ responses were scored based on the level of difficulty of each question described for each level. A 50-word summarisation was included as the final task for measuring the influence of local coherence on text comprehension. Readers’ 50-word summaries of the text were scored using the Constructive Activity Scale to measure the level of their constructive activity and examine whether local coherence also influences readers’ constructive activities compared with their comprehension.

### 3.2 Participants

The total of seventy-two students who participated in the study were all middle years students and included 34 males and 38 females. Gender was not considered as one of the variables for this study. Overall, 60 students participated in the first part of the study and an additional 12 students in the second part. Students in Australia had English as their first language and, as Australia is a multicultural country, they had a diverse range of backgrounds. This was also true for students who took part in the study in China. China is
also very multicultural with 52 different ethnic and cultural communities. For example, one third of the local population in the autonomous province of Ningxia, where the study took place, is made up of Hui Chinese who have a Muslim background and are not Han Chinese. All students agreed to take part in exchange for small cultural gifts from both countries as inducement.

Part 1: For the first part, 60 students, 15 Grade 5 and 15 Grade 8 students from China and 15 Grade 5 and 15 Grade 8 students from Australia, participated in the study.

Part 2: 48 out of the sixty students who participated in the first part of the study were included in the second part of the study. This meant that within each language group, there were 12 participants in each Grade level and within each grade level there were 4 participants from each of the three reader categories (Above Average, Average and Below Average). This was to ensure each Grade 5 and Grade 8 reader was given one of the four coherence versions of the passage, *China and Australia*, a prediction task sheet and a series of three-level comprehension questions.

Hypothesis 2 – The Control Group

In addition to the 48 students, an additional 12 Grade 8 Chinese language readers were selected to participate in the second part. These 12 Grade 8 Chinese language readers were also from the same school in China and were treated as a control group to allow for further comparison in the second part of the study. The students in the control group were only asked to read the English versions of the texts and complete the tasks only in English. This was because the main focus of the second part of the study was to investigate the influence of text coherence on the performance of the Chinese language readers.
3.2.1 Selection of schools

Schools in each country were selected based on the index for the socio-economic status of the parents of the students living in the area as well as the proximity between the primary and secondary schools. Primary and secondary schools in both China and in Australia were in the same vicinity, in other words within the same campus but separate from each other. These were Narre Warren South P-12 College in Melbourne, Australia and Tang Lai Hue Middle School and Tang Lai Hue Primary School in Yinchuan, China. Both primary schools were feeder schools for the secondary schools. Hence, all of the Grade 8 students who participated in the study came from the primary school where the Grade 5 students were enrolled.

3.2.2 Selection of students

The classes were selected and students were placed into different ability groups based on their scores in the latest national testing for both year levels in each country. These tests were The National Assessment Program – Literacy and Numeracy (NAPLAN) in Australia and National Chinese Language Test (NCLT) for Grade 5 and Grade 8 students in China. Both tests are intended for large populations, are crude and have significant limitations for individual level assessment. Nonetheless, they are frequently used in this way by schools in both countries and for the purposes of this study, they are sufficient to provide the spread of ability required to define the three categories of readers, Above Average, Average and Below Average.
The researcher worked with the teachers to analyse the confidential data with the written permission of the parents and the schools in both countries. Written acknowledgement and official permissions were also obtained from the education departments in both countries to access this information. The analysis of students’ scores and the identified levels of both Chinese and English language readers were used to describe three levels or bands of reading comprehension for the purpose of this study as below.

**Above Average (AA)** (Advanced, high-skilled readers)

**Average (A)** (Intermediate)

**Below Average (BA)** (Weak/low-skilled readers)

The reading ability levels used to describe each student were also confirmed with their Chinese and English teachers. The titles used interchangeably to refer to each ability group within the study are as listed below. Student codes used for referring to different readers consist of ethnicity of the readers, grade, ability group and the rank within the group. For example:

**AS8_BA_5** = Grade 8 Australian student ranked fifth in Below Average ability group

**CS5_A_3** = Grade 5 Chinese Student ranked third in Average ability group

**AS5_AA_2** = Grade 5 Australian student ranked second in Above Average ability Group
Table 2

2. Ability Category Selection Bands

<table>
<thead>
<tr>
<th>Language</th>
<th>Grade Level</th>
<th>Reader Category</th>
<th>Selection Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>English NAPLAN</td>
<td>Grade 5</td>
<td>AA</td>
<td>3.75-4.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>3.25-3.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA</td>
<td>2.25-3.00</td>
</tr>
<tr>
<td></td>
<td>Grade 8</td>
<td>AA</td>
<td>4.75-5.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>4.25-4.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA</td>
<td>3.50-4.25</td>
</tr>
<tr>
<td>Chinese National</td>
<td>Grade 5</td>
<td>AA</td>
<td>81-100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>61-80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA</td>
<td>41-60</td>
</tr>
<tr>
<td></td>
<td>Grade 8</td>
<td>AA</td>
<td>92-117</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>66-91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA</td>
<td>40-65</td>
</tr>
</tbody>
</table>

3.2.3 Selection of teachers

Teachers of each year level who also administered the tasks were the students’ English language teachers in Australia and Chinese language teachers in China during the time of the study. In addition, native teachers not only had an excellent grasp of the language but also a very good understanding of the culture as well as the reading behaviours of the participants. The data suggests that this was successful, as there were only two students who spoke with long pauses or hesitation during the course of the study. The English teacher of the same group of students in China also took part in the study. His Grade 8 students who had already completed all the tasks with their Chinese teachers in Chinese also read and
completed the same tasks in English as the control group. The results for these students are discussed in Chapter 4.

3.3 Materials

Two reading texts were developed for the study, *Electricity and Magnets* and *China and Australia*. Both texts were written in the expository style by the researcher following a thorough examination of textbooks in both countries. Expository text style and the structure were found to be more or less the same in both English and Chinese. This was done to reflect the majority of texts students typically study across all subject areas during their middle years of schooling in both China and Australia.

3.3.1 Readability measures

The texts used in the study were designed and written by the researcher and were appropriate for the readability levels of each age group. The researcher both drafted and edited each text to ensure suitability for the groups. In doing so, the Flesch-Kincaid Grade Level Readability Measure was adapted to confirm the readability levels for each text and grade level in English. The translation was checked and confirmed for any possible discrepancies by three qualified, English- and Chinese-speaking independent translators. They were also educators and two were studying towards a PhD in education. This measure was taken in order to overcome the differences in both languages and minimise the limitations of translating a text.

Chinese texts were also sent and trialled in China by students at two independent schools other than the schools selected for the study. Following this, teachers from the schools provided feedback on the tests for each grade level. In addition, the Chinese
Vocabulary Profiler (Version 1.0 Beta) (Da, Jun, 2004), which rates the relative frequency of difficult words in Chinese texts, was also applied to the translated texts across the two grade levels. All this ensured that the texts written in Chinese were compatible and were age and grade level appropriate for Chinese language readers and similar to the ones written in English.

3.3.2 Text 1: Electricity and Magnets

The text *Electricity and Magnets* included separate information on the background, the nature and daily uses of electricity and magnets. It concluded with a paragraph on electromagnetism. The author’s intended underlying message was although electricity and magnets are useful in our lives; they are much more useful when they work together. Therefore, electromagnets are more useful than magnets or electricity alone. Students in both countries learnt about the topic electricity and magnets as well as electromagnetism as part of their middle years’ curriculum. Therefore, they all read similar expository texts on this topic as part of their Science class. The rationale for choosing such a topic for this study was to increase the reliability of the text and to ensure that all students bring prior knowledge on the text topic, as this was one of the variables investigated in the study. This was done to determine whether prior knowledge, as mentioned in Kintsch’s CI Model of text comprehension theory (Kintsch, 1988), is a significant factor in text comprehension. Hence, students in both language groups, who score high in the prior knowledge interview questions, may also be the students who achieve high comprehension scores.
3.3.2.1 Micro- and macro-structure

For eliciting evidence of thinking processes and strategies for both Chinese and English language readers, every 12th word and in total 57 words were left out in both the Chinese and English language versions of the text for each year level. The text was first written in English and then translated into Chinese. The Chinese translation of the text also had 57 gaps, which suited the structure of Chinese characters and the overall purpose. Bilingual professional translators confirmed the structure of the translated texts to be very similar to expository texts studied in Chinese schools.

The information in textbase (network of propositions which make up the information base of the text at the conceptual level- see Chapter 2, p.42) is represented at two different levels of conceptual abstraction within the text structure. These are described as micro- and macro-structures. The micro-structure includes more specific and detailed information presented in propositions within and between sentences. In contrast, the macro-structure of a textbase includes the main ideas in each paragraph, inferred subtopics and subheadings (see Appendix C for micro-structure, Level 5 and macro-structure, Levels 1-4) as well as, for example, their hierarchical, parallel and/or sequential relations between paragraphs. This requires a higher level of processing (such as inferencing), and activation of and integration with readers’ prior knowledge (Melissa & Meyer, 2011, p. 68). For the purposes of the study, the words which were left out in the text were classified to belong to either the micro- or macro-structure of the texts (see Table 20 in Appendix B for the lists of missing words) depending on whether they link to the text’s micro- or macro-structure (Kintsch & van Dijk, 1978; Kintsch, 1988, 1998). These words or lexemes provide information or hints about the nature of particular constructive reading activities, thinking processes and strategies, which include micro- and macro-processing of the text at the conceptual level described by
Kintsch’s CI Model of text comprehension (van Dijk & Kintsch, 1983; Kintsch, 1988, 1992). In other words, they indicate whether readers are able to comprehend the main ideas and relations in the text at a higher macro-conceptual level or only comprehend words, basic ideas and their relations at the micro-conceptual level (see Chapter 2, p. 40).

The missing words, which linked to comprehension at the micro-conceptual level and are part of the micro-structure of the text, are words, which are described as automatic for most readers in that language and which provide grammatical and semantic information at sentence level or between sentences through references. Hence, they may be words, which have appeared once or more in the preceding propositions in the text. These words are necessary for maintaining local coherence at the propositional and sentence level. Therefore, conjunctions such as ‘and’ ‘but’ and ‘then’ assume knowledge of relations within and between the propositions and sentences and do not refer directly to the main ideas between the paragraphs or ideas underpinning the whole text (e.g., Electromagnetism, history of electricity, magnets). They refer to micro-level information and conceptual relations between the propositions within the same paragraph.

On the other hand, the missing words which linked to comprehension at the macro-conceptual level and are part of the macro-structure of the text required higher-level processing of textbase information and relations as well as knowledge of the text at a more global, macro-level. These mainly included content words or lexemes of which some required the use of readers’ existing knowledge about the text information and words which link directly or refer to the main ideas in the text. Words such as ‘discovered’, (gap 46) in the Grade 5 text, not only required basic grammatical knowledge of the past tense making morpheme /-ed/ in English (micro-structure) but mainly semantic knowledge of the actual concept that would best suit the relevant meaning within the context of the underpinning
topic of the paragraph and the text in general. Students, who were not able to process the information at this level, provided responses such as, ‘used’ and ‘invented’. In addition, other words such as ‘energy’, ‘electrons’ and adjectives such as ‘long’ and ‘magnetic’ were considered as part of the macro-structure of the text because they also assumed specialised prior related knowledge on the topic. These concepts expressed through these words did not appear or were not referred to in the preceding propositions or sentences within the text.

3.3.2.2 Limitations of the study

One of the limitations of the study is composing the texts in English and translating them into Chinese rather than using an authentic Chinese text. This, however, allowed for more detailed and targeted comparison between English and Chinese language readers using the CI Model as its theoretical framework. Some particular strategies employed by Chinese language readers during the cloze task would not have been possible with an authentic Chinese text. It is similar strategies such as these, which this study aimed to reveal in supporting Chinese language readers’ learning in English.

The translators were able to maintain the textbase with the same micro- and macro-structure in the original text. This meant that the information at the conceptual level was represented in the same way as in the original. The translators were given the micro- and macro-structures of the two original texts for each year level (see Appendix C) and the concepts of micro- and macro-structures were explained at a number of meetings. Once the translations were completed, all three qualified translators who were all bilingual in English and Chinese checked these independently. Therefore, the study achieved the desired purpose of eliciting information of the particulars of text processing maintaining its natural flow. This meant that some gaps in the Chinese texts were unavoidably positioned differently in a
sentence and required different words than the ones in the English version. This was due to
the natural flow of the language, its different orthography and word order. In other words, the
gap for the same word may be placed in the middle of the sentence for one language and at
the end for the other because of its word order. In addition, Chinese grammar is quite
different as there is no tense for verbs as this and other inflections are expressed through
other parts of speech, unlike English. It is important to note that for the purposes of this study
the focus was on maintaining a similar micro- and macro-structure in both languages and the
position of the gaps in the texts did not affect these.

3.3.3 Text 2: China and Australia

The second text called China and Australia, also written by the researcher, was about
the distinctive but similar journeys of the national identities of China and Australia as distinct
nations. This shorter text included information on the geography, history, government and
economy of each country. With this second text, the study aimed to investigate the role of
local text coherence in text comprehension. Local text coherence is defined as the
connections between the different idea units in the text (van Dijk & Kintsch, 1983).

Similar to the first text, this text reflected the type of texts and topics commonly
studied during the middle years of schooling (Grades 5-9) in both countries. The topic and
subtopics were also kept similar to the study by Eileen Kintsch (1990), which shared a similar
theoretical framework and objectives with this study. That study also investigated Kintsch’s
text comprehension processes, looking at the development of summarisation skills of 96
Grade 6, Grade 10 and college students through their reading of an expository text called
Peru and Argentina. In her study, Kintsch explored the nature of students’ mental
representations and inferences by altering the text difficulty and the tasks.
This study also altered the levels of difficulty of the text by creating four versions of the same text. Although the task sheet and the tasks were kept the same for all four versions, the local coherence of the text was methodically manipulated in terms of its micro- and macro-structures to produce four distinct versions that varied in their local coherence. Each one of the four versions of the second text, *China and Australia* below is described in more detail in the next section.

1. Good Macro/Good Micro
2. Good Macro/ Poor Micro
3. Poor Macro/Good Micro
4. Poor Macro/ Poor Micro

### 3.3.3.1 Good macro/good micro

This is the original, most coherent version of all in terms of its micro- and macro-structure. In this version, the higher-level idea units in the text within the paragraphs were sequenced and linked logically following the order of sub-topics in the macro-structure the researcher designed for the text (see Appendix C). This meant that, for example, the sub-topic geography of China was followed by a paragraph on the geography of Australia, followed by another sub-topic on the history of the two countries. Micro-level coherence refers to the connections within and between paragraphs and sentences. The order of words in each sentence for example is logical with the Good Micro textbase. One example of such coherence in Good Macro/Good Micro Grade 8 text can be seen in the sentence below:

“Australia is both a very old and a very new nation. It started 40,000 years ago with the Aboriginal people.”
In this example, the micro item ‘It’ refers back to Australia and the two sentences belong to the macro sub-topic of history of Australia. The use of link words such as ‘and’, ‘with’ and the pronouns such as ‘it’ and ‘he’ as well as macro-words such as ‘old’ and ‘Aboriginal’ all contribute to maintaining the local coherence within and between the sentences and paragraphs (sub-topic history) as well as the overall meaning in the text (nation building).

3.3.3.2 Good macro/poor micro

This version of the text maintains the macro-structure and the subtopics are still logically sequenced between the paragraphs, as in Version 1. However, the connections between the meanings of propositions in the sentences and word and phrase level meanings are deliberately made more complex and abstract. An example of such changes in the text to make it poor at the micro-structure level is:

Good Micro sentence:

“Two hundred years ago, the settlers and the convicts from Britain arrived in Australia.”

Poor Micro sentence:

“Then, 200 years ago the British dropped anchor.”

In his discussion of what makes a coherent text at micro-structure, Hutchins gives the examples of anaphora, reference, substitution, ellipsis, the role of conjunctions and ‘sentence adverbs’ as well as lexical and semantic cohesion between sentences (Hutchins, 1977). Eliminating the simple common verb ‘arrived’ and replacing it with the verbal phrase ‘dropped anchor’ which is both grammatically and semantically a more complex expression and requires specialised knowledge, the substitution of ‘the settlers and the convicts’ with
‘British’ and misleadingly adding the conjunction ‘then’, all transform the above sentence into a linguistically complex one in terms of access to its meaning. It now requires understanding of a more complex meaning unit and prior knowledge integration of ‘ships dropping anchor’ with the intended meaning of ‘arrive/come’.

3.3.3.3 Poor macro/good micro

This version is the opposite of Version 2 in terms of both its micro- and macro-structure. The order of propositions (idea units) within a paragraph and the order of sub-topics within the text are manipulated to make the main ideas in the paragraphs and in the text less coherent and supposedly more difficult to comprehend as it requires more resources to identify the main ideas within each paragraph and connect these to other main ideas scattered randomly in the text. An example of such a structure can be seen in the paragraph below.

On the other hand, Australia’s deserts are called the ‘bush’ or the ‘outback’ and cover 80% of the country. Australia did not become wealthy overnight. Two hundred years ago, the explorers, the convicts and the settlers from Britain arrived in Australia. They built colonies on the Aboriginal lands and damaged their culture.

The order of ideas in the paragraph is jumbled. The paragraph starts with ‘On the other hand’, which suggests compatibility and a logical flow and connection with the meaning presented in the previous paragraph. However, this is not the case as this topic sentence relates to the geographical features of Australia but the sentences that follow this topic sentence all relate to another sub-topic, the history of Australia as a nation. The poor macro-structure did not include disordering and combining idea units from the two countries
as the number of versions needed to be kept at a minimum. Hence, sentences from the history of China were not used together with the sentences about the geography of Australia.

3.3.3.4 Poor macro/poor micro

This final version of the text was the least coherent. It was deliberately manipulated to include both a poor macro- and micro-structure. In other words this version not only had complex micro words but also jumbled propositions or idea units within and between the paragraphs. This made it the most difficult one to comprehend according to Kintsch’s (1990) findings of summaries in Grade 6, 10 and college students. Below is the same paragraph from the Grade 8 text with Poor Micro and Poor Macro-structure.

“On the other hand, the inland terrains are called the ‘bush’ or the ‘outback’ and extend over 80% of the country. Then, 200 years ago the British dropped anchor. Together they raised colonies on Aboriginal land and culture, which were marred as a result.”

Not only is the linking phrase ‘On the other hand’ misleading, but the micro-level items such as ‘terrains’, ‘dropping anchor’, ‘raised colonies’ and ‘marred’ all require more complex levels of connections made between the readers’ prior knowledge and the textbase.

3.4 Task Design and Procedures

The study used a total of nine tasks to test the two hypotheses on Chinese and English readers’ text comprehension processes in Grade 5 and Grade 8. The chronological summary of all the tasks completed by both Chinese and English language readers in both countries is in the table below.
Table 3

3. Summary of All Tasks and Measures

<table>
<thead>
<tr>
<th>TASKS</th>
<th>MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1: HYPOTHESIS 1</td>
<td></td>
</tr>
<tr>
<td><strong>Part 1- Construction of Textbase</strong></td>
<td></td>
</tr>
<tr>
<td>1. Cloze Task: Students read the text on Electricity and Magnets silently and fill in the 57 gaps using their own words.</td>
<td>1. Number of correct micro- and macro responses</td>
</tr>
<tr>
<td>2. Think-aloud Protocols: Students verbalised their thinking, processing and comprehension through their responses to the probe questions during reading</td>
<td>2. The Think-aloud Constructive Activity Scale (Level 1-4)</td>
</tr>
<tr>
<td>3. 100-word Summary: Students wrote 100-word summary of the text Electricity and Magnets in own words.</td>
<td>3. Five-level Macro-structure Scale (1-5 points)</td>
</tr>
<tr>
<td><strong>Part 2 - Construction of Situation Model</strong></td>
<td></td>
</tr>
<tr>
<td>4. Prior Knowledge Interview: Students were asked questions about the concepts in the text.</td>
<td>4. Four-level Prior Knowledge Test (10 questions and 0-21 points)</td>
</tr>
<tr>
<td>5. Prediction Task: Students were asked to predict the topic and sub-topics in the text, China and Australia.</td>
<td>5. Four-level Prediction Scale (0-3 points)</td>
</tr>
<tr>
<td>6. Adding titles for marked sections of the text</td>
<td>6. The Titles Constructive Activity Scale (Level 1-4)</td>
</tr>
<tr>
<td>7. Adding sentences for marked sections of the text</td>
<td>6. The Sentence Constructive Activity Scale (Level 1-5)</td>
</tr>
<tr>
<td><strong>Day 2: HYPOTHESIS 2</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Influence of Local Text Coherence</strong></td>
<td></td>
</tr>
<tr>
<td>8. Three-Level Guide Questions: Students answered short Literal, Inferential and Applied type of comprehension questions.</td>
<td>8. Number of correct responses for each comprehension question (Literal - 1 point; Inferential - 2 points and Applied - 3 points)</td>
</tr>
<tr>
<td>9. 50-word Summary: Students wrote 50-word summary of the text China and Australia in own words</td>
<td>9. The Summary Constructive Activity Scale (Level 1-4)</td>
</tr>
<tr>
<td><strong>Additional Task For Hypothesis 2</strong></td>
<td></td>
</tr>
<tr>
<td>10. Think-aloud Protocols: Chinese students verbalised their thinking, processing and comprehension through their responses to the probe questions during reading of Text 2 China and Australia</td>
<td>10. The Think-aloud Constructive Activity Scale (Level 1-4)</td>
</tr>
</tbody>
</table>
3.4.1 Day 1- Text comprehension processes

3.4.1.1 The construction of a textbase

3.4.1.1.1 Cloze task

As this study is interested in finding possible similarities and/or differences between active processing of meaning for Chinese and English language readers, a number of gaps were systematically built into the text for students to fill in using their ability to manipulate such processes at different levels.

The Cloze task involved filling in the 57 gaps missing in the text Electricity and Magnets in both languages. Each gap required readers to use only a single word or equivalent in Chinese characters. Following this, the number of correct words was counted and a raw score assigned for each participant for both grades and language groups. Some gaps had more than one possible correct response, which were equally included in the scores. The criteria used for correct responses pertained to maintaining the overall meaning of the complete sentence intended in the textbase created by the author. The example below from the fourth paragraph of the passage displays this well:

“They [magnets] are used to hold notes on the fridge door, and in compasses to find the way. They are also used in switches and on/in/cupboard/fridge doors to keep them shut.”

As in the last example, one gap (underlined) may have more than two alternatives as long as the alternative word or character/s provided by the student serve the purpose of maintaining the overall meaning of the sentence and hence the micro-structure of the textbase. As shown in the last example, the words did not always necessarily share the same grammatical function. While it was adequate to have the prepositions ‘on’ and/or ‘in’, the readers were also correct if they used another semantically acceptable noun to describe the
However, other responses, which included adjectives such as ‘front’ and ‘blue’ to describe the doors, were not accepted as these did not fit in with the network of propositions in the textbase and further indicated students’ lack of knowledge about which doors are usually associated with magnets. The concept of magnet is mentioned earlier in the text.

3.4.1.1.2 Think-aloud protocols

Alongside working memory, metacognition is found to be one of the factors, which helps reading comprehension (Carretti et al., 2014). Although there have been think-aloud studies on reading, the use of think-aloud protocols as a data collection tool or to assess middle year readers’ text comprehension at school has rarely been done across the two language groups. However, in many think aloud studies, the participant is required to speak aloud whatever comes to mind. It is much less guided. In fact, the ‘think alouds’ here were really answering open-ended questions. In this study the students were asked to verbalise their thoughts in response to a range of eight probe questions designed to help them think aloud while they were still reading (See Appendix A). Some of the probe questions required students to recall or were related to their comprehension (1 and 2), some aimed to elicit their processing (6, 7 and 8) while some linked to their metacognition or reflecting on their own understanding (3, 4 and 5).

The study used this method for two major reasons. Firstly, think-aloud protocols have recently proven to reveal reader characteristics naturally and secondly, given the right conditions, they have recently been more reliable for capturing diversity in text processing and comprehension strategies during reading (Afflerbach, 2000; Hilden & Pressley, 2011). Hilden and Pressley (2011) remind us that think-aloud protocols yield information from short-term memory and this is why they should be conducted concurrently as in this study.
According to the CI model of text comprehension, readers actively make assumptions about the main ideas or *macro-propositions* in the text and while some are involved in what is described as macro-processing of the text at a higher level, some others are constrained by their understanding of micro-propositions (smaller idea units represented in sentences and/or phrases) or micro-processing of the text (Kintsch, W., 2004; Kintsch & Malagath, 2010). A day before the students were asked to complete the tasks, their teachers were briefed about and provided with the sample script of eight probe questions for the think-aloud task so that they were familiar with the nature of the task (that it had to be done while students are still reading). The researcher and the students’ teachers who conducted the think-aloud protocol with the students had gone over each probe question and teachers were provided with technical advice for the use of the voice recorder. This was done to maintain consistency across the two language groups as well as across the grades in both countries.

Students were given exactly the same instructions for the think-aloud task, which they completed with their teachers. When students were reading to fill in the gaps, they were asked to think-aloud about their reading by their teacher. This task was recorded by the teacher for each student using a digital voice recorder device about the size of a USB stick. The researcher transcribed the English recordings and a qualified translator, who is also a native Chinese speaker, transcribed the Chinese recordings of the interviews. The probe questions were designed to reveal students’ construction of the textbase information at different levels. Readers’ think-aloud responses were scored and analysed by using The Think-Aloud Constructive Activity Scale which was adapted from The Constructive Activity Scale first developed by Chan et al. (1992). Regardless of whether they were comprehension, processing or metacognitive in nature this scale measured all think-aloud responses to probe
questions based on their constructive activity levels. More detailed description and information on this scale are presented and discussed later in this chapter.

3.4.1.1.3 Summarisation

Following the cloze task and the think-aloud protocols the participants were provided with a task sheet, which required them to respond to a set of tasks about the text they had read. Before the students were asked to read the tasks and write their responses, clear instructions were given about the tasks and the requirements explained to them by the researcher and their teacher. The first task was to summarise the text in 100 words. Readers had access to the text when they did this task however, as part of the instructions given, they were reminded again not to copy word-for-word the sentences from the text and to use their own sentences instead (See question below).

“Write a brief summary of the text you read in 100 words on the given blank sheet.”

The rationale for using the summarisation task was to investigate the possible differences and/or similarities in the ways Chinese and English language readers recalled and represented the textbase information following their reading of the same text at different year levels. According to Kintsch’s Construction-Integration Model of text comprehension an ideal summary of a text should convey that text’s macro-structure (Kintsch, 1998, p. 50). The macro-structure of a text, as mentioned earlier, is hierarchical, that is, there is a hierarchy both between the propositions and main ideas and topics and subtopics in the text.

The researcher produced the macro-structure of the text Electricity and Magnets (See Appendix C) and used this for scoring Text 1 summaries of each participant. This procedure was based on the similar procedure adopted by Eileen Kintsch’s study of micro- and macro-
processes in the development of summarisation skills (Kintsch, 1990). A score was given for each proposition in participants’ summaries that was present in the macro-structure of the original text. The propositions at the higher level in the macro-structure including the subheadings and headings were scored higher as a result of the hierarchical order of the propositions and the level of constructive activity. The higher the level, the more in-depth the summarisation was considered at that level. This is because readers needed to be more active in inferring relations between the propositions and concepts in the text to be able to summarise these. The macrostructure levels starting from the highest one with sample statements and the scores are below.

1. **Level 1 - Topic and Conclusion** (5 points)
   - Electromagnetism
   - Explanation
   - Conclusion

2. **Level 2 - Inferred Subtopics** (4 points)
   - Introduction
   - Electricity
   - Magnets
   - Electromagnets

3. **Level 3 - Subheadings** (3 points)
   - Historical Background – Previous experiments and scientists
   - Electricity – its definition and many sources of energy

4. **Level 4 – Main Ideas** (2 points)
   - Introduction: We rely on electricity and magnets everyday
   - How electricity was invented
5. **Level 5 – Details** (1 point)

Introduction: Electricity and magnets as important part of life

We rely so much on electrical and magnetic tools.

Therefore, if statements in readers’ summaries mentioned explanation or conclusion they were given 5 points each. The reason why Level 1 is more difficult than the other levels is because it requires students to understand and identify the underpinning message and conclusion in the overall macro-structure of the text. While Level 2 requires readers to identify the subtopics not literally mentioned in the text, Level 3 identifies subheadings such as Electricity, Magnets and Electromagnets. Within those subheadings, there are subheading statements that explain them. Some of these include subheadings statements such as Definition and Many Sources of Energy. Level 4 comprises the main ideas of each paragraph in the text and Level 5 includes propositions, detailed information and single ideas.

Participants’ scores were calculated based on the total number of words in the text divided by the total number of possible correct statements in the macro-structure of the text. Hence, the total number of words in the Grade 8 English text *Electricity and Magnets* was 678 and the total number of possible statements in its macro-structure was 121. If the maximum achievable score for 678 words is 121 points, per 100 words the score is 17.84, which converts to approximately 18 possible correct statements. This was the same for the Grade 5 text based on the same formula.
3.4.1.2 The construction of a situation model

3.4.1.2.1 Prior knowledge task

Before any of the students read the texts, as the first task they were asked to respond to 10 prior knowledge questions in which their knowledge and anticipation on what the text will be about was assessed. Prior knowledge refers to what students already know that is relevant to text comprehension not what they know having read more while reading the text. The prior knowledge task does not aim to measure in any way students’ understanding of the text. This is done by comprehension measures. To repeat the rationale behind this, van Dijk and W. Kintsch’s (1983) model of text comprehension as well as consecutively W. Kintsch’s first and second CI (Construction-Integration) models of text comprehension suggested that prior knowledge plays a significant role in text comprehension and interpretation, and hence readers’ ability to process the text (Kintsch, W., 1988; Kintsch & Rawson, 2005). The prior knowledge questions were ranked in terms of the difficulty and the nature of each question. This is to investigate how much the students might have used their prior knowledge to comprehend the text later when they read. Questions like question 10 (What is the name of the reaction when electricity and magnets are put together?) is possibly a very good indicator for students’ higher level of prior knowledge on this topic. Other questions such as question seven (Give one example of using electricity in everyday life), require the use of basic knowledge of the use of electricity in everyday life and were not ranked equally with question 10.

Prior knowledge questions were designed so that the answers to all the questions asked could be linked to the information in the reading passage. Readers’ responses at each year level were then scored using a ranked scale for analysis of the role of prior knowledge as a predictor for comprehension not as a measure for comprehension. The table with all the
prior knowledge questions together with the descriptors for levels of difficulty can be found in Appendix A. The results are discussed in Chapter 6: Results and Discussion.

3.4.1.2.2 Prediction Task

The tasks for the second reading text were handed to students in two stages. First, they were each given a cover sheet with pictures of two roads accompanied by the national flags of China and Australia placed directly below the pictures (see pictures below). Students were then asked to use all the visual and written information on the cover in order to write their prediction of the topic of the passage in one sentence. This was before they were provided with the reading text and started reading. The prediction task is often used as an instructional strategy in class but here it is used to measure readers’ metaphorical interpretation to find out about the conceptual differences between the two language groups. Following this, students were handed a worksheet with comprehension tasks.

CHINA and AUSTRALIA

Similar to prior knowledge task the prediction task also aimed to get information on the nature of students’ predictions on what the text will be about. Again, it is not designed to measure students’ comprehension or processing of the reading text. This time the task involved processing visual imagery instead of a text and interpreting the metaphorical
meaning of the roads and the flags in the pictures. Students with higher level of prediction skills were expected to interpret the pictures of the roads and the two flags as Australia’s and China’s journeys as nations. Students who were able to process the information on the visuals as well as the title to predict the accurate text topic or subtopics were considered to be the ones who are best able to use macro- as well as micro-processing skills. While the prediction task was part of the comprehension task for scoring purposes, there is no doubt that it is also valuable to look at the responses to this separately for a few reasons. The main reason is that prediction is one of the well-known reading comprehension strategies which helps readers have a purpose in reading, interact with the text more actively, increase their interest and improve their understanding of the text (McKown & Barnett, 2007).

It was hypothesised that weaker students would only be guessing that the topic would be about Australia and China or the roads in the two countries. This is due to the literal level of the interpretation of the information on the cover page. However, if students were able to read beyond what is presented in the pictures and construct their educated guesses about the journeys of each nation, then, this is considered to require higher-level prediction. This also indicates that they are able to integrate and assimilate their existing prior knowledge about countries and roads beyond the literal text level. Therefore, these latter students are more likely to form a situational model of the text successfully using the text information later on. Readers needed to have some prior knowledge about the flags and interpret the metaphorical meaning of the roads in the pictures for achieving higher scores.
3.4.1.2.3 Adding titles

Following this summarisation task, the students were asked to write titles for the four numbered paragraphs to further investigate their ability to infer main ideas and integrate these with their prior knowledge to write appropriate and accurate titles.

As a measurement tool for scoring the titles, this study adapted the use of The Titles Constructive Activity Scale from Chan et al. (1992) and Law (2008). Chan et al. (1992) developed The Constructive Activity Scale for measuring readers’ constructive activities for text comprehension. This scale was later adopted by Law (2008) for assessing Grade 5 and Grade 6 Chinese Language readers’ constructive activities in think aloud protocols in a study conducted in Hong Kong.

Four levels of constructive activity below were identified in Chinese and English language readers’ titles constructed for the four marked paragraphs in the text. Students’ titles are scored based on which level they belong to in terms of their levels of constructive complexity in text processing. A score of 1 was given to Level 1 titles and a score of 4 given to Level 4 titles and so on. The highest score for writing titles was 16 if all four titles were at Level 4. Below is The Titles Constructive Activity Scale with examples of student responses. The numbered paragraphs included main ideas, which linked to the macro-structure of the text; for example, one selected paragraph had the invention of electricity as a main idea. Students had to write each title in the provided space on the task sheet. They were told that the titles needed to be constructed as subheadings. Writing an appropriate title for the paragraphs required the readers to reread the other paragraphs and process the information to link the ideas to one main idea for that particular paragraph. For some students this may be quicker as they already had a coherent mental representation of the macro-structure of the text. The constructive processes imply the use of constructive activities.
Table 4

4. The Titles Constructive Activity Scale

<table>
<thead>
<tr>
<th>Constructive Levels</th>
<th>Definitions</th>
<th>CI Levels</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pre-structural</td>
<td>No understanding</td>
<td>Linguistic Level</td>
<td>[AS5_BA_3] “could you imagine”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conceptual: Micro-structure</td>
<td>[CS5_BA_5] “with electricity, people have better life”</td>
</tr>
<tr>
<td>4 Relational</td>
<td>Use of existing knowledge</td>
<td>Situational Level</td>
<td></td>
</tr>
</tbody>
</table>

3.4.1.2.4 Adding sentences

The Sentence Constructive Activity Scale also adapted from the scales used by Chan et al. (1992) and Law (2008) was used to score the sentences. Readers’ added sentences were scored based on which level they belong to out of the five levels. Additional sentences were scored in the same way the titles were scored. Level 1 sentence was given a score of 1 and Level 5, a score of 5.

Similar to the task of adding titles, the next task required students to add sentences to the end of four marked paragraphs in the text. These paragraphs did not include any of the numbered paragraphs used previously for the titles. Students were expected to reread the paragraphs marked with an asterisk on their sheets and add a sentence at the end. The sentence had to follow from the same main idea and fit in with other ideas or propositions in that paragraph. The sentence should also be grammatically and syntactically accurate.

Adding sentences to the marked paragraphs aimed at providing information about students’ micro- and macro-processing skills. Students who were able to identify an original idea that was relevant to the main idea in the paragraph and connected well with other
sentence meanings in the paragraph would do well in this task. In addition, the students’ use of logical, clear and effective ordering of words in a sentence form was also considered part of an accurate and appropriate added sentence and hence constructive activity. This task together with the summarisation and the adding titles tasks, aimed at revealing the nature of readers’ situation models because it required integration of readers’ prior knowledge with textbase information which do not exist in the text. Below is a summary of the levels for measuring the added sentences with examples of student responses. The next section explains Day Two and the second part of the study, which focused on collecting and measuring data on the influence of local text coherence through a prediction and a series of comprehension tasks.

Table 5
5. The Added – Sentences Constructive Activity Scale

<table>
<thead>
<tr>
<th>Constructive Levels</th>
<th>Definitions</th>
<th>CI Levels</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pre-structural</td>
<td>No understanding</td>
<td>Linguistic Level</td>
<td>[AS5_A_1] “What kind of magnets do we need?”</td>
</tr>
<tr>
<td>2 Factual</td>
<td>Knowledge telling</td>
<td>Conceptual: Micro-structure</td>
<td>[CS5_A_2] “in conclusion, human [sic.] may not be without electricity and magnetism”</td>
</tr>
<tr>
<td>3 Multi-structural</td>
<td>Inferential construction</td>
<td>Conceptual: Macro-structure</td>
<td>[AS8_AA_3] “Many scientists have improved our electricity technology over the times, and it will continue to improve over time”</td>
</tr>
<tr>
<td>4 Relational</td>
<td>Use of existing knowledge</td>
<td>Situational Level</td>
<td>[CS8_A_5] “because the electric current generated this way is not only weak, but also difficult to control.</td>
</tr>
<tr>
<td>5 Extended Abstract</td>
<td>Explicit Knowledge building</td>
<td>Situational Level</td>
<td>[CS5-AA_3] “The invention of Maglev train was based on the characteristics of the attraction between magnets”</td>
</tr>
</tbody>
</table>
3.4.2 Day 2 – The influence of text coherence

The first part of the study focused on the readers, the second part focuses on the text characteristics and in particular local coherence in text comprehension. At the start of the day, students and teachers were briefed and instructed about the nature of the tasks and were provided with further information. There were 10 questions on the task sheet related to the comprehension of the second passage, *China and Australia*. These included the prediction task described below as well as the summarisation task.

3.5 Comprehension Tasks

3.5.1 Three-level guide questions

As also described earlier, the three-level guide is a comprehension assessment tool, which makes use of three levels of text comprehension identified first by Herber (1978). The researcher created three-level-guide questions for the second text to investigate text coherence and text comprehension of Chinese and English readers. The three levels are *Literal Level, Inferential Level* and *Applied Level* and the questions for each level on the task sheet are listed in Table 6 below.

Students’ responses to nine three-level-guide comprehension questions were scored in terms of their level of difficulty: Score of 1 given for each correct response to each Literal question (questions 2, 3 and 4), score of 2 for each correct response to inferential question (questions 5, 6 and 7) and score of 3 given for each correct response to Applied level questions (questions 1 [prediction task], 8 and 9). The literal level relates to the surface level understanding of the text information through *reading on the line*. The answers to Literal Level questions were explicitly stated in the text. Inferential questions required readers to *read between the lines* and make connections between the ideas within the text, reflect and
draw conclusions. The applied level is the highest level of comprehension attainable based on the Three-Level Guide. This is when readers read beyond the lines to make connections with their knowledge of the world and the textbase - in other words, the readers’ construction of the situation model plays a crucial role for success here, according to Kintsch’s model of text comprehension.

Each question level was checked and confirmed by a panel of experts, which included an education officer, three teachers and two literacy coordinators who have been using the three-level guide as an assessment tool and evaluated it as part of a postgraduate project in assessment and evaluation. In addition, the questions were tested with two other small groups of readers from each language to ensure that they provide the information about the levels at which the readers are able to process and comprehend the text and they best match the three levels of text comprehension identified in the CI Model, Linguistic-Literal, Situational-Inferential and Applied.

Table 6

6. Three-Level Guide Levels and Questions

<table>
<thead>
<tr>
<th>LITERAL LEVEL</th>
<th>INFERENTIAL LEVEL</th>
<th>APPLIED LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Give one example of reforms China made to become wealthier.</td>
<td>5. Why do a lot of people choose to live along the coast in Australia?</td>
<td>1. Look at the title page and guess what the text will be about in one sentence</td>
</tr>
<tr>
<td>3. How did the convicts arrive in Australia?</td>
<td>6. What are the two differences between Chinese and Australian histories?</td>
<td>8. What is the author’s view in the passage about both China and Australia?</td>
</tr>
<tr>
<td>4. How big is the Chinese economy?</td>
<td>7. Write an appropriate title for Paragraph 3. (I)</td>
<td>9. Write one other factor that would influence the identity of a nation apart from the ones mentioned in the passage</td>
</tr>
</tbody>
</table>
3.5.2 Text 2 summarisation

On the same task sheet following all of the comprehension tasks, the participants in this study were asked to produce a 50-word summary of the second text, *China and Australia*. Similar to the summaries in the first part of the study, these are also used to examine readers’ levels of constructive activities. More specifically, the aim was to compare and contrast these four different manipulated versions of the text to investigate the possible influence of local text coherence on Chinese and English readers’ understanding at both Grade 5 and 8 levels. Eventually, this will either confirm or contradict the findings of current research on the influence of text coherence for Chinese as well as English readers at these levels who are reading-to-learn at school.

The researcher adapted and elaborated on The Constructive Activity Scale, first developed by Chan et al. (1992) and later adapted by Law (2008) as The Text Constructive Activity Scale. Based on the readers’ summaries, this study developed a similar new four-level The Text Summary Constructive Activity Scale to suit the purpose of the study. The types of responses and examples for summarisation are provided below. The readers’ summaries were classified into four levels below based on their constructive activities in representing their understanding of the text. The reliability of the results and the scoring scale below was ensured with an independent-samples *t*-test conducted between the three markings of readers’ 50-word summaries. Any differences were discussed and resolved between all the markers.

i. **Pre-Propositional Level**: Stating the topic in general, responses to individual words or phrases, personal/affective, unrelated comments with no links to any of the text propositions, chunks of word-for-word or character-for-character copied fragments or sentences from the text.
ii. **Partial-Propositional Level**: Generalised statements about the overall meaning of the text, repetition of known facts about the topic, retelling/listing of isolated details of topic, verbatim/near-verbatim repetition of text statements (including copying of topic sentences), personal knowledge artificially linked to text, no main ideas, no inferences made, information not organised, no links/incorrect links made between ideas.

iii. **Perceptive-Propositional Level**: Basic inferences of text information with low degree of coherence, evidence of understanding of single or very few text propositions, some basic inferences and links made between ideas in the texts. Details not explained. Personal knowledge used to add to text propositions not integrated.

iv. **Para-Propositional Level**: Coherent inferences based on high level of analysis, explanation of details, coherent and fluent written expression with use of connectives between sentences, which link to macro-structure of the text. Higher-level text proposition and evidence of integration of prior knowledge.

### 3.6 Chinese Language Readers’ Think-aloud and Text Coherence

Additional think-aloud protocols were set up and conducted for testing the influence of text coherence using the same method and procedure in the first think-aloud protocols. These second think-aloud protocols were conducted only with Chinese language readers in order to gain more insight into Chinese readers’ text processing skills and the influence of local text coherence on their text comprehension. The measurement tool, The Think-Aloud Constructive Activity Scale, which was applied to the first think-aloud protocols, was also used for scoring the think-aloud protocols for the second text. The reliability of the scale and the scores were ensured by having three independent raters for think-aloud responses for Text 2 scores as well as running an independent samples t-test between the scores of the three
raters. The description of each of the four levels of constructive activity used for measuring the think-aloud protocols are as follows:

1. **Pre-Propositional Level**: Evidence of lack of constructive activity, no comprehension of any of the text propositions, lack of responses or unrelated affective comments on the text, topic or question.

2. **Partial-Propositional Level**: Retelling details from the text, generalised or simple, short explanation based on understanding of concrete, literal type details, personal knowledge cued by single detail in the text at surface level. Evidence of lack of strategies or poor strategies.

3. **Perceptive-Propositional Level**: Understanding of simple relationships between the propositions (inferences), correct explanation of responses and use of strategies.

4. **Para-Propositional/Meta-cognitive Level**: Detailed explanation and reasoning of higher-level meaning and the strategies, evidence of linking prior knowledge to the responses.

### 3.7 Data Collection

Data collection in Australia took place in two stages based on the students’ grades. Grade 8 data (Data set 2) were collected first as they complete their school year earlier than the students at primary schools. Data collection in China was also completed at around the same time based on the school calendar in China. The data in Australia were collected in December, the last month of the school year and the Chinese data were collected in June, which is the last month of the school year in China. This was mainly done to ensure that the
Data were comparable in terms of grades and the students’ ages and so that one language group did not have an advantage of having more educational time than the other group.

Data were collected over two days for both Chinese and English language readers. Over two consecutive days, students read two texts to complete a total of four tasks on reading comprehension. On the first day, students were asked to fill in the gaps in a cloze passage *Electricity and Magnets* coming up with their own words. The researcher organised the rooms and met with the teachers, leading teachers, the principals and the other relevant officers at each school several times to explain the procedures step by step and take the necessary precautions to ensure that the teachers and students were fully aware of the procedures and the tasks were completed in total silence without any interference. For example, while students were filling in the gaps during the cloze task, the students’ English teacher called students one by one to another room or to the teacher’s office to conduct the think-aloud protocols without any interference. During this time, the researcher observed the way the tasks were conducted to ensure that all went according to plan in both countries. Once students completed their think aloud and cloze task, they then completed a series of comprehension tasks for investigating any possible links between the comprehension processes and the students’ comprehension skills in different areas.

On the next day, students were asked to read a version of the second passage called *China and Australia* which was about the changing identities of China and Australia. This passage was issued in four different versions based on differing levels of textual coherence. Please refer to Chapter 3, section 2.3, *Text Two: China and Australia* for the details about the design of each version. Once all the data had been collected, the Chinese language data were transcribed and translated. This process was overseen and later adjusted and confirmed by three professional translators. The process of transcription and translation of the Chinese data
was followed by the transcription of the Australian data. Five data sets were constructed in total.

**Hypothesis 1 - Text 1 –**

Please note that there are five readers from each ability level, Above Average (AA), Average (A) and Below Average (BA), language and grade.

**Data set 1:** English Language Data from 30 students:
- 15 Grade 5 Australian students (5 AA, 5 A and 5 BA)
- 15 Grade 8 Australian students (5 AA, 5 A and 5 BA)

**Data set 2:** Chinese Language Data from 30 students:
- 15 Grade 5 Chinese students (5 AA, 5 A and 5 BA)
- 15 Grade 8 Chinese students (5 AA, 5 A and 5 BA)

**Hypothesis 2 - Text 2**

Please note that there are four versions of Text 2 and each version read by six Australian and six Chinese students. The Ability levels were same as Text 1 except there were four students per grade and language group instead of five. However, these were not studied for this part of the study as the number of students per ability level and text version was very small.

Manipulated Text Versions (see Chapter 3 for more detailed descriptions):

1. Good Macro/Good Micro
2. Good Macro/ Poor Micro
3. Poor Macro/Good Micro
4. Poor Macro/ Poor Micro

**Data set 3:** English language data from 24 students
- 12 Grade 5 Australian students (4 AA, 4 A and 4 BA)
12 Grade 8 Australian students (4 AA, 4 A and 4 BA)

**Data set 4:** Chinese language data from 24 students

12 Grade 5 Chinese students (4 AA, 4 A and 4 BA)

12 Grade 8 Chinese students (4 AA, 4 A and 4 BA)

**Data set 5:** English language data from 12 students

12 Grade 8 Chinese students (Control group) (4 AA, 4 A and 4 BA)

For the purposes of this study, more data were collected from Chinese language readers than from English language readers in Australia. This data was collected from Grade 8 Chinese language readers using the same versions of the text and the same procedures and tasks. Data Set 9 included 12 control group Grade 8 Chinese language students who were not included in the main part of the study and only took part in the second part of the study, completing the tasks for Text 2 in English. This was to maintain the reliability of the English language data in Data set 8 and avoid interference of another variable, ‘familiarity of text’, for Grade 8 Chinese students who completed the tasks for Text 2 in English. Second, Data set 9 provided more insight into Grade 8 Chinese language readers’ ability in text comprehension and the influence of local coherence when reading in a foreign language. All the readers had been learning English as a foreign language since Grade 7 and they had English classes once a day.

### 3.8 Administration of Tasks

Teachers administering the tasks on both days were briefed before the actual day about each task and the conditions required for each task. They were then given specific instructions and the script to use for conducting each task. The researcher stayed with the administrating teachers at all times assisting with the administration of the tasks. This
procedure was repeated with the students at the primary school and no difficulties arose. The
tasks in English completed by Grade 8 Chinese readers were administered by the readers’
own Grade 8 English teachers and all the administrative training and procedures were kept
the same for reliability, validity and comparability purposes. The researcher stayed with the
groups before, during and after all the tasks were completed.

3.8.1 Conducting the tasks in China

The researcher also stayed with the teachers in China during the task completion at all
times. The teachers in China were also briefed one day before about the tasks on each day.
They reviewed the translated script with the help of another teacher at the school who was
also a native speaker of English as well as Chinese.

In addition, on each day, this same teacher would assist the class teacher with the
tasks if needed. They reviewed the requirements for each task and repeated the instructions
for the class teacher before they started the task with the students. The same procedure was
followed for both Grade 5 and Grade 8 students on both days to maintain consistency with all
the tasks for different year levels. Hence, at the start of each day before the teachers
conducted any of the tasks, this teacher would review the instructions in Chinese and check
any questions with the researcher to ensure that all the instructions were followed according
to the task sheet and the script. Grade 8 Chinese language readers completed the
comprehension and summarisation tasks also in English during their English class time with
their English teachers and the researcher. These were conducted five days after the
completion of the tasks in Chinese. The gap between the two sessions was to reduce the
effect of prior knowledge of the text and the questions completed in Chinese.
Chapter Four: Data Analysis – Hypothesis 1

Chapter 4 presents the analyses for text comprehension processes. The data analysis is in two parts. The first part examines readers’ construction of a textbase and the second part examines their ability to construct the situation model of the text.

4.1 The Construction of Textbase

To understand and describe the type of text processing, one needs to first investigate the nature of their constructive activities and their link with the textbase or the micro- and macro-structure of the text. Readers’ scores for micro- and macro-level responses indicate how well they are able to construct the textbase. Tasks used to measure these constructive activities included the cloze task, readers’ meta-cognitive comments elicited during their think-aloud protocols and the nature of their summaries. These provided adequate data to further understand readers’ construction of the textbase. Kintsch (1998, p. 49) describes the textbase as “the propositions that are directly derived from the text...” The textbase includes both the micro- and macro-structure of the text. Micro-structure is the ‘local’ structure of the text comprising sentences and words while macro-structure is the structure made up of ‘hierarchically ordered’ most significant propositions which are usually linked to the main ideas in the text. Kintsch also explains that, when constructing the textbase together with its micro- and macro-structures, one needs to be able to semantically analyse that particular text and its rhetorical structure (Kintsch, 1998, p. 50). Hence, before, during and after the actual reading of the text, this study was designed to include a series of tasks that required readers to demonstrate their ability and knowledge of such semantic analysis of the text and its rhetorical structure. Below is the list of these tasks used in the study and the analyses of Chinese and Australian readers’ responses in Grade 5 and Grade 8.
It should be noted that the sample size in the study is very small and the distribution of each year level is approximately normal. The statistics used are appropriate and assume this small sample size. SPSS statistical software was used for computing all the relevant analyses. Measurement tools used include; one-way ANOVA and Independent-samples t-test for comparing the differences between the groups, mainly between 30 English and 30 Chinese language readers, three ability groups and two grades. Linear regression analysis is applied for determining whether any of the independent variables predicted any of the readers’ performances and finally Pearson’s product-moment bivariate correlation is used to assess whether there is any strong positive or negative correlation between two or more variables or tasks such as the summarisation or think-aloud tasks and cloze task results. Table 17 and 18 at the end of Chapter Five provide summaries of all these correlations. Z-scores (a z-score is a measure of how many standard deviations below or above the population mean a raw score is) were computed for raw scores in each grade data set.

Table 7

7. The Construction of Textbase Results in Z-Scores

<table>
<thead>
<tr>
<th>Students</th>
<th>Cloze Task</th>
<th>Think-Aloud</th>
<th>Summarisation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>AS5</td>
<td>15</td>
<td>0.44</td>
<td>0.11</td>
<td>0.45</td>
</tr>
<tr>
<td>AS8</td>
<td>15</td>
<td>0.66</td>
<td>0.15</td>
<td>0.64</td>
</tr>
<tr>
<td>CS5</td>
<td>15</td>
<td>0.56</td>
<td>0.17</td>
<td>0.56</td>
</tr>
<tr>
<td>CS8</td>
<td>15</td>
<td>0.62</td>
<td>0.1</td>
<td>0.52</td>
</tr>
</tbody>
</table>

*Note. AS=Australian Students CS=Chinese Students M=mean SD=Standard Deviation, N=number of participants*

Table 7 above has the summary of means and z-scores for each task by language and grade level. For example, Grade 5 Australian students’ average cloze z-scores $z = 0.11$, $p =$
.044, were lower than Grade 8 Australian, $z = 0.15$, $p = .066$ and Grade 5 $z = 0.17$, $p = .056$, and Grade 8 Chinese students’ average cloze z-scores, $z = 0.1$, $p = .062$. This means that fewer Grade 5 Australian students’ cloze scores were above the average compared to the other groups. Table 8 has average raw cloze scores including micro- and macro-level responses using proportional z-test.

4.1.1 Cloze task

This section presents the analyses of readers’ responses in the cloze task for both language groups and grades. In doing so, the analyses will focus on the differences and similarities in both grade levels and across the two language groups in relation to readers’ construction of the textbase. A score of 1 was awarded for every correct response and 0 for every incorrect response. Readers’ cloze responses were categorised and analysed based on their connection to main ideas in the macro- or the word and phrases in the micro-structure of the textbase (see Chapter 3 for more detailed descriptions). For this purpose, the study used proportional scores for analysing participants’ cloze responses in terms of their links to micro- and macro-structure.

When comparing group means, the study applied the z-test with the formula below for comparing the two proportions, as used by Park (2009). The proportion, $p^{*}_{pooled}$, is used where the null hypothesis, $H_0$, is of two population proportions of equal size: $H_0: p_1 = p_2$. $p^{*}$ below formula is used for $p^{*}_{pooled}$ where $p^{*}_{pooled} = n1p1/n1+ n2 p^{*}_2/n2 = y1 + y2$. $p_1$ and $p_2$ are the mean proportion for micro-words and macro-words and $y1$ and $y2$ are the number of correct micro- and macro- responses for the two samples, $n1$ and $n2$. 
The formula for the z-test comparing two proportions is:

\[ z = \frac{(\hat{p}_1 - \hat{p}_2) - 0}{\sqrt{\hat{p}(1-\hat{p}) \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}} \]

Below is the summary table for the cloze task data including proportional micro- and macro-level responses calculated using the z-test formula above for comparing proportions. \( M \) is the mean score and \( SD \) is the standard deviation for each reader.

Table 8

8. Cloze Task and Proportional Micro- and Macro-Scores

<table>
<thead>
<tr>
<th>Language</th>
<th>Year</th>
<th>N</th>
<th>Ability Level</th>
<th>Cloze Scores</th>
<th>Micro M</th>
<th>Micro SD</th>
<th>Macro M</th>
<th>Macro SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade 5</td>
<td>5</td>
<td>AA</td>
<td>28.2</td>
<td>0.7</td>
<td>0.14</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>A</td>
<td>25.2</td>
<td>10.92</td>
<td>0.60</td>
<td>0.06</td>
<td>0.17</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BA</td>
<td>21.2</td>
<td>10.23</td>
<td>0.48</td>
<td>0.14</td>
<td>0.18</td>
<td>0.09</td>
</tr>
<tr>
<td>Grade 8</td>
<td>5</td>
<td>AA</td>
<td>35.83</td>
<td>18.80</td>
<td>0.84</td>
<td>0.13</td>
<td>0.59</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>A</td>
<td>34.33</td>
<td>17.12</td>
<td>0.81</td>
<td>0.08</td>
<td>0.48</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BA</td>
<td>23.33</td>
<td>11.96</td>
<td>0.62</td>
<td>0.09</td>
<td>0.22</td>
<td>0.12</td>
</tr>
<tr>
<td>Grade 5</td>
<td>5</td>
<td>AA</td>
<td>33.17</td>
<td>16.71</td>
<td>0.62</td>
<td>0.09</td>
<td>0.52</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>A</td>
<td>26.67</td>
<td>15.82</td>
<td>0.50</td>
<td>0.21</td>
<td>0.40</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BA</td>
<td>19.83</td>
<td>11.23</td>
<td>0.43</td>
<td>0.14</td>
<td>0.21</td>
<td>0.11</td>
</tr>
<tr>
<td>Grade 8</td>
<td>5</td>
<td>AA</td>
<td>31.33</td>
<td>15.53</td>
<td>0.56</td>
<td>0.09</td>
<td>0.53</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>A</td>
<td>31.50</td>
<td>16.63</td>
<td>0.58</td>
<td>0.12</td>
<td>0.52</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BA</td>
<td>25.33</td>
<td>13.00</td>
<td>0.49</td>
<td>0.08</td>
<td>0.39</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Note. M=mean SD=Standard Deviation N=Number of participants in each ability category
4.1.2 Chinese and English language readers’ cloze responses

The proportional mean score calculated for each grade and language reader group was based on the number of correct responses at the micro- and macro-level structure of the text. A z-test was computed for comparing the proportional scores between the responses of Chinese and English language readers at the micro- and macro-level.

To this extent, an independent-samples $t$-test for comparing the means of raw cloze scores for both language groups was computed. There were no statistically significant differences revealed between English and Chinese language readers’ raw cloze scores, $t(58) = -1.06, p > .05$. The $p$-value was .290 and the difference between the two language groups was only -2.43 points with a $t$-value of -1.067. Grade 5 English readers’ scores were the lowest amongst all four groups. An independent-samples $t$-test revealed that there was a statistically significant difference between the raw cloze scores of Grade 5 Chinese with the mean score of 31.86 and Grade 5 English with the mean score of 24.86; $t(28) = -2.40, p < .05$.

In terms of proportional scores for micro- and macro-level responses, an independent $t$-test result indicated Chinese language readers’ macro-level responses were statistically significantly higher than English language readers’ macro-level responses, $t(58) = -3.84, p < .05$. This was mainly due to the difference between Grade 5 English and Chinese language readers’ macro scores as well as the differences between how readers constructed the textbase at macro-level in the two languages. These differences will be discussed in more detail in the first part of Chapter 6.

A series of simple linear regression analyses were conducted to further assess the relationship between the variables of ethnicity (Australian/Chinese), micro- and macro-response scores and grade levels for the readers in both language groups. In line with the results above, readers’ ethnicity statistically significantly predicted their macro-level
responses, $b = -.45$, $t(60) = 1.59$, $p < .05$ and explained a significant proportion of these, $R^2 = .20$, $F(1, 58) = 14.74$, $p < .001$. Two raters independently marked the responses for cloze tasks and their reliability was ensured with an independent samples t-test.

These results suggest that although there was no statistically significant difference between Grade 8 language readers, Grade 5 Chinese language readers’ responses help understand the nature of differences between the two language groups. Grade 5 Chinese language readers were able to comprehend the text particularly at the macro-level statistically significantly better than their Grade 5 English language counterparts. This indicates that Grade 5 English readers found the text at the macro-level more difficult than their Chinese peers. This is evidenced in the responses such as gap 18 for the macro-word ‘turn’ in the sentence ‘It turns the generator that makes electricity’. Only one English language reader (AS5_A_1) answered this correctly, compared to four Grade 5 Chinese language readers. Seven English language readers including all the Above Average readers, filled the gap with ‘is’. This meant that ‘it’, which refers back to the turbine in the preceding sentence, is understood to be the generator not the tool that turns it by these Grade 5 English language readers. Chinese language readers were able to use words, which meant ‘turns’ but were expressed through different characters. One word meant ‘drive’, two words meant ‘through/by’. However, both were semantically and syntactically correct and carried the same meaning as ‘turn’ and suited the gap accordingly. Similar examples for other gaps displayed the difference between the constructions of textbase in two language groups. For example, unlike English, the Chinese language does not have equivalents for articles ‘a/an’ and ‘the’ and separate words for ‘to be’ verbs such as ‘am/is/are’. Different grammar units or the micro-structures evident in these examples between the two languages for that matter affected the readers’ construction of the textbase and revealed the Chinese language to be
semantically more flexible than English allowing for more options in terms of filling in the gaps.

Other examples imply the importance of prior knowledge when filling in the gaps. For example, gap 10 for the word ‘kite’ in the sentence, ‘Later on, in 1752, inventor Benjamin Franklin had an experiment with a kite’. None of the English language readers answered this correctly compared to the two Chinese language readers who did. The two readers who used ‘kite’ as the correct answer were from the Above Average and Average groups and scored high in the prior knowledge test. One final example, which displays the differences between the responses of the two language groups, relates to the underpinning message provided in the text. Gap 52 in the first sentence of the concluding paragraph required the use of the word ‘electromagnets’, which is deliberately not mentioned anywhere in the text. Again, while none of the Grade 5 English readers answered this correctly, almost all (except one) Above Average and Average Grade 5 Chinese language readers (nine in total) used the word ‘electromagnets’ correctly. This further confirms the importance of the level of constructive activities and the use of prior knowledge in text comprehension during the construction of textbase as opposed to only in the situation model as suggested in the CI Model by Kintsch (1991).

This first section of Chapter 4 presented analyses on readers’ performances in the cloze task for the two language groups. The next section will analyse readers’ performances in think-aloud protocols in relation to their metacognitive ability and construction of the textbase. This will be followed by analyses of readers’ performances in relation to their construction of a situation model representation of the text.
4.1.3 Think-aloud protocols

Think aloud protocols were conducted to investigate readers’ perceptions of the type of constructive activities and strategies they used during reading in both languages. Analyses of participants’ think-aloud protocols identified four levels of constructive activity. The Constructive Activity Scale, first developed by Chan et al (Chan et al., 1992), was adapted as a Constructive Activity Measure (CAM) for measuring these activities and processes in constructing meaning from the text.

The think-aloud results of the two language groups were very similar. For example, both English and Chinese language readers mentioned actively using similar strategies such as reading forward and backward in the text and using topic sentences in attempting to construct the textbase. CS5_BA_4’s explanation “later in the text it was mentioned a scientist proved the relationship between electricity and lightning, I learnt from this” for using the word ‘this way’ in the sentence, “This way is how everything is started” and “it was inferred by the later word “common” are evidence that even Below Average Grade 5 Chinese language readers were making inferences and were engaged in constructive activities and able to explain these.

Although readers’ results in terms of text comprehension were similar in both language groups, the nature of readers’ recall of the overall meaning of the text differed within and across the two language groups. Chinese language readers in general provided more details than English language readers in their think-aloud responses when asked to talk about the overall meaning of the text. There were also some cultural differences in readers’ perceptions of the main idea and approach to the text as a whole as shown in the example below. CT5 below refers to the Grade 5 Chinese language teacher.

CT5: “Now, I will ask you to think aloud about what the text tells us. What is the text
about?"

CS5_BA_3: “We shall treasure and avoid wasting electricity.”

This Below Average reader’s response indicates that the reader did not understand the main idea but guessed at it based on prior knowledge of the common main ideas that s/he may have encountered reading this type of expository texts at school in China. Another Grade 5 Chinese language reader displayed the number of details they recalled from the text in the example below. This and the paraphrase of the same reader indicated the difference in terms of the details between the two language groups.

“I learnt what metals were used to make a magnet, the attractive forces are greater at the two ends of a magnet than in the middle, and I learnt why the two ends of a magnet are called poles, which will attract and repel each other.”

Furthermore, one other difference between Chinese and English language readers’ think-aloud responses relates to the use of contextual cues. In their Level 3 type think-aloud responses when asked about which strategies they used, Chinese language readers, indicated their use of semantic cues with a mean score of 22.00, more than English language readers whose mean for the number of times they mentioned semantic cues was merely 8.00. These readers did this by mentioning the semantic relations in the text in more detail. On the other hand, English language readers mentioned the use of syntactic cues more times than Chinese language readers in their think-aloud responses (see Figure 1). Almost all Grade 8 Chinese language readers and most Grade 5 Chinese language readers mentioned the use of contextual cues as a strategy in their think-aloud responses. This indicates that Chinese language readers use semantic cues more than syntactic cues in their construction of textbase compared with English language readers.
A simple linear regression analysis was computed to further assess the relationship between think-aloud scores and readers’ comprehension. The regression results indicate that readers’ think-aloud scores statistically significantly predicted their cloze scores, $b = .674$, $t(60) = 7.04$, $p < .001$ and explained a significant proportion of their variances, $R^2 = .45$, $F(1, 58) = 48.40$, $p < .001$.

Grade 5 English language readers’ think-aloud mean score 0.45 was statistically significantly lower than Grade 8 English language readers’ mean score 0.64. The result of an independent-samples $t$-test; $t(28) = -2.28$, $p < .05$ revealed a statistically significant difference between Grade 5 and 8 English language readers’ think-aloud scores. A simple linear regression analysis; $b = .395$, $t(30) = .031$, $p < .05$, also suggests that English language readers’ grades statistically significantly predicted their scores for think-aloud, whereas this was not the case for Chinese language readers or for the two groups in general.

Figure 1. Types of Contextual Cues During Think-aloud Protocols
4.1.4 Chinese language readers’ think-aloud responses

The nature of Chinese readers’ think-aloud responses revealed very useful information. Both English and Chinese readers think-aloud responses were marked independently by two raters one who were both native speakers and fluent in Chinese and English. The scores were then confirmed by conducting an independent samples t-test.

While Grade 5 Chinese language readers’ responses included the use of prior knowledge, these were not elaborated or explained as well as Grade 8 Chinese language readers’ responses. Grade 5 responses comprised a few shorter responses to different gaps and answers in the text. CS5_AA_3’s responses mentioned TV and instinct as the source of information when asked how he got the answer for particular gaps. Grade 5 readers’ responses indicated overreliance on the text propositions for generalised explanations. For example, using ‘magical’ instead of ‘magnetic’ to describe the stone and for the probe question ‘How do you know it would stick onto a fridge door?’ providing explanations such as “because an ordinary stone will not stick onto the fridge doors, therefore it is a magical stone”, “because there is a magnet on our fridge door” or “encyclopaedia, because earth has gravity, and is able to attract or repel other objects without touching”. The Grade 5 Chinese language reader was recalling appropriate prior knowledge and text information but did not have the means or the vocabulary to explain and find the accurate missing word. These are typical examples for Level 2 constructive activities in which readers are providing limited, near verbatim or personal responses without any evidence of higher-level processing or inferences. Although the reader is able to identify prior knowledge relevant to the topic, this is only ‘recalling’, it is not used to explain or interpret their own strategy use.

On the other hand, Grade 8 Chinese language reader, CS8_AA_1, amongst other words, was able to explain the uses of words ‘magnet’, ‘copper’ and ‘generate’. The reader
was not only able to infer, explain and provide appropriate reasons but also used prior knowledge of magnets and electricity to help find the correct answers. For example, for explaining the use of the word ‘magnet’ in the sentence “When we hang upside down…” the reader used “because the physics teacher told us that when we hang a compass upside-down, it will point to the north-south direction”, also “I chose copper because of its good electrical conductivity” for explaining the use of the word ’copper’ and “the earlier sentence indicated that an extremely powerful current will be generated when the magnet was moved away, therefore I used ‘generate’” for explaining the use of ‘generate’. Full texts of these readers’ think-aloud responses can be found in Appendix B.

4.1.5 Summarisation

Readers’ summaries were scored based on the level and the number of macro-propositions from the text in their summaries (see Appendix C for Text 1 macro-structure and the list of macro-propositions). The results of the summaries of the two language reader groups were also similar.

The readers who scored higher results in the prior knowledge task, also scored higher in the summarisation task. Above Average Grade 5 English language readers’ summaries consisted of more text propositions and details from the text compared with Average and Below Average summaries, which did not include many details or evidence of connections to any of the text propositions. These were mainly broad, generalised comments about the topic as well as unrelated affective comments. Grade 8 readers’ summaries compared to Grade 5 readers’ displayed higher-level and more complex inferences and coherence. Advanced Grade 8 readers’ summaries are considered to be at Level 4, which means they were able to link their prior knowledge to the text propositions.
4.1.6 Chinese language readers’ summaries

Out of 24 Chinese language readers, two Above Average Chinese language readers; one Grade 5 and one Grade 8 were able to achieve the highest possible summarisation score of 18. They were the only ones who inferred and included the overall text meaning ‘the importance of Electromagnetism’ in their summaries.

CS5AA_3: “Therefore, electricity is very important, combination of electricity and magnet is more important. (L1)

CS8AA_5: “The combined use of electricity and magnetism makes our life more convenient.” (L1)

The Grade 5 reader was also creative in adding appropriate narration to the summary and structured it like the original text. The reader did not copy character for character from the original text, like most low-scoring Chinese language readers. Over-reliance on the original text for writing the summaries was higher in the summaries of Chinese language readers compared to the summaries of English language readers. All three translators and the two independent native-speaking Chinese language teachers confirmed this. Three independent raters scored readers’ summaries and an independent samples t-test revealed no statistically significant differences between the scores. The differences were all discussed and modified.

The analysis of readers’ cloze task responses, think-aloud protocols and summaries helped further understand their construction of the textbase and comprehension. To sum up, the results of the three tasks, cloze, think-aloud and summarisation above revealed that while Grade 8 and Above Average readers did better, there are no statistically significant differences between English and Chinese language readers’ construction of textbase. The differences between the two language groups were based on their macro-level cloze
responses and the nature of their responses for each task. Examples of readers’ cloze and think-aloud responses also indicated the use of prior knowledge.

As described in the CI Model, to investigate the second part of Hypothesis 1 about the situation model, it is necessary to analyse readers’ ability to integrate their prior knowledge with the textbase they constructed. This will show their representation of the situation in the text and their comprehension of the text at a higher level and in a broader context. The next section will attempt to describe readers’ text processes through the description of their representation of a situation model and the analysis of their responses in the prior knowledge and prediction task, followed up by analyses of their responses in the adding titles and adding sentences tasks.

4.2 The Situation Model

The second part of Hypothesis 1, readers’ text comprehension processes entails exploration of text representation at a situational level. Readers construct a situational model of the text information, which is only possible with the integration of text information with readers’ own world knowledge and experiences. Without this they are not able to comprehend the text at a higher level (see Chapter 2 for more detailed explanation on the situation model).

Similar to the construction of a textbase, a series of tasks were designed to measure readers’ construction and representation of a situation model in the text. To this extent, the study used five tasks namely, prior knowledge, prediction, adding titles and adding sentences. The results will be analysed using the same statistical measurement tools such as, independent-samples $t$-test for comparing the differences between the groups, simple linear regression for comparing the impact of variables in predicting results and Pearson’s product-moment correlation for possible correlations between the variables.
4.2.1 Prior knowledge

The level of prior knowledge readers possess and use during their reading is part of the text comprehension processes identified in Kintsch’s (1998) CI Model. The participants in this study were given 10 questions to assess their prior knowledge of the topic Electricity and Magnets. The questions were completed before the start of the reading task. These were scored based on the level of difficulty and the total score was calculated out of 21 for each group of readers. Each one of the questions linked to a proposition and information presented in the text *Electricity and Magnets*. It was then investigated whether this was an indicator of higher-level comprehension attained at the end of the tasks. See Figure 2 below for results for each group of language readers.

An independent *t*-test was conducted to compare prior knowledge levels between the two language groups. The results, *t*(58) = -4.10, *p* < .001, suggest that there was a statistically significant difference between the two language groups. Chinese language readers had greater prior knowledge than their Australian counterparts for both grade levels. Overall, Grade 8 Chinese readers achieved the highest score for prior knowledge amongst all the participant groups. A simple linear regression analysis was conducted to see whether the readers’ grade levels and ethnicity predicted their level of prior knowledge of the text topic. The results further established that the readers’ grade levels, *b* = .27, *t*(57) = 2.40, *p* < .01, as well as their ethnicity, *b* = .47, *t*(57) = 4.27, *p* < .001 statistically significantly predicted their level of prior knowledge of the topic in the text, *Electricity and Magnets*. Readers’ grade levels and their ethnicity explained a significant proportion of variance in prior knowledge scores, *R*² = .30, (2, 57) = 12.02, *p* < .001. They accounted for 27.2% of the explained variability in prior knowledge scores.
As expected, an independent *t*-test comparing the level of prior knowledge across the two grades confirmed that Grade 8 language readers within each language group showed a higher level of prior knowledge about the text topics than Grade 5 language readers. The independent-samples *t*-test result, $t(28) = -2.61, p < .05$, proved that Grade 8 English readers’ score for the prior knowledge task was statistically significantly higher than Grade 5 English readers’ score. Although Grade 8 Chinese readers were also able to score higher than Grade 5 Chinese readers unlike English language readers, an independent *t*-test result, $t(28) = -1.18, p > .05$ indicated no statistically significant difference between the Chinese language readers’ level of prior knowledge.

A simple linear regression analysis was conducted to assess the relationship between readers’ prior knowledge and their cloze scores. It was found that the prior knowledge scores of both English and Chinese language readers’ statistically significantly predicted their cloze scores, $b = .48, t(60) = 7.52, p < .05$ and in fact they explained a significant amount of variance in their cloze scores, $R^2 = .23, F(1, 58) = 18.12, p < .05$. 
As the level of readers’ prior knowledge increases so do their cloze task scores or comprehension of the text. This confirms what is expected within the Construction-Integration model of text comprehension (Kintsch, 1998). In other words, this confirms that the readers who had more prior knowledge were able to construct a more coherent mental representation or situation model of the text. Once again, it can be concluded that prior knowledge is a good indicator for higher level of text comprehension and levels of constructive activities for not only English language readers but also for Chinese language readers. For the full table of raw results for prior knowledge and comprehension please see Table 22 in Appendix B.

This study will next analyse the results for performances in other tasks such as prediction, adding titles and adding sentences. This will also provide information on how readers integrate their prior knowledge with the information in the paragraphs when constructing the situation model of the text in both English and Chinese.
4.2.2 Prediction

Responses to the prediction task showed four levels of reasoning ability. These were ranked in scores ranging from 0-3 just as the other applied comprehension responses were scored after reading the second text, *China and Australia*. Responses that were scored as 0 showed literal levels of understanding, which were almost always based on the photos or the text on the cover page. These responses predicted that the text would be about the flags or roads in the two countries or just said it would be about Australia and China. One reader’s response included a prediction that the text would be about darkness due to the shading in one of the photos. One Grade 5 English language reader predicted that the passage would talk about how China has too many babies and one said China is “more dark and empty and Australia is not dark and empty, they have light on the side of the roads”. Responses, which were scored as 1, consisted mainly of predictions that the text would be about the differences or comparison between the two countries. Responses that were scored as 2 managed to go beyond the immediate information and provided more information about the areas in which the two countries were compared or contrasted, while the highest level of responses, which were scored as 3, included more detailed and explicit information and accurate prediction of the actual areas of comparison or the inferred subheadings in the actual macro-structure of the text.

The mean for prediction scores of English language readers, .35 was statistically significantly higher than the mean prediction score of Chinese language readers, .08. It was more than double. An independent-samples *t*-test was computed to assess the differences between the readers in the two language groups. Again, different from the prior knowledge results, the prediction results showed a statistically significant difference between English and Chinese language readers’ scores, *t*(46) = 3.31, *p* > .05. This was further assessed by a
simple linear regression analysis in which readers’ ethnicity statistically significantly predicted their scores for guessing the text topic using the information on the cover sheet, \( b = -0.44, t(48) = -3.32, \ p < .05 \). Readers’ ethnicity accounted for 10.9% of the explained variability in prediction scores.

In assessing the relationship between readers’ prediction skills and their cloze task scores, it was found that the prediction scores statistically significantly predicted the cloze scores of the 48 students who completed the second part of the study, \( b = .35, t(48) = 19.50, \ p > .05 \), and they explained a significant proportion of their cloze scores, \( R^2 = .12, F(1, 46) = 6.7, \ p < .05 \).

Overall, the results of the prediction task revealed that English language readers were better predictors of the topic using the information on the cover page and their prior

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Figure 3. Text 2 Prediction Scores by Ability Groups
knowledge. Chinese language readers were not able to go beyond the information provided on the cover page to the same extent as their English language peers.

### 4.2.3 Adding titles

Readers’ responses for adding titles showed differences both between the language groups and the ability levels. A one-way ANOVA test was conducted to determine if the ability to add titles was different for Chinese and English language readers. It was found that the ability to add titles to paragraphs was statistically significantly different between the two language groups, $F(1, 58) = 19.202$, $p < .001$. Similarly, an independent $t$-test comparing the results for the two language groups revealed that Grade 5 and Grade 8 Chinese language readers scored statistically significantly higher than Grade 5 and Grade 8 English language readers, $t(28) = -4.38$, $p < .05$.

![Figure 4. Mean Scores for Adding Titles and Sentences](image)

A simple linear regression analysis found that readers’ ability to add titles predicted their cloze task scores for both language groups, $b = .34$, $t(60) = 8.35$, $p < .05$ with an $R^2$ of
F(1, 58) = 7.56, p < .05. To further assess the relationship between adding titles and readers’ ability and language backgrounds, two other simple linear regression analyses were conducted. One between adding titles and the language groups, \( b = .49, t(60) = 4.63, p < .05 \) and one between adding titles and the ability levels, \( b = .37, t(60) = 2.73, p < .05 \). These results revealed that readers’ ability as well as their language background statistically significantly predicted their scores for adding titles.

In terms of readers’ constructive activity levels, Chinese language readers outperformed English language readers for both grade levels. While there were no Grade 5 English language reader titles constructed at Level 4, there were only four Level 4 titles by Grade 8 English readers compared with 13 Level 4 titles by Grade 5 and 26 titles by Grade 8 Chinese language readers (See Table 9 below).

Table 9

9. Adding Titles Results by Reader Responses

<table>
<thead>
<tr>
<th>Constructive Activity Level</th>
<th>YR5AS Titles</th>
<th>YR5CS Titles</th>
<th>YR 8AS Titles</th>
<th>YR8CS Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>26</td>
<td>20</td>
<td>23</td>
<td>6</td>
</tr>
<tr>
<td>Level 2</td>
<td>33</td>
<td>24</td>
<td>31</td>
<td>34</td>
</tr>
<tr>
<td>Level 3</td>
<td>16</td>
<td>17</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Level 4</td>
<td>0</td>
<td>13</td>
<td>4</td>
<td>26</td>
</tr>
</tbody>
</table>

Although it does not appear that adding titles is developmental, it is certainly significant to note that, similar to prior knowledge results, while Chinese language readers were better at adding titles out of the two language groups, Above Average readers were better at adding titles in both languages. Chinese language readers’ titles indicated better construction of the situation model or mental representation of the situation in the text. Below
are the examples of Chinese and English language readers’ titles, which demonstrate the levels of their constructive effort.

4.2.3.1 Level 1 – Pre-structural (pre-factual confabulation)

Grade 5 readers and in particular Grade 5 English language readers had the highest number of Level 1 titles while Grade 8 Chinese language readers had the lowest number of Level 1 titles. These titles included no responses and off task words and phrases, which indicated no understanding of the main idea in the paragraph and focused on isolated words or sentences in the paragraph. These responses indicated lack of understanding of the information in the paragraph. There was no meaning or demonstrated understanding as described in the pre-structural level or pre-factual confabulation level as described by Law (2008).

Scattered and copied words, phrases and sentences selected randomly from the paragraph were included at this level of responses. Readers’ could not identify the main idea in the paragraph and did not use their existing knowledge to write titles. Readers’ responses linked to the main idea or parts of the main idea and/or information in the paragraph were not relevant. The responses at this level displayed a very low level of constructive activity. These readers also indicated lower competency in written expression such as poor spelling, grammar, sentence structure and punctuation when compared with the rest of the responses. An isolated item of information such as the response by CS5_BA_3 below is one of the examples for this level of responses.

AS5_BA_3: “could you imagine [sic.]”

AS5_AA_1: “without electricity”

AS8_BA_4: “William Gilbert”
4.2.3.2 Level 2 – *Factual (knowledge telling)*

The majority of readers’ titles constructed across the two grades and the language groups were at Level 2. Readers’ responses at this level still showed little understanding of the main idea in the paragraphs and a low level of constructive effort. These responses rated as Level 2 involved statements, which relied heavily on local surface features of the text. In addition, there was no attempt at understanding and making connections between different textual elements or micro-propositions within the paragraph or within the text for that purpose. Readers seemed to focus on one single aspect of the information provided in the paragraph and usually expressed this in a factual statement (AS5_AA_2) or elaboration (CS5_BA_5) of a text statement.

- **CS5_BA_2**: “in 1752, electricity was discovered”
- **AS5_AA_2**: “Electricity is a form of energy”
- **CS5_BA_5**: “with electricity, people have better life”

Readers’ responses also indicated that the constructive processes in which they were engaged were only at the local-text level with no attempts made at integrating existing knowledge with the new information read in the paragraphs. Readers within this level are said to be readily fitting the new information into their existing schemas by restating statements and using simple, shallow paraphrases (Law, 2008). It was interesting to see how some Chinese language readers were being creative with such restatements or artificially altered text statements. Readers used omission and/or addition as strategies to restate the
original text statements and in particular the topic sentences without further attempt at understanding the connections between these statements and the others in the relevant paragraphs.

Some of these readers omitted and added characters to make the sentence sound and look different. This was done in particular with the first part of the characters, which is mostly used as the cue for its pronunciation and it does not alter the meaning, which is usually expressed by the second part (See Chapter 2 for further information on Chinese character formation). One example of such strategy below reveals that omitting and adding new characters for the sake of it may cause distraction to the microstructure or surface level features of the sentence.

Original text statement:

大部分的电能是由燃烧矿物燃料所产生的。

Most of electric energy is from burning fossil fuels produced

CS8_BA_4’s altered restatement:

大部分的电能部是由燃烧矿物燃料燃烧所产生的。

Most of electric energy all is from burning fossil burning produced

Chinese translation of the topic sentence reveals the differences (highlighted) in terms of the individual characters actually used in the sentence. Hence, the reader added the extra character, 都 (dōu, pronounced /dov/) meaning ‘all of’ already used at the start of the
sentence to mean ‘most of’ for the purpose of emphasising while maintaining the overall meaning of the sentence.

The same reader also deleted the second part of the character 燃料 used for ‘fuels’ in the original text and instead added 燃烧 as in 燃烧 for ‘burning’ and as a result changed the character from a noun to a verb. This was again an unnecessary repetition because the sentence already had the character for ‘burning’ expressed earlier as indicated above with the underlined character. It seems that the reader again wanted to give the impression that the sentence sounds and looks different and yet the overall meaning is maintained but instead unintentionally created an ungrammatical sentence.

One last example of omission and addition as a strategy used by Chinese language readers relates to the topic sentence of the second paragraph about the discovery of electricity. The reader CS8_BA_4 omitted 们 from the second part of the character 人们 for ‘people’ as well as the characters 琥珀上 for ‘on amber’ from the original sentence ‘In ancient times, people knew that rubbing fur on amber made an attraction.’ The reader still maintained the overall meaning because not only the character 人 without the plural making character 们 means ‘person’ as the singular form of the word ‘people’ but it also means ‘a human being/mankind’. These examples above showed weaker Chinese language readers’ low level of constructive attempts to understand the main idea and their reliance solely on the topic sentences as a strategy to write titles.
4.2.3.3 Level 3 – Multistructural (inferential constructive processes)

As the readers start making connections between different elements, they are able to focus on more than one aspect of the meaning implied in the paragraph and the text. They are attempting to construct the text representations for the first time. At Level 3, readers’ responses appear more like inferences, which indicate attempts at integrating micropropositions with macroproposition or the main idea in the paragraph. There is also an attempt at structuring the response as a title without overly depending on local text sentences as also seen in the examples below. Readers still wrote sentences as titles within Level 3 responses showing that there are still inconsistencies that exist within this level of titles.

CS5_AA_2: “Life without electricity and magnets”
CS5_A_1: “Proving existence of electricity”
AS5_A_4: “How did electricity start?”
CS8_A_4: “Electric energy may be transformed from other energies”
AS8_A_5: “How magnets work”
CS8_AA_2: “Formation of magnets and the relationship”

The examples above showed that the readers were making an effort at constructing the textbase by integrating micro-propositions with macro-proposition sometimes successfully, sometimes unsuccessfully. For the title below the reader attempted at connecting micropropositions from different paragraphs into macroproposition by lengthening the sentence artificially and failing to consider the structure of it as a title.

CS5_A_5: “Composition of magnets and the relationship between electricity and magnetism, and the advantages of electro-magnet in life”
Readers’ understanding is still limited to the text knowledge and they are not able to integrate their existing knowledge to understand the text at a deeper level as in Level 4 or 5.

**4.2.3.4 Level 4 – Relational (implicit knowledge building)**

Readers’ titles, which indicated processes that went beyond the text, were considered to be at the highest level of understanding. These titles, which displayed the use and integration of existing knowledge with the text information, indicated an attempt for the first time to construct a situational model of the relevant paragraphs and the text. Readers’ titles at this level were clearly relating to the main idea of the text and showed deeper understanding and integration of micropropositions into the macropropositions or the main idea. Level 4 responses such as the ones below involved connections made between the readers’ existing knowledge and main idea in the paragraphs. All Level 4 titles involved the use of a word that cannot be found in the original paragraph in the text as highlighted below indicating the use of readers’ existing knowledge in creating the title. There is a sense of analysis, originality and creation with these titles. These all relate to the processing of the text information through making appropriate and accurate connections between the micropropositions and the macroproposition or the main idea in the paragraphs as indicated in the examples below. Grade 5 English language readers were not able to construct Level 4 titles and Grade 8 English language readers were able to construct six Level 4 titles in total.

CS5_AA_1: “The importance of electricity and magnetism”

CS8_AA_3: “origins of electrical conductivity”

CS5_AA_3: “sources of electricity”

CS8_A_4: “The origin of electricity and magnetism”,

CS8_AA_4: “Electricity and magnetism are essential part of life”
CS8_A_5: “Effects of electricity and magnetism on life.”
AS8_AA_1: “Electricity in the making”,
AS8_AA_4: “Production of electricity”

Reader CS8_A_5 identified the main idea, used existing knowledge about writing titles and vocabulary as in ‘effects’ to construct an appropriate and accurate title.

4.2.3.5 Level 5 – Extended abstract (explicit knowledge building)

The responses that included the use of abstract ideas that identify other related areas outside the text were considered as part of problem solving and synthesising. None of the readers’ titles showed any evidence of such extrapolation. Overall, Law (2008) describes Level 4 and Level 5 responses as attempts at constructing a situational model of text representation.

4.2.3.6 Adding sentences

The final task for examining the construction of a situational model was adding four sentences to the four paragraphs marked with #, the hash symbol otherwise known as the number sign. The task similar to adding titles aimed at eliciting information about the level of readers’ construction of a situation model of the text and in doing so, the nature of their processing of information presented in the text. The task necessitated understanding the main idea in the paragraphs as well as constructing an additional relevant idea, which would be different to the ideas and statements presented in the text. Readers needed to use their knowledge of the textbase and integrate this with their existing prior knowledge to add a relevant sentence to each of the paragraphs. The only difference between this task and the previous task of writing titles is that the readers’ responses to adding sentences were longer.
and more open-ended. Readers’ titles were not supposed to be in sentence form and needed to be short and succinct enough to capture the main idea in each paragraph.

The indicators for readers’ construction of a situational model of each paragraph were evident in readers’ sentences, which went beyond the immediate information or ideas presented in the paragraph and the text. Readers’ responses that showed evidence of readers’ construction of the situational model included attempts at hypothesising, expanding and, more importantly, considering and examining the textual information and ideas in new situations outside the world of the text. Similar to the previous task, the responses for adding sentences were further scored using The Sentence Constructive Activity Scale also adapted from Chan et al. (1992) and Law (2008). A maximum score of 20 was awarded for Level 5 responses.

Based on The Sentence Constructive Activity Scale, the results below are similar to the results of the adding titles task for which Grade 8 Chinese language readers achieved the highest score out of all the groups across grades and the two language groups, $M = .57$, $SD = .19$. Chinese language readers’ added sentences were the only ones at Level 4 and at Level 5 in terms of their level of constructive activity. Grade 8 Chinese language readers constructed 20 sentences, which were at Level 3 (see Table 10). Their sentences were similar to their titles and the level of their prior knowledge scores all indicate that Grade 8 Chinese language readers were able to construct better situation or mental model of the text than any other group. Students were given a score for each of the four sentences out of 5. Based on the levels of their sentences the readers could achieve up to the perfect score of 25 (if all sentences were at Level 5).
Table 10

10. Adding Sentences Results by Reader Responses

<table>
<thead>
<tr>
<th>Constructive Activity Level</th>
<th>YR5AS</th>
<th>YR5CS</th>
<th>YR8AS</th>
<th>YR8CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>40</td>
<td>17</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>Level 2</td>
<td>16</td>
<td>34</td>
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<td>27</td>
</tr>
<tr>
<td>Level 3</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>20</td>
</tr>
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<td>Level 4</td>
<td>0</td>
<td>2</td>
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<td>4</td>
</tr>
<tr>
<td>Level 5</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Overall, as seen in Figure 4 above, Chinese language readers’ mean scores for adding sentences, for Grade 5; .47, Grade 8; .57, were statistically significantly higher than English language readers’ mean scores, Grade 5; .41, Grade 8, .39. An independent t-test was conducted to compare the differences between the two language groups for the adding sentences task. The results, $t(58) = -3.08$, $p < .05$, revealed a statistically significant difference between the two language groups.

The examples below demonstrate different levels of constructive activity for constructing sentences to add to the end of the four marked paragraphs. In general, English language readers’ added sentences were fragmentary and in response to immediate, random or single ideas and sentences in the paragraphs. Grade 5 English language readers’ sentences could not go beyond Level 2, which comprised factual statements and required very little constructive effort. As can be seen in the examples below (AS5_BA_3 and AS5_A_1), some were not even able to construct a full sentence. Grade 8 English language readers constructed only seven added sentences at Level 3 with evidence of inference but no sentences at Level 4 or 5 which require integration of prior knowledge and evidence of the situational model of
Unlike Chinese language readers, some English language readers’ provided no response or responded with, “I don't know”. These responses were scored as Level 1.

4.2.3.6.1 Examples of English language readers' sentences for each level

Level 1

Paragraph One

AS5_BA_1: “We need electricity to see in the dark”

AS5_BA_3: “and electricity to get through our everyday life”

AS8_A_1: “We use magnets everyday”

AS8_BA_3: “life without energy would be very hard”

Paragraph Two

AS5_BA_2: “Who was the inventor of magnets?”

AS5_BA_4: “Why did electricity come into our lives?”

AS8_A_4: “even you and me are made up of atoms”

AS8_BA_3: “Planets have emergy [sic.] in their universe” (Paragraph Two)

Paragraph Three

AS5_A_4: “These energy sources are great”

AS5_A_1: “And that’s are [sic.] very useful”

AS8_BA_1: “magnets can be used for other things” (Paragraph Three)

Paragraph Four

AS5_AA_5: “magnets can be many different sizes”
Level 2

Paragraph One

AS5_AA_2: “life without electricity and magnets is hard”

Paragraph Three

AS5_AA_4: “the magnets help many people by closing doors firmly”

Paragraph Four

AS8_BA_3: “electromagnets have many advantages”

Level 3

Paragraph One

AS8_AA_3: “magnets assist us to keep notes on fridge doors, but they can also create electricity too”

Paragraph Three

AS8_A_2: “magnets are used to keep doors shut and if we don't have magnets we would have doors open all the time”

Grade 5 Chinese language readers’ sentences were similar to Grade 8 English language readers’ added sentences mostly at Level 2 with six at Level 3. Unlike Grade 5 English language readers their sentences showed evidence of inferences and attempts at high level of construction. Chinese language readers scored higher in the prior knowledge test and achieved better result with macro-propositions than English language readers. They managed to construct six Level 4 and four Level 5 sentences. They provided evidence of constructing a coherent situational model, synthesising and explicit knowledge building.
4.2.3.6.2 Examples of Chinese language readers’ sentences for each marked paragraph

Level 3

Paragraph Two

CS8_A_1: “Electric current is a type of matter produced naturally in the universe”

CS5_A_1: “Electricity is a type of energy too and there are many sources of energy including, water, sun and wind”

Level 4

Paragraph Three

CS8_AA_2: “So as to make our life safer and avoid troubles caused by the thefts”

CS8_A_5: “As a result of this we are able to reduce the sizes of switches and other objects making them more portable”

Level 5

Paragraph Three

CS5_AA_3: “the invention of Maglev train was based on the characteristics of the attraction between magnets”

CS8_AA_1: “When a credit card is printed, there is a magnetic chip on the credit card”
Additionally, a simple linear regression analysis was conducted to assess the relationship between adding sentences and readers’ cloze scores. The results demonstrated that readers’ ability to add sentences predicted their cloze task scores for both language groups, $b = .45$, $t(60) = 6.92$, $p < .05$ with an $R^2$ of .21, $F(1, 58) = 17.53$, $p < .05$. Another simple linear regression also revealed that readers’ ethnicity statistically significantly predicted their scores for adding sentences, $b = .38$, $t(60) = 3.08$, $p < .05$. Similar to the adding titles task results, readers’ grades, $b = .05$, $t(60) = .04$, $p < .05$ and their age, $b = .14$, $t(60) = 1.11$, $p < .05$ were not significant factors in predicting their scores for adding sentences. The results of another simple linear regression model established that readers’ prior knowledge scores statistically significantly predicted their ability to add correct sentences to the paragraphs in the text, $F(1, 58) = 14.393$, $p < .001$. Students with higher prior knowledge scores were more likely to add correct sentences and construct a better situation model of the text than students with lower prior knowledge scores. Table 12 presents a summary of all means and statistical differences between the two language groups for dependent variables used for testing Hypothesis 1.

### Table 11

**11. Mean Scores for Adding Titles and Sentences**

<table>
<thead>
<tr>
<th></th>
<th>Adding Titles</th>
<th>Adding Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
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</tr>
<tr>
<td>CS8</td>
<td>15</td>
<td>0.58</td>
</tr>
</tbody>
</table>
Table 12

12. Summary of Means for Each Part 1 Dependent Variable

<table>
<thead>
<tr>
<th>Language</th>
<th>Grade</th>
<th>N</th>
<th>Cloze Scores</th>
<th>Macro-Responses</th>
<th>Think-Aloud</th>
<th>Prior Knowledge</th>
<th>Prediction</th>
<th>Adding Titles</th>
<th>Adding Sentences</th>
</tr>
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<tbody>
<tr>
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<td>0.37</td>
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<td>Gr 5</td>
<td>15</td>
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<td>0.22</td>
<td>0.36</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>Gr 8</td>
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<td>0.33</td>
<td>0.38</td>
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<tr>
<td></td>
<td>Gr 5</td>
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<td>31.86</td>
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<td></td>
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</tr>
</tbody>
</table>

*Statistically different means b/w language groups are highlighted

4.2.4 Independent marking analysis and inter-rater reliability

Independent markers both in Chinese and in English also marked readers’ responses for each task to ensure the validity and the reliability of all the results. A native speaker who is also a professional editor marked each English language reader’s response independently for cloze, think-aloud, summary, adding titles and adding sentences tasks. Furthermore, Chinese responses for all the tasks were independently marked in English and in Chinese by two independent markers. While the independent marker in English was the same as above, the independent Chinese marker marked the original Chinese responses in Chinese rather than in translation and was a bilingual speaker of Chinese and English and a teacher of Chinese language who was a PhD candidate and had a high level of understanding of educational research. Both markers were provided with information on the thesis and a copy of the methodology chapter.
The marking criteria were confirmed in a separate discussion time with each of the independent markers before they started marking. The independent markers’ scores for each task were checked against the scores given by the researcher and/or other independent markers. These were then combined using a statistical software tool, SPSS, for analysing differences between the scores for each task. All differences between the markers were discussed and resolved before the scores were finalised.

The independent marking of the prior knowledge task for English language readers revealed no differences between the researcher’s marking and the independent marker. Grade 5 Chinese language readers’ prior knowledge results also revealed no differences between the marking in Chinese and the marking of the translations in English. Both the independent and the researcher’s marking resulted in a mean score of .53. Independent marking for Grade 8 Chinese language readers’ prior knowledge marking revealed -0.02 difference between the researcher’s mean, .61 and the independent Chinese marker’s mean, .63. The independent-samples t-test conducted revealed that there was no statistically significant difference between the two markings, \( t(58) = -4.10, p > .05 \). This was confirmed by Pearson’s product-moment correlation analysis. This showed statistically strong positive correlation between the two markings of prior knowledge responses \( r(60) = .68, p < .05 \). The independent marking of prior knowledge results was very useful in understanding how different levels of scoring for different prior knowledge questions were developed. The process also revealed some cultural differences between English and Chinese language readers and most importantly helped interpret the results of different groups as well as individual readers.

The results of independent marking for the cloze task in English also revealed total agreement and no differences between accurate and inaccurate responses provided for each gap. The results of independent marking of Chinese language readers’ responses for the cloze
task revealed very little difference between the two markers. While the Grade 5 Chinese readers’ mean score for the first marking was 31.87, the independent marking mean score was 31.73. There was a difference of 0.14 between the two markers. Grade 8 Chinese language readers’ mean score for the first marking was, 35.26. This was, 35.00 for the independent marking which was a difference of 0.26. The independent-samples t-test was conducted to further assess the differences and there was no statistically significant difference found between the two markings, \( t(58) = .31, p > .05 \). All the differences between the two markings were resolved with discussion and both markers agreed on all of the Chinese language readers’ cloze responses. This discussion further helped improve understanding of the type of differences between English and Chinese language readers’ cloze responses, which were included in the results and discussion chapter.

Furthermore, the independent marking of think-aloud responses for both Chinese and English language readers again yielded no differences. The results for independent marking for Text 1 summaries revealed total agreement between the researcher and the independent markers for both English and Chinese language readers which helped confirm the macro-structure of the texts both in English and Chinese. This was important as the macro-structure of the first text was used as a measurement tool for summarisation task. On the other hand, independent marking for adding titles for Grade 5 English language readers’ responses displayed 0.003 difference between the independent marker’s mean score, 36.33 and the researcher’s mean score, 36.00. Independent marking of Grade 8 English language readers’ scores for adding titles revealed a difference of -.04 (researcher, \( M = .38, SD = .11 \); independent marker, \( M = .42, SD = .11 \)). Chinese language responses for adding titles were marked three times. The first marking of the translation of the transcripts was completed by the researcher, the second by an independent marker again through marking the English
translations of the transcripts and the third marking was done by the independent Chinese marker who marked the original transcripts in Chinese, not the translations. The first marker’s Grade 5 mean score, .52 was lower than the second independent marker, .51, but higher than the third marker in Chinese, .50. The first marker’s Grade 8 mean score, .58, was lower than the second independent marker, .58 but higher than the third marker in Chinese, .60.

Both Grade 5 and Grade 8 English language readers’ scores for adding sentences rated by an independent marker revealed a difference of .003. Three markers also scored Chinese readers’ added sentences. The first marker’s Grade 5 mean score, .47 was higher than the second independent marker, .46, and same as the third marker in Chinese, .47. The first marker’s Grade 8 mean score for adding a sentence, .57 was higher than the second independent marker, .53 but lower than the third marker in Chinese, .58. A Pearson’s product-moment correlation analysis revealed that there was a statistically strong positive correlation between markings one and two, \( r(30) = .83, p < .05 \) and markings two and three \( r(30) = .93, p < .05 \). This part of the independent marking not only helped improve understanding of the differences between English and Chinese language readers, but also was used for designing the measurement tool and scoring. The discussions and the scores were highly instrumental in determining the levels of constructive activity and comprehension processes involved in adding titles and sentences to the paragraphs.

Overall, this procedure of independent marking for each task proved to be more beneficial than it was predicted. It was useful in improving the task design and interpreting the initial results as well as understanding the nature of English and Chinese language readers’ text comprehension processes.
4.3 Summary

In conclusion, this chapter has presented the analyses and the interpretation of the results for text comprehension processes. The results were presented using readers’ performance scores and statistical analyses of these in two parts. The first part of the chapter presented the analyses and results on the construction of Textbase and the second part focused on the Situation Model.

4.3.1 The textbase

Readers’ responses in the cloze task, think-aloud protocols and summarisation tasks were analysed to investigate their ability to construct a textbase reading in different orthographies. The results in the cloze task indicated common trends and similarities between Chinese and English language readers. The most obvious trend is the developmental trend that exists between the two grades in both language groups. Grade 8 readers in general achieved better comprehension scores than Grade 5 readers. Grade 5 Chinese macro responses were found to be statistically significantly higher than Grade 5 English but not Grade 8 English language readers. While there was no statistically significant difference between micro level responses for both language groups, this suggests that Chinese language readers’ construction of the textbase is very similar, regardless of their grades. Grade 5 English language readers struggled more than any other group with macro-level responses.

The think-aloud protocols were conducted during the cloze task activity. This was designed to capture readers’ metacognitive thinking processes when they are engaged actively with the text. For the purposes of measuring and analysing the think-aloud protocols, the present study developed think-aloud criteria by adapting the Constructive Activity Scale developed by Chan et al (1992). Probe questions asked during think-aloud protocols aimed to
assess the skill areas below which separates this study from other studies, which used think-aloud as a method of data collection.

- Recalling Main ideas
- Text Comprehension strategies
- Reasoning

An independent t-test conducted also indicated that overall, there was no statistically significant difference between the think-aloud responses of English and Chinese language readers. These findings suggest that the think-aloud strategies and the cloze responses of both language groups are similar. Think-aloud strategies proved to be very beneficial in the construction of textbase for readers of both language groups.

Another significant result was the positive and strong correlation between think-aloud responses and cloze task responses for both language groups and grades. Readers who scored higher in the cloze task in both language groups and grades, also scored higher in the think-aloud task and vice versa (see Table 17). Hence, Grade 5 readers who scored the lowest in the cloze task also scored the lowest in their thinking aloud. This may have many practical and pedagogical implications for developing reading comprehension programs, which make use of think-aloud as a text comprehension strategy in schools.

Above Average readers were able to recall more details and text propositions from the text while weak readers provided generalised or even unrelated comments in both the language groups. Advanced readers were able to infer a higher-level of ideas and relationships within the text, including the overall message given by the author. Readers’ think-aloud comments on the reading strategy used also showed that advanced readers and Grade 8 readers were able to express and explain in detail their use of the strategies. Weaker Grade 5 readers were not able to think-aloud about any of the strategies. Although this may
not mean they did not employ any strategies, looking at their results and other think-aloud statements, it is a good indication of the level of their constructive processes. Think-aloud responses again indicated a developmental trend in thinking about strategy use. Grade 5 readers’ think-aloud responses showed a lower level of knowledge of reading strategies and how they could help the construction of textbase in text comprehension. Readers’ think-aloud statements in both language groups also proved that integration of prior knowledge does occur and influences readers’ performance at each level rather than as the last step for constructing the situation model of the text as suggested by Kintsch’s CI Model.

The results were similar in terms of readers’ constructive activity scores. Advanced readers’ think-aloud responses showed a higher-level of engagement with the text and the levels of text content. They not only talked about the strategies at sentence and word level but also strategies which involved reading for the main idea at paragraph level. They were able to provide a more detailed and explicit explanation of their strategy use supporting this with details from the text. Again Grade 5 readers and weaker readers seemed to be outperformed by Grade 8 and more advanced readers who were able to provide better reasoning and understanding of the difficulties presented in the text, indicating a construction of the textbase at a higher level.

Readers’ summary scores were also analysed to describe their construction of the textbase of the passage. The summaries were scored using the macro-structure of the text designed by the researcher and adapted from Eileen Kintsch’s study of macro- and micro-processes in summarisation (Kintsch, E., 1990). This was based on the number and the level of text propositions used in the readers’ summaries. The summary results indicate that although there were no statistically significant differences found between the grades and language groups, Grade 8 language readers were able to construct summaries more
coherently than Grade 5 Language readers. The summaries differed in the number and complexity of the inferences made as well as the language proficiency displayed in the summaries. Grade 5 English language readers scored the lowest in terms of their summaries and Grade 8 Chinese language readers scored the highest amongst all the groups and two languages. Finally, Above Average or advanced readers’ summary scores were found to be statistically significantly higher in both language groups and grades. Advanced readers from both grades summarised using inferences, while very weak readers were not able to make sense of the text and only included near verbatim repetitions, and general statements on the topic, such as “This passage is about electricity and magnets”. Some wrote unrelated affective personal comments, which had no links to any of the text propositions. These readers were not able to construct higher-level meaning.

4.3.2 The situation model

The second phase in Kintsch’s Construction-Integration Model relates to integration of prior knowledge into readers’ constructions of textbase to create the Situation Model of the text they read. According to Kintsch, this completes the text comprehension processes.

The prior knowledge test showed that the use of readers’ prior knowledge predicts comprehension both for English and Chinese language readers. It was established that Chinese language readers’ prior knowledge was not only statistically significantly higher than English language readers for both grade levels but it also indicated a different knowledge structure that is their responses in the prior knowledge test indicated culturally different information and schemata compared to English readers’ responses. The possible reasons behind this will be discussed further in Chapter 6. The results for the prior knowledge task were not as hypothesised given the results in the comprehension task and the summarisation
tasks. Grade 8 Chinese language readers scored statistically significantly higher than the rest of the groups and Grade 5 English language readers attained the lowest score after Grade 5 Chinese language readers. It is important to note that the prior knowledge scores of Grade 8 English language readers were lower than Grade 5 Chinese language readers. Given the developmental trends in all the previous tasks and results, this suggested the possibility of cultural differences between the readers in the two language groups.

Although the interviews with the teachers and the schools confirmed that readers did not study the topic, electricity and magnets in Grade 8 or Grade 5 this year, Chinese language readers’ prior knowledge on the topic was generally higher than English language readers, based on the Prior Knowledge Test. Furthermore, there was a positive correlation between readers’ prior knowledge scores, their grades and the cloze task scores. As prior knowledge increased cloze comprehension scores also increased for both language groups. Looking at the nature of the responses, Chinese language readers demonstrated greater prior knowledge on the topic.

Besides prior knowledge, readers’ results for their prediction of the topic for the second text, *China and Australia*, were also analysed for describing readers’ text processes. The analyses indicated the same trends as in the prior knowledge task for describing the differences between the processes of Chinese and English language readers. This time it was English language readers who scored statistically significantly higher than Chinese language readers. Independent *t*-tests found significant differences between the readers in the two language groups. Only the Above Average Grade 8 Chinese language readers were able to score 3 for the prediction task, but even then they did not present creative predictions as English language readers did.
The last two tasks and results analysed and described included adding titles and adding sentences to the marked paragraphs on the sheet. Readers were asked to create their own original titles and sentences, which required them to use knowledge beyond the textbase. To create titles, readers first had to work out the main idea in the paragraph then make inferences and use relevant knowledge and skills in writing to complete the task. This demonstrated their abilities to process the text information at a higher-level in their attempt at constructing a situation model representative of the text. The results of adding titles and sentences demonstrate that overall Grade 8 language readers’ are better at adding appropriate titles for the five paragraphs marked in the text than Grade 5 readers, although the independent-samples t-test conducted revealed no significant difference between Grade 5 and 8 language readers’ titles for both language groups. Grade 8 Chinese language readers’ titles and sentences stood out amongst all the other titles and sentences. They achieved the highest scores in total and their responses indicate a high level of processing and inferences for each of the marked paragraphs.

Overall, statistically significant differences were found between English and Chinese language readers’ titles and sentences. Grade 5 English language readers’ titles and sentences are scored as the lowest amongst all the groups. These readers’ responses showed very little constructive effort in processing the information in the text. Their titles are mostly comprised of one word fragmentary responses or no response. Grade 5 English and Chinese language readers’ titles included deliberate omission of words or parts of characters from topic sentences or detail sentences to convert them into titles. They also repeated verbatim text statements.
Readers’ titles and sentences indicate their ability to understand the overall meaning in the text and their text representation at the macro-level. The results of the cloze task, think-aloud protocols, summaries, adding titles and adding sentences all revealed the differences between the readers’ text comprehension processes across the two languages and grades. It is reasonably accepted in the text comprehension literature that in addition to differences between readers’ processing, the Construction-Integration Model of reading, as an interactive process, recognises the influence of text features in understanding the text (McNamara et al., 1996; Kintsch, 1999; Long et al., 2006). Coherence of ideas in the text is one of the key features identified by Kintsch and many other researchers in the field as a factor that influences readers’ text comprehension. The next chapter will analyse data in relation to the impact of manipulated local coherence of texts on comprehension.
Chapter Five: Data Analysis – Hypothesis 2

According to the CI Model, text comprehension is an interactive process between the reader and the text and hence, this process is inevitably affected not only by the nature of readers’ characteristics (e.g., prior knowledge, memory span) but also by the features of the reading text (e.g., local coherence). The first phase of this study focused on the former. The second phase appropriately focuses on the latter, where coherence, as one of the prominent text features, is investigated in relation to its influence on text comprehension.

The second hypothesis was investigated through the use of a second expository text, *China and Australia* and students’ performances in three types of tasks. Below are the tasks, which are used to measure the influence of text coherence.

1. The three-level Comprehension Questions
2. 50-word Summary
3. Think-aloud (Only completed by Chinese readers)

48 participants out of 60 were selected for involvement in the second part of the study. This was to ensure that an equal number of readers were given one of the four coherence versions of the text to read. Four readers in each ability category (Above Average, Average and Below Average) were randomly assigned one of four coherence versions of the passage in a way that all four coherence versions were read by readers in each ability category. This was done to avoid the possibility of readers’ ability and their reading of one particular version influencing their performance when reading the other versions. Each of the four versions of the text (1- Good Micro/Good Macro; 2- Good Micro/Poor Macro; 3- Poor Micro/Good Macro and 4- Poor Micro/Poor Macro) is explained in detail in Chapter 3. The criteria for selecting the 48 participants were to include the first four participants in each of
the three ability groups, Above Average, Average and Below Average in Grade 5 and Grade 8 for equal comparison between English and Chinese language readers’ results.

As in previous analyses, Independent Sample $t$-tests were used to analyse the differences between the performances of the readers in the two language groups. Simple linear regression analysis and Pearson's product-moment correlation (see Table 17) were used to assess the relationship between text coherence and text comprehension. First, readers’ results in the above three tasks for each version of the text *China and Australia* are analysed. This is then followed by the analyses of further data on Grade 8 Chinese research and control groups’ performances in both Chinese and English before all the results are summarised at the end of the chapter.

5.1 Text Coherence and Comprehension

5.1.1 Comprehension scores and coherence versions of the text

In this section, readers’ results in the three-level guide comprehension task for four versions of the second text, *China and Australia*, will be analysed to investigate the possible influence of local coherence as a text feature on comprehension for English language readers as well as Chinese language readers. Students’ nine three-level guide comprehension responses were scored in terms of their level of difficulty: Score of 1 was assigned for each correct Literal level question (questions, 2,3 and 4), score of 2 for each correct inferential question (questions 5, 6 and 7) and score of 3 was assigned for each Applied level question (questions1 [prediction task], 8 and 9). Applied being the most difficult level where students integrate their prior knowledge use to find the answers and the Literal being the easiest less construction demanding level where the answers are easily located in the text.
Due to the small sample sizes in this study, it should be noted that only independent sample $t$-tests are robust for such sample sizes. To this end, independent-samples $t$-tests were performed to assess the significance of differences between the comprehension scores of Grade 5 and Grade 8 Chinese and Australian language readers. The results of an independent-samples $t$-tests revealed a statistically significant difference between the two grade levels, $t(21) = -3.54, p < .05$.

Readers’ comprehension scores were then compared with each coherence version of the text using independent-samples $t$-tests to gain further understanding of the individual effect of each version of text. The coherence versions are Version 1, the original text with GOOD MICRO / GOOD MACRO, Version 2; POOR MICRO / GOOD MACRO, Version 3; GOOD MICRO / POOR MACRO and Version 4; POOR MICRO / POOR MACRO structure. Table 1 displays the raw comprehension results for each version of the text. Independent-samples $t$-tests revealed that there was a statistically significant difference between the comprehension scores for coherence Versions 1 and 4, $t(22) = 2.14, p < .05$ and Versions 2 and 4, $t(22) = 2.44, p < .05$ of the text (see Table 10 below). Another independent-samples $t$-test revealed that while there was statistically significant difference between Grade 5 readers’ comprehension scores for Versions 1 and 3, $t(10) = 2.51, p < .05$.

Above results imply that the macro-structure of the text plays more significant role than micro-structure when it comes to comprehending the text information in both languages. Comprehending the macro-structure of the text requires a higher level of inferences made between the key ideas and information in the text. Although having a sound grasp of the micro-structure helps this, it does not necessarily assume better comprehension at the macro-level. In particular, as seen with Grade 5 English language readers’ results, the influence of text coherence versions is greater for readers with lower text comprehension.
The relationship between readers’ comprehension scores and the coherence versions of the text indicate that although coherence versions of the text influenced readers’ comprehension scores in general, the level of influence was different for Chinese language readers. Coherence Version 2 with Poor Micro- and Good Macro-structure seem to trigger even better comprehension scores than Version 1 for Grade 5 Chinese students, while poor macro-structure of coherence Version 3 seems to trigger better comprehension scores for Grade 8 Chinese students. Poor-macrostructure had a much more positive influence on Grade 8 Chinese language readers’ comprehension whose scores were the highest for Version 3 compared to other groups and coherence versions.

Table 13

13. Readers’ Raw Comprehension Results by Coherence Versions

<table>
<thead>
<tr>
<th>Coherence Versions</th>
<th>N</th>
<th>YR5AS</th>
<th>YR5CS</th>
<th>YR8AS</th>
<th>YR8CS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1- GoodMicro/GoodMacro</td>
<td>48</td>
<td>19</td>
<td>16</td>
<td>23</td>
<td>24</td>
<td>82</td>
</tr>
<tr>
<td>V2- PoorMicro/GoodMacro</td>
<td>48</td>
<td>17</td>
<td>20</td>
<td>23</td>
<td>23</td>
<td>83</td>
</tr>
<tr>
<td>V3- GoodMicro/PoorMacro</td>
<td>48</td>
<td>6</td>
<td>7</td>
<td>17</td>
<td>29</td>
<td>59</td>
</tr>
<tr>
<td>V4- PoorMicro/PoorMacro</td>
<td>48</td>
<td>5</td>
<td>5</td>
<td>18</td>
<td>17</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>48</td>
<td>81</td>
<td></td>
<td></td>
<td>93</td>
</tr>
</tbody>
</table>

Nonetheless, as shown by the lower comprehension scores above in total for Versions 3 and 4, poor macro-structure seems to have a greater impact on readers’ comprehension than poor micro-structure for both language groups. The next section will analyse readers’ summaries by seeking more answers in relation to the role of coherence in text comprehension for English and Chinese language readers.
5.1.2 Text 2 summarisation and coherence

Following the comprehension questions, on the same sheet, readers were asked to produce a 50-word (word equivalent in Chinese) summary of Text 2. The summaries were scored using Constructive Activity Scale adapted from Chan et al. to ensure the validity of the results obtained. Readers’ summaries were placed on the scale of Levels 1-4 and scored accordingly. If their summaries were comprised of affective comments with no links to any of the text propositions (ideas units) they were scored as Level 1 (Pre-Propositional Level) and given a score of 1. If they were comprised of repetition of some facts about the text topic or general statements about the overall meaning, then it was scored as being at Level 2 (Partial-Propositional Level) and given a score of 2. If a summary included evidence of some inferences and links to propositions in the text it was scored as Level 3 (Perceptive – Propositional Level) and assigned a score of 3. Lastly, if a summary is scored 4 the highest score possible then it means the reader organised their summaries coherently and used their prior knowledge to complete high-level analysis at macro-structure level. This is scored as 4 for being at Para-Propositional Level (Level 4). Readers’ constructive activities in summarising the text are measured for each manipulated coherence version of the text in order to investigate the influence of local coherence.

Additionally, the Chinese Grade 8 language readers’ summarisation score in total was more than double that of the Chinese Grade 5 language readers. A simple linear regression was computed to determine whether the readers’ ages predicted their summary scores. The result confirmed that there was a significant regression equation, $F(1, 46) = 14.06, p < .05$ with an $R^2 = .23$ between the two variables. This also confirms Eileen Kintsch’s findings (Kintsch, E., 1990) about age as a predictor for better performance in comprehension and summarisation skills, regardless of how poorly the text is organised. It also confirms the
significance of summarisation as a constructive activity strategy in text comprehension in both English and Chinese.

Each coherence version of the text generated diverse qualities of summaries. The scores in Figure 5 below display how the different versions of the text generated different results in readers’ summaries for Grade 5 and Grade 8 readers. Mean summary scores for Version 1, .06, were higher than Version 2, .05, Version 3, .04 and Version 4, .03. The summary scores increased from Version 4 to Version 1 in that order. Again the study used mostly t-tests instead of ANOVA as the most suitable statistical tool due to this study’s small sample size. Independent-samples t-tests were computed to assess the differences between the readers’ summary scores and different coherence versions of the text. It was found that there was a statistically significant difference between the summary scores for:

- Versions 1 (Good Micro-Good Macro) and 3 (Good Micro-Poor Macro), t(22) = 2.75, p < .05
- Versions 1 (Good Micro-Good Macro) and 4 (Poor Micro-Poor Macro), t(22) = 5.13, p < .05
- Versions 2 (Poor Micro-Good Macro) and 4 (Poor Micro-Poor Macro), t(22) = 3.20, p < .05

The statistical difference between Versions 1 and 4 was the greatest. It is evident in the above analyses that the macro coherent version as opposed to micro is the most influential when it comes to summarisation for both language groups.

Readers’ summaries of text input Version 1 are measured to be at constructive activity Level 3 (Partial-Propositional Level) for Grade 5 language readers and Level 4 (Para-Propositional Level) for Grade 8 language readers. None of the Grade 5 or Grade 8 language readers’ summaries of text input Version 1 were found to be at Level 1- Pre-Propositional.
Level. This confirms that readers who read Version 1 (Good Micro-Good Macro) of the text in the two grades and language groups were able to generate better summaries than the readers who read other versions. This is particularly in contrast to the readers’ summaries of Version 4 (Poor Micro-Poor Macro) of the text. Version 4 summaries display the lowest level of constructive activities. In particular, weak readers’ Version 4 summaries mostly consisted of affective/personal comments, copied text fragments, generalised statements about the overall meaning and retelling of text propositions.

![Summary Scores](image)

*Figure 5. Raw Summary Scores By Coherence Versions*

The above summary results suggest that text coherence influences readers’ performance differently based on the level of constructive activity they engage in. The think-aloud protocols were again conducted to gain further understanding of the nature of Chinese language readers’ constructive activities, their meta-cognitive skills and the reading strategies they used. Next, these will be briefly analysed in relation to their role in text coherence.
5.1.3 Chinese Readers’ Think-aloud Protocols and Text Coherence

Before examining the results for the think-aloud protocols, some comments relevant to the above results are worth exploring. One such think-aloud comment came from a Grade 5 Chinese language reader, CS5_BA5 who read Version 3 (GOOD MICRO/POOR MACRO). This was a comment about the statement on Australia’s wool exports, which was discussed earlier as part of Version 3 summaries. The verbalisation was given in response to the prompt on Question 7 on what title she would add for Paragraph 3 as shown below. The original transcripts in Chinese are provided underneath each translation.

CT5.1: To add an appropriate title to the 3rd paragraph, what title did you add?

老师: 为第三段加个合适的题目,你加的是?

CS5_BA5: Australia is exporting its wool

学生: 澳大利亚在出口羊毛.

The student saw the first topic sentence and assumed that the paragraph was about wool. During the same interview, following the response from the reader above, the teacher read the sentence from the relevant paragraph and asked the reader further questions to clarify her response. The reader still understood that most of the paragraph was about wool. This is very similar to the way in which English language readers make use of topic sentences when reading in English.

CT5.1: This type of red soil is very attractive, and it is one of the most prosperous and wealthy countries... can these be related to wool?

老师: 这种红土非常引诱人,是最富裕的国家之一.....这些和羊毛有关吗?

CS5_BA5: No.

学生: 没有.
Therefore half of the content has nothing to do with this title, why did you choose this title?

老师: 那么有一半的内容和这题目没有关系,你为什么要选这题目呢?

CS5_BA5: Mostly it described wool.

学生: 大多数写的是羊毛

CT5.1: Thank you.

老师: 谢谢。

The Grade 8 Chinese language readers’ think-aloud mean score, .53 was statistically significantly higher than the Grade 5 Chinese language readers’ mean score, .40. An independent-samples t-test found statistically significant difference between the two grade levels, $t(22) = -2.34$, $p < .05$.

Think-aloud results not only confirm this study’s Hypothesis 2 about text coherence but they also are revealing about Chinese language readers’ behaviour and approach to reading and their metacognitive skills in terms of their text processing and comprehension. Through the use of think-aloud protocols one can further explore the nature of Chinese language readers’ constructive activities and reading strategies.

The Grade 8 Chinese language readers’ results in all tasks provided evidence for the influence of text coherence on text comprehension. The analysis in the next section will continue with further insight into the role of text coherence on text comprehension from a different perspective. This time, Grade 8 Chinese language readers’ performances reading in Chinese will be compared with their performances reading in English. This will be followed by the summary, which brings all the data analysis and scores for the influence of text coherence together.
5.2 Reading English as a Foreign Language

Grade 8 Chinese language readers’ think-aloud protocols revealed crucial information about the influence of coherence. This triggered a need for further investigation about the influence of coherence and how it relates to their text comprehension processes. The main aim was to find out whether Grade 8 Chinese language readers would act in the same way when they read and completed the same tasks in another language.

The Grade 8 Chinese readers’ mean comprehension score overall was statistically significantly higher for Chinese text, .43 than English text .09. An independent-samples t-test established that this difference between the same readers’ comprehension scores for English and Chinese texts was statistically significant, $t(22) = 2.88, p < .05$. It is plausible that this is mainly due to their low proficiency in English, which they study as a foreign language for a limited time per week compared to Chinese as part of the curriculum at school.

The same was also true for their summary scores. An independent-samples t-test was computed to assess the readers’ differences in their summary scores for English and Chinese texts. The results verified that the difference between the same readers’ Chinese and English summary scores was statistically significant, $t(22) = 3.87, p < .05$. The readers who achieved the highest scores for both comprehension and summary were the same readers for both English and Chinese texts. The results indicated that readers who were good at comprehension in their first language were more likely to do better in comprehending the text in another language than readers who achieved lower comprehension scores in their first language. This information is vital and has practical implications for reading-to-learn at school.

The Grade 8 Chinese language readers’ comprehension scores for different coherent versions of Text 2 in English yielded a different pattern to their comprehension scores for the
same versions in Chinese. The results in English were similar to English language readers’ results. The research group’s mean comprehension score for Version 1, .15 was higher than all the other versions. Unlike their scores for the Chinese text, their mean score for Version 2, .06, was not lower than Version 3, .040 and out of all scores, their mean comprehension score for Version 4, .04 was the lowest, as can be seen in Figure 6 below for raw scores.

![Figure 6. Comprehension Scores and Coherence Versions in English](image_url)

A Control group of another 12 Grade 8 Chinese language readers was created to validate the results for Grade 8 Chinese language readers’ performance in English. The Control Group completed the same tasks in English. The coherence versions of the text input were kept unchanged for each reader in the group. The results are displayed in Table 14 below.
The results of a One-way ANOVA test show that the Grade 8 Chinese language Research Group performed statistically significantly better than the readers in the Control Group for comprehension task, F (2,21) = 5.21, p < .05 but not for summarisation task, F (2,21) = 1.41, p > .05.

Table 14

14. Research Group (RG) and Control Group (CG) Results

<table>
<thead>
<tr>
<th>COHVER 1-4</th>
<th>Comprehension</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>YR8 RG</td>
</tr>
<tr>
<td>V1</td>
<td>12</td>
<td>0.78</td>
</tr>
<tr>
<td>V2</td>
<td>12</td>
<td>0.67</td>
</tr>
<tr>
<td>V3</td>
<td>12</td>
<td>0.44</td>
</tr>
<tr>
<td>V4</td>
<td>12</td>
<td>0.22</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>2.11</td>
</tr>
</tbody>
</table>

N= Number of participants in each group

Readers in the two groups achieved the highest comprehension score for Version 1 (GOOD MICRO/GOOD MACRO), followed by Version 2 (POOR MICRO/GOOD MACRO), Version 3 (GOOD MICRO/POOR MACRO) and the lowest score for Version 4 (POOR MICRO/POOR MACRO) (see Table 15 and Table 16). This is very similar to the scores achieved by the same students in Chinese as well as the results for Grade 8 English language readers analysed previously. These results confirm the different influence of four coherence versions of the text for all groups.
Table 15

15. Research Group’s Results by Coherence Versions

<table>
<thead>
<tr>
<th>Ability Levels</th>
<th>Research Group</th>
<th>Comprehension Scores</th>
<th>Summary Scores</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>V1</td>
<td>V2</td>
<td>V3</td>
</tr>
<tr>
<td>Above Average</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Average</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Below Average</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>13</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 16

16. Control Group’s Results by Coherence Versions

<table>
<thead>
<tr>
<th>Ability Levels</th>
<th>Control Group</th>
<th>Comprehension Scores</th>
<th>Summary Scores</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>V1</td>
<td>V2</td>
<td>V3</td>
</tr>
<tr>
<td>Above Average</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Average</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Below Average</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 17

17. Summary of Correlations Between the Tasks

<table>
<thead>
<tr>
<th>Tasks</th>
<th>N</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cloze Task</td>
<td>60</td>
<td>*0.67</td>
<td>0.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Micro-Responses</td>
<td>60</td>
<td>0.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Macro-Responses</td>
<td>60</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Think-Aloud</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Ability Levels</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Summarisation Text1</td>
<td>60</td>
<td>0.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Prior Knowledge</td>
<td>60</td>
<td>0.37</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Three-Level Guide</td>
<td>48</td>
<td></td>
<td></td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Summarisation Text2</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p = <.05  *p = <.01
Finally, Pearson's product-moment correlation analysis was run to assess the relationship between the different tasks across the grades and the two language groups. As expected there were significant positive correlations between some of the tasks the readers completed. Table 17 above presents a summary of significant positive correlations found between the tasks completed by both Chinese and English language readers followed by Table 18 which presents a summary of the significant positive correlations found between the tasks completed only by Chinese language readers.

Table 18

18. Summary of Correlations Between the Tasks – Chinese Readers

<table>
<thead>
<tr>
<th>Tasks</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Think-Aloud</td>
<td>*0.01</td>
<td>0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Summarisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Three-Level Guide</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Summarisation (Gr 8 in English)</td>
<td></td>
<td></td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>5. Three-Level Guide (Gr 8 in English)</td>
<td></td>
<td></td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>N = 24 p = &lt;.05 *p = &lt;.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 19

19. Summary of Means for each Part 2 Dependent Variable

<table>
<thead>
<tr>
<th>Language Grade</th>
<th>N</th>
<th>Three-Level Guide</th>
<th>Think-Aloud</th>
<th>50-word Summaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>0.3</td>
<td>NA</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Gr 5</td>
<td>15</td>
<td>0.22</td>
<td>NA</td>
<td>0.1</td>
</tr>
<tr>
<td>Gr 8</td>
<td>15</td>
<td>0.38</td>
<td>NA</td>
<td>0.15</td>
</tr>
<tr>
<td>Chinese</td>
<td>0.32</td>
<td>NA</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Gr 5</td>
<td>15</td>
<td>0.22</td>
<td>0.4</td>
<td>0.11</td>
</tr>
<tr>
<td>Gr 8</td>
<td>15</td>
<td>0.42</td>
<td>0.53</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*Statistically different means are highlighted
5.2.1 Independent marking analysis and inter-rater reliability

Independent marking for Part 2 of the study took place in a similar way to Part 1. Grade 5 English readers’ responses for the comprehension scores rated by an independent rater showed .001 difference and Grade 8 readers’ independent rating showed a difference of .003 (researcher, \( M = .38, SD = .20 \) and independent, \( M = .41, SD = .24 \)). For Chinese language readers’ results, two independent raters rated their comprehension scores. While there were no differences between the researcher and the first independent rater who both rated the translated scripts, the difference between the second independent rater’s mean (in Chinese), .24, and the researcher’s mean score, .22, for Grade 5 was .002. A Pearson's product-moment correlation was run to assess the relationship between the two raters and there was statistically strong positive correlation, \( r(24) = 1.0, p > .05 \). The same mean difference of .002 was revealed for Grade 8 Chinese language readers.

Similar to the independent think-aloud rating completed for the first part of this study, there was also no statistically significant difference between the researcher and the independent raters for think-aloud responses for Text 2 scores. An independent-samples \( t \)-test was conducted to assess the differences between the markers. The same was true for independent rating of English language readers’ summaries. Grade 5 achieved a mean score of .10 and Grade 8, .15. The second independent marker’s mean score and the researcher’s rating, .19 for Grade 5 Chinese language summaries of Text 2 differed by .002. This difference was .004 for Grade 8 summaries. An independent-samples \( t \)-test conducted between the three markings of readers’ 50-word summaries showed that there was no statistically significant difference between the three markings, \( t(30) = -1.64, p > .05 \). Independent ratings for all the tasks for Text 2 did not make any changes to the mean scores for each of the coherence versions of the text. All the differences were discussed and resolved.
between all the markers. These further confirmed the reliability of the results obtained for the second part of this study and the influence of coherence for readers in all groups.

5.3 Summary

In addition to analysing and interpreting the differences between the readers’ text comprehension processes, this chapter has presented analyses of the results for Hypothesis 2 on the influence of local text coherence on text comprehension. The analyses computed were of the readers’ performances on comprehension, summarisation and think-aloud tasks against the four local coherence versions of Text 2. A detailed summary of these results follows.

5.3.1 Comprehension

Just like the cloze task comprehension results in part one, there was no statistically significant difference between the Chinese and English language readers’ comprehension scores for the second part of the study. Examining the results of readers’ comprehension for the different versions of the text, one striking difference lies again between Grade 5 and Grade 8 English and Chinese language readers. Grade 5 readers’ scores with Version 1 and Version 3 of the text with good macro-structure were much lower than the Grade 8 readers’ scores. Overall, Grade 8 language readers performed better than Grade 5 language readers and Grade 5 English language readers were the weakest group across the two language groups in all tasks.

All readers’ comprehension scores were the lowest with Version 4 of the text compared to their scores with all the other versions. The independent-samples t-tests revealed that the differences between Versions 1 and 4 as well as Versions 2 and 4 were significant
compared with the other versions. Overall, the influence of coherence versions was found to be more significant with Grade 5 English language readers and the versions of the text statistically significantly predicted readers’ comprehension scores while these two variables were statistically significantly negatively correlated.

Furthermore, although Chinese language readers’ results were similar to English language readers’ comprehension results across two grades, Grade 8 Chinese language readers achieved higher results in Version 3 of the text, unlike other readers. It becomes evident that the differences in these results were mainly due to the extraordinary performances of Above Average Grade 8 Chinese language readers with Version 3 text. They were able to achieve higher results due to their correct answers to the Evaluative/ Applied level questions. This is no surprise, as these questions require the use of prior knowledge and Grade 8 Chinese language readers also achieved the highest score in the earlier prior knowledge task. This also confirms the results on ability groups and comprehension. It was revealed that not only were there statistically significant differences between Above Average and Below Average ability groups’ scores but also that in general, readers’ ability groups statistically significantly predicted their comprehension scores.

Interpreting readers’ comprehension scores in terms of the type of questions was very useful in understanding the initial differences and discrepancies between the scores of Grade 5 and Grade 8 readers in the two language groups. For example, it was very useful to see that none of the 12 Grade 5 readers in either language group was able to answer any of the three Applied questions accurately for Versions 3 and 4. This indicates the scope of influence of comprehending a text with poor macro-structure on Grade 5 readers. Above Average Grade 8 English and Chinese language readers were the only ones who attained accurate answers for these questions in Versions 3 and 4. These questions needed higher-level construction of the
textbase and the use of prior knowledge. More Above Average readers were able to overcome incoherent macro-structure making use of their prior knowledge. Briefly, the influence of text coherence seems to be developmental for readers from both language groups and this influence seems to increase statistically significantly for weaker Grade 5 English language readers compared with advanced Grade 8 readers. For Grade 8 Chinese language readers, poor macro- and good micro-structure together seem to trigger better comprehension.

5.3.2 Summarisation

Readers’ summaries across the two language groups appear to have similar qualities for each text version. Similar to the hierarchy in the comprehension scores, the summary scores for Version 1 were the highest followed by Version 2 and the summary scores for Version 4 were the lowest preceded by Version 3 summary scores. All the readers’ summaries were statistically significantly different for different versions of the text. Additionally, there were statistically significant differences between readers’ summarisations for Versions 1 and 4, Versions 1 and 3 and Versions 2 and 4. The differences between other versions were not statistically significant.

There was no statistically significant difference between the two language groups. Therefore, the summaries of all the readers displayed similar qualities based on both the constructive activities and the level of propositional understanding identified in the summaries. A statistically significant difference was found between readers’ summarisation and their grades.

Grade 5 language readers’ summaries for Version 1 generally displayed qualities of the Partial-Propositional level (Level 3) of constructive activities, where they were able to make some inferences but with a low degree of coherence in their summaries. Grade 8
language readers’ summaries for the same version of the text displayed higher qualities at Para-Propositional level (Level 4), where they were able to construct highly coherent summaries with more sophisticated language, vocabulary and use of prior knowledge. None of the summaries of Version 1 are described as having the lowest qualities, which are considered part of the Pre-Propositional level (Level 1). Readers were able to produce better, more coherent summaries after reading Version 1 compared to summaries of other versions.

In contrast, in their summaries, readers of Version 4 proved that they were engaged in the lowest level of constructive activities possible on this study’s Propositional Constructive Activity Scale (PCAS). These summaries, generally comprised affective comments, copied text fragments and over-generalised statements about the overall meaning as well as retelling of text propositions. It was in Version 3 summaries where both English and Chinese language readers showed how they were able to deal with the poor macro-structure quite creatively. Version 3 had the macro-structure of the text manipulated and the order of topic sentences, propositions and details were not in their coherent logical order, as they were in Version 1. However, Version 3 had good micro-structure, meaning that the words, grammar and other surface level linguistic features were left unchanged. Even so, advanced Grade 8 readers, although they demonstrated higher-level constructive activity, were not able to sequence and construct a coherent macro-structure in their summaries when compared with the macro-structure of the original text in Version 1.

5.3.3 Think-aloud and text coherence

In addition to all the tasks completed by both language groups, because the focus of the second hypothesis was to investigate Chinese language readers’ text comprehension, the second part of this study conducted think-aloud protocols with Chinese language readers. The
task was administered in the same way as it was for the first part of the study and readers’ responses were scored using the same constructive activity scale. The results of these think-aloud protocols agree with the results of the same readers’ summaries confirming the influence of local text coherence on Chinese language readers’ text comprehension. There was no statistically significant difference found between readers’ think-aloud scores and versions of the text and between think-aloud scores and readers’ grades. The results provided more information on Chinese language readers’ text comprehension processes. Based on their think-aloud responses, none of the Grade 5 Chinese language readers showed the higher-level constructive activities typically expected at Level 4. The highest level of think-aloud responses for Grade 5 was at the Partial-Propositional Level (Level 2). These were also advanced Grade 5 readers. Below Average Grade 5 readers were only able to achieve Level 1 Pre-Propositional Level with a very low level of constructive activities. These responses comprised mainly literal level comprehension without evidence of any inferences, reflecting the actual performance of the students in comprehension tasks.

Similarly, Grade 8 Chinese language readers’ think-aloud results also mirrored their performance in the comprehension and summary tasks. The nature of their responses revealed the differences in their processing of texts and how they used prior knowledge in an attempt at constructing a situational level representation of the text. They scored higher than Grade 5 Chinese language readers for all the versions of the text, providing more complex and detailed explanations and elaborations. When asked about the reasons for their answers for particular questions, Advanced Grade 8 Chinese language readers outperformed others in their think-aloud responses, showing an ability to think of a step–by-step, complex explanation of their strategy use and integration of prior knowledge using sophisticated language and vocabulary. They were able to link their knowledge of past events in Chinese
history and economy with the text propositions and the questions, unlike any of the Grade 5 Chinese language readers. Through their think-aloud responses, Grade 8 advanced readers were able to explain the fact that they had to use knowledge outside the text. Some Chinese language readers were able to point at the specific difficulties with the structure and coherence of Version 3 or Version 4 as well as the strategies they used during their reading.

5.3.4 Grade 8 Chinese language readers’ results in English language tasks

It was not unexpected that Grade 8 Chinese language readers’ comprehension scores for the tasks completed in English were lower compared to their comprehension scores in Chinese. The scores of the research group in Chinese were more than double their scores in English. There was a statistically significant difference between the research group’s (the same readers who completed the tasks in Chinese) comprehension and summarisation scores in Chinese and English for the same text.

The Grade 8 Chinese language research group scored higher than the control group. The difference in scores was statistically significant. This study was more interested in the way readers processed the text information and the nature of the constructive activities they displayed for different English versions of the text. This may also possibly reveal more about the impact of differences between the two language systems on readers’ particular comprehension processes.

Considering their low proficiency in English, the comprehension results of the readers from both the research and the control group displayed similar trends. Readers from both groups scored highest in Version 1 and lowest in Version 4 of the texts in English and advanced readers scored better than weak readers in all versions of the text. The only difference in the scores was the hierarchy displayed for different versions of the text. Both
Grade 8 Chinese language research and control groups who completed the tasks in English scored highest for Version 1 followed by their scores for Versions 2, 3 and 4. This was quite different from the research group’s earlier results in Chinese, where they scored higher in Version 3 than in other versions. Although all groups scored very low on Version 4, the research group’s low scores particularly for Version 3 demonstrated the importance of the text’s macro-structure and in particular for readers with low competency in that language.

There are similarities in the quality of responses displayed by the same readers in both languages. For example, Above Average readers who achieved the highest scores in Version 1 were also the only readers from the two Grade 8 Chinese language groups who were able to answer Applied type questions accurately. The quality and the nature of these higher-level responses that required readers to go beyond the text were not the same as their responses in Chinese. One example of how coherence influenced Chinese language readers’ responses in English was with the low macro-structure text input, Version 3. In their English comprehension responses to Version 3 of the text, even Above Average Chinese language readers were confused and scored low. Their responses to question 7 about writing titles for Paragraph 3 proved this when they used the jumbled topic sentences to write the wrong title. It should be noted that the same students completed this task for the same version of the text correctly in Chinese. Similarly, Below Average readers who encountered greater difficulty with Versions 3 and 4 comprehension questions in Chinese also struggled in answering the questions for Versions 3 and 4 in English. These again prove that readers’ competence in a language determines the level of influence local coherence of the text in that language will have on their comprehension.

Readers’ summaries in English comprised a considerable number of pre-propositional level affective comments or partial-propositional level fragmented details. Most readers, in
particular Below Average readers, wrote near-verbatim or verbatim repetition of text statements. The control group’s summaries mainly consisted of copied statements from the text, which showed no evidence of inference or understanding in English. It was only advanced readers from the research group who were able to show some evidence of basic inferences with Version 1 of the text. Apart from the obvious language proficiency differences evident in all the summaries completed in English, Above Average and Average readers’ summaries also revealed the habit of relying heavily on context in English as well. Although they were able to identify the appropriate topic sentences and main ideas, they were not able to express these using their own words. Some Above Average readers were even more creative and joined the parts of different topic sentences without using their own words.

Some readers’ summaries also indicated a possibility of transfer of comprehension skills and knowledge from one language to another in the summaries of Above Average readers. Hence, it is reasonable to suggest that knowledge transfer during second language reading seems more of a possibility given an increasing ability in the target language. Below Average Chinese readers, unlike in their Chinese summaries, used affective personal comments unrelated to the text propositions as well as a few connectives in their English summaries for Versions 3 and 4. All this and the above-mentioned strategies point towards the influence of local text coherence on comprehension being universal across different orthographies. Overall, based on all the results, it is plausible that local text coherence also influences Chinese language readers’ performance in comprehension, summarisation and think-aloud results. Above Average Grade 8 Chinese language readers seem to comprehend texts in Chinese with poor macro-structure better if the micro-structure of that text is accessible.
Chapter Six: Results and Discussions

This chapter further discusses and summarises the results of the study. It does this in two parts: the results for readers’ text comprehension processes are discussed in the first part. The discussion of the results for the influence of local text coherence on text comprehension will follow in the second part.

6.1 Text Comprehension Processes

A series of tasks is employed for examining readers’ comprehension processes at text based and situational levels of representations of the first expository passage, *Electricity and Magnets*. These included: a cloze task, think-aloud protocols and summarisation tasks for text based representations and a prior knowledge test prediction, adding titles and adding sentences task for situational representations. These were all completed to examine readers’ text comprehension processes and the levels of their constructive activities. For the purpose of this study these are all selected to provide the best information on readers’ construction of a textbase and situational models at Grade 5 and Grade 8 levels for the two language groups.

6.1.1 The construction of textbase

In terms of investigating readers’ construction of a textbase, this section describes and discusses the results of the cloze task, think-aloud protocols and summarisation tasks in the light of their levels of constructive activities at micro- and macro-levels of text structure.
6.1.1.1 Cloze task and readers’ levels of constructive activities

The cloze activity required the readers to process the information in the text thoroughly and use their own linguistic, syntactic and semantic resources to fill in the gaps in the text. Readers’ responses to the cloze task were ranked based on the micro- and macro-structure of the text designed by the author when writing the text and creating the gaps. A criteria table for rating the readers’ responses as micro- and macro-responses was developed based on the number and the type of responses readers had which linked to either the micro- or macro-structure of the text. Students’ levels of constructive activities were described based on these responses and analyses.

The results overall showed that Chinese and English language readers’ cloze scores as well as their micro-responses were not statistically different. However, Chinese language readers performed statistically significantly better with macro-responses, which required a higher level processing of text information at the conceptual level. This was evident in the level of constructive activities in which Chinese readers were engaged at macro-level.

Chinese language readers were more constructive and made more efforts at constructing the textbase than English language readers at conceptual level. Evidence, in this study’s cloze task results, can be found in the number of possible lexical items produced to fill in the gaps in the text in Chinese. Chinese language readers’ high macro-scores can definitely be attributed again to the differences in how the two languages organise meaning in discourse as well as the differences in grammar systems between Chinese and English.

For example, Gap 1 for the sentence below had seven and Gap 2 had eight possible accurate lexical items used by Chinese language readers compared to the only two used by English language readers which are semantically and grammatically possible in English. This is due to the fact that there is no equivalent of the definite article ‘the’ in the Chinese
language and the micro-structure for English is more dominant and presents more constraints for constructing meaning than the Chinese language system at linguistic level. For example, Chinese language allowed its readers to make more constructive efforts to find an appropriate word for the gap than English language.

Example: “**For/With this**, we use solar panels on the roofs. Solar panels absorb the sunlight.”

- **Gap 1**: In order/in addition/for this/therefore/because/however/also
- **Gap 2**: Store/much/strong/warm/hot/enough/greater/more

This also means that the translation of the text in English into Chinese may have impacted on Chinese readers’ construction of meaning as mentioned in the limitations of the study. As a result, Chinese language readers displayed more effort to make sense of the text information and they engaged in more active construction of meaning in the text than English language readers. It has become more of a problem-solving task for them. This is why they were able to produce so many correct answers which all make perfect sense within the micro- and macro-structure of the text in Chinese.

The possible words were not only limited to grammatically similar words either. For the same gap there could be a possibility of filling it with a verb or an adjective or a noun in Chinese. The micro-structure of the Chinese language, which includes grammar and sentence structure, did not show any evidence of constraints on macro-structure compared with English. The English language seemed to present a more complex and challenging micro-structure for readers compared to the Chinese language when readers construct the meaning from the text. This means that although readers from both languages use bottom-up and top-down processes, their language system influence these processes greatly. This is something
which should be considered when using a cloze task for text comprehension in English for both Chinese and English language readers.

In terms of the nature of readers’ responses, Chinese readers seemed to fill in the nouns more correctly than any adjectives or verbs. This and two other trends in relation to the use of words in the gaps by Chinese readers can again be attributed to the Chinese language system and how readers identify and form words in Chinese as opposed to English. In Chinese, readers segment words based on their familiarity and knowledge of the use of characters.

Firstly, Chinese has many compound words and Grade 5 Chinese language readers’ errors in the gaps indicated that they still have not developed knowledge of the accurate use of some characters in compound words. Some Chinese Grade 5 readers applied their knowledge of spoken Chinese to write words to fill in the gaps. For Chinese readers, although the correct words for the gap had a character with the same sound it carried a different meaning. Hence, in Chinese, unlike in English, readers must develop the knowledge of compound words and homophones first to make up correct words in writing.

Secondly, Chinese readers used characters in the gaps, which on their own could not count as words (see Chapter 4, p. 114). Together with other characters preceding and/or immediately following the gap, these characters became words with appropriate meaning, which fitted in the gaps perfectly. This shows two things. One, that Chinese readers rely on context as much as, if not more than, English readers to find the correct word. This finds support in descriptions of Chinese as ‘contextual’ in nature where readers rely more heavily on context for information processing and context is used at morphological level for distinguishing between so many different homophones unlike in English (Nisbett, 2003). Two, they are more active in constructing the meaning in particular, possibly because the
original text was written in English. This was confirmed when, despite the gap in the sentence being redundant and the sentence still making sense without the gap, readers were still determined to construct the meaning to find the answer. Unlike English, the Chinese syntactic and semantic system allowed readers to be creative with the gaps when they used other adjacent characters to construct a meaningful word to fill in the gap. This proves the suggestions of constructivist theories that readers actively construct meaning and use multiple sources both bottom-up and top-down in nature until they achieve this. In Adam’s text processing model (Adams, 1994; 2004) described earlier in Chapter Two, the readers simultaneously make use of four bottom-up and top-down processors, namely, phonological, orthographical, meaning and context processors to activate different associations in meaning. Amongst these, according to Adams model, the role of the context processor is to ensure that there is continuous coherence in readers’ construction of the text meaning through the relevant selection and use of word meanings, which fit in with the context and the situation presented in the text. Hence, when actively constructing the meaning in the text during the cloze task, the Chinese and English readers above also made use of such multiple processing strategies above to find the right words for the gaps.

This proves the existence of a multilevel comprehension activity to form a textbase when reading to understand a text. It suggests that Chinese readers, perhaps not in exactly the same way as English readers, still construct the text information at different levels as also suggested in Kintsch’s Construction–Integration model of text comprehension. This suggests that it is not only readers of English or other alphabetic languages but also readers of a logographic and morphosyllabic language such as Chinese who are processing the text information at multiple levels and constructing a similar textbase of a text when reading-to-learn at school. Furthermore, this also confirms the findings in Chan and Law’s Hong Kong
study (2003) on Chinese language readers’ constructive activities. The study like other studies before it suggested that the ways Chinese language readers construct meaning as well as their cognitive processes are similar to English language readers.

As mentioned earlier as part of its theoretical framework, this study is theoretically based on reading models, which use both bottom-up and top-down processes just like Kintsch’s model does. The cloze task results above also confirm that bottom-up models particularly the earlier models based on orthographic and word level studies fall short in explaining the differences between the two language groups above. According to one such model, Automatic Information Processing Model (LaBerge & Samuels, 1974; Samuels, 2004) readers process the text in sequential stages starting from visual to phonology before semantic and episodic stages. They could not possibly process the text semantically before processing it visually first. This presents many constraints on what readers can process at first when working out the meaning. This may not be the case for readers of different orthographies and language systems who may use different text processes than English language readers.

The above cloze results, in relation to macro-responses and the differences between the readers in two language groups do not support the suggestions of this reading model. This is why Grade 5 Chinese readers including some low-skilled readers were able to achieve better scores with more accurate macro responses than English readers and some English readers were able to achieve better micro-responses than high-skilled Chinese language readers who successfully constructed the meaning at a higher macro-level in that language.

In their responses, Chinese language readers revealed more constructive activity than English language readers for the cloze task. This was also evident in their attitude to the task. None of the 30 Chinese students left any blank gaps but English language readers left a few
blank gaps in their responses. A test-oriented and competitive educational culture dominates the Chinese education system, whereas in Australia this is not the case. This was mainly the case between Grade 5 English and Chinese readers and less so between the Grade 8 readers and not in a way which could alter the results. Overall, the Chinese readers’ responses in the cloze task as well as in other tasks suggest that they were able to construct the textbase better than English language readers.

To summarise, although the cloze task results suggest no statistically significant differences between the two language groups’ cloze scores, this study provides sufficient evidence to explain the statistically significant differences in the macro-responses of Chinese and English language readers and the levels of their text processing. Both Grade 5 and Grade 8 Chinese language readers used a higher number and a wider range of words appropriately and accurately in the gaps than English language readers. This is mainly due to the nature of word segmentation and coining in Chinese sentences. It seems like Chinese orthography is more permissible when it comes to creating new meanings using the same context compared to English as an alphabetic language which presented more syntactic and grammatical constraints for sentence and text level meaning than Chinese during the cloze task.

Readers’ results in the cloze comprehension tasks are not the only source of evidence that assists in understanding how readers process the text information and construct the textbase of the text they read in both languages. Another task, which was conducted simultaneously with the cloze task and designed to investigate and describe readers’ text comprehension is the think-aloud protocol. The results of this task are discussed next.
**6.1.1.2 Think-aloud protocols and text comprehension processes**

Think-aloud protocols are considered to be one of the most reliable tools for providing access to constructive and responsive processes involved in reading in a non-intrusive and non-destructive manner (Afflerbach, 2000; Schellings et al., 2006). Readers’ think-aloud protocols yielded results that also revealed the nature of their text comprehension processes and constructive activities during the reading of the text. In this study think-aloud protocols used probe questions to elicit readers’ understanding and their text processing in terms of the text they were reading.

Probe questions used during the think-aloud protocols make it easier to further examine and explain the nature of readers’ responses and the levels of their constructive activities. Probe questions are aimed at eliciting evidence for a range of cognitive processes involved in constructing a textbase at multiple levels. As the think-aloud task was completed simultaneously with the cloze task, readers’ thinking processes and strategy use was still considered as in natural state and the processes incomplete (Schellings et al., 2006). As a result, this timing and the think-aloud practice were selected to expose these processes more than any other tasks. The three different areas of comprehension skills and strategies listed below are instrumental in distinguishing these processes, which are deemed necessary for constructing a coherent mental representation of the textbase.

1. Recalling Main Ideas
2. Text Comprehension Strategies
3. Reasoning

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*6.1.1.2.1 Recalling main ideas*
Recalling and talking about the main ideas require the use of more constructive activities than those which readers use to decode the text and read sentences. Readers needed to remember the macro-propositions in individual paragraphs and in the whole text. The results of readers’ think-aloud comments for recalling main ideas suggested that low-skilled readers were not only unable to identify the underpinning message in the text; ‘electromagnets are more useful than the usual magnets’, but they also failed to understand the main ideas in the individual paragraphs. This was the same in both language groups across the two grades but more so with low-skilled Grade 5 English language readers. Chinese language readers and in particular Above Average readers were able to recall more text propositions and in more detail than English language readers.

In terms of the level of their constructive activities, Below Average readers also made unrelated comments, which did not link to any of the text propositions, or commented on single details or just repeated the sentences word by word or near verbatim when asked to recall. In contrast, Above Average readers’ think-aloud responses exhibit more thorough construction of textbase than the others. While Below Average low-skilled readers were able to recall mostly isolated details or irrelevant information from the text, Above Average readers were not only able to recall the main idea in different paragraphs but also the underpinning idea in the whole text.

6.1.1.2.2 Text comprehension strategies

Similar to recalling main ideas, readers’ ability levels whether they were Above Average, Average or Below Average readers played a significant role during their verbalisations of text comprehension strategies. Above Average language readers were able to make detailed comments about the links between the different propositions in different
parts of the text when they were talking about the strategies they used. All these suggest that high-skilled Above Average readers in both language groups were better constructors of the textbase because they were better equipped with a higher level of understanding of comprehension strategies, which they were also able to verbalise during their think-aloud protocols.

Chinese language readers more frequently mentioned contextual cues as strategy than English language readers. In doing so, they mainly talked about using semantic cues as opposed to English language readers who mostly talked about using syntactic cues. This again relates to the structural differences between the two languages and as stated earlier, how Chinese syntax and grammar are more flexible than English in terms of allowing more and wider correct macro-level responses during the cloze task.

6.1.1.2.3 Reasoning

Reasoning is the last constructive activity out of the three that are investigated through the think-aloud protocols. It is also mentioned and used in other relevant studies. For example, Coté et al. used ‘Reasoning’ (1998) for investigating the quality of the textbase representation in relation to prior knowledge of 12 fourth-graders and 12 sixth-graders reading three expository passages.

When asked about their choices for using certain words to fill in the gaps, readers across the two languages and grades talked about the fact that the introduction had a familiar theme, language and vocabulary, which most readers could relate to their daily lives and these made the gaps in the first paragraph less challenging than other parts of the text. A few of the Above Average readers said that the paragraphs in the second half of the text were easier as they had more prior knowledge on the topic. Other readers also mentioned magnets
and atoms as specialised topics as part of their reasons for finding prior knowledge a challenge.

The think-aloud results and the use of both bottom-up and top-down strategies are in line with the current text comprehension theories described earlier in Chapter Two. Readers’ verbalisations indicate that they are not limited to bottom-up decoding or word level strategies, they are able to use a range of sentence and text level strategies, including making inferences to recall main ideas and making use of their prior knowledge during their construction of the textbase. Rummelhart’s Interactive Reading Model (Rummelhart, 1994, 2004), Pearson’s Three Cueing System Model (Pearson, 1976; Adams, 1998) Adam’s argument of four text processors (Adams, 2004) all include readers’ simultaneous use of both bottom-up and top-down processes and cues. In line with the readers’ verbalisations above these theories include the use of syntactic, semantic and contextual processors which operate in a multimodal network of meaning associations. In addition, part of their reasoning the Above Average readers mentioned the use of prior knowledge which again is accommodated within current theories of text comprehension. For example, similar to Kintsh’s Construction-Integration Model, The Landscape Model of reading (Van der Broek et al., 1999) proposes that the activated concepts and ideas during reading build a better landscape for comprehension.

Readers’ think-aloud responses confirmed that the construction of textbase both in an alphabetic language such as English and a logographic language such as Chinese is similar in predicting comprehension as described in Kintsch’s CI Model (Kintsch, 1998).

Overall, similar to cloze task results, the results of think-aloud protocols confirm Chan and Law’s findings (2003) that English and Chinese language readers’ share similar constructive activities in text comprehension. This is because based on their think-aloud
responses, their constructive activities, although different in nature, were at similar levels on the Constructive Activity Scale. Think-aloud data together with the cloze analyses provided a very clear picture of readers’ text processes and comprehension at textbase level.

6.1.1.3 Summarisation and the textbase

Students’ 100-word summaries of the text *Electricity and Magnets* were scored based on the level of their summaries similar to the ones used in Eileen Kintsch’s study of summarisation (Kintsch, E., 1990). The statements used in readers’ summaries indicated different levels of constructive activity. For example, if they copied sentences word for word or near verbatim, this indicated lack of inferencing and low constructive activity.

Chinese language readers’ summaries displayed similar differences to English language readers. Despite this, compared to English language readers’ summaries, Chinese language readers’ summaries still displayed more reliance on the actual statements and propositions in the original text. This may also be explained again by the structural differences between English and Chinese. Hence, due to higher memory span of Chinese language readers than English readers, they may have been able to allocate more resources to recalling text propositions than perhaps on grammar, syntax, spelling or punctuation which are not as resource demanding in Chinese as English when writing. Lastly, Chinese readers may have just opted for more content generation compared to English readers, as they tend to do in writing (Guan et al., 2014).

Furthermore, readers’ level of prior knowledge played a significant role in their summarisations. Readers who scored high in the prior knowledge test were able to summarise the textbase information much better than readers who scored low in the prior knowledge test. These readers did not rely heavily on text propositions as they had other prior knowledge
of the topic, which helped them understand and summarise the text information and ideas in
the macro-structure of the text. These results confirm the role of prior knowledge in text
comprehension not only for readers of alphabetic languages but also for logographic
languages such as Chinese. Readers from both languages were able to activate their prior
knowledge and include coherent mental representations of the text in their summaries. These
also reflect the claims of current constructivist theories and models of reading such as The
Landscape Model and Construction-Integration Model of reading. These models and others
also emphasise the significance of prior knowledge in constructing mental representations of
the text in readers’ summaries. Readers with higher levels of prior knowledge and better
ability to identify the main ideas in the macro-structure of a particular text are also able to
write better summaries of the text closer to the textbase.

In conclusion, Chinese readers’ summaries of the first passage *Electricity and
Magnets* proved to be similar to English language readers’ summaries despite their over-
reliance on text propositions. It is plausible to suggest that these results of readers’ written
summaries are consistent with results of previous research on Chinese and English writing in
terms of text comprehension. Guan et al.’s recent study on Chinese text comprehension and
written compositions (2014) revealed that working memory was the greatest predictor of
Grade 4, 5 and 6 Chinese students’ writing followed by morphological and syntactic
awareness. This is similar to previous studies on working memory’s role in English writing
(Graham, 2006).

Although this was the case with summarisation of the first passage, to further
investigate the differences in readers’ text processes, the second part looks at readers’ text
processes at situational level. The next section will further examine and discuss the results in
the light of readers’ text processes and use of their prior knowledge necessary for creating a situation model of the text.

6.1.2 Situation models

6.1.2.1 Prior knowledge and prediction

As discussed briefly above and in Chapter Two, there is strong evidence in the literature on text comprehension and in particular on the Construction–Integration Model on the effects of prior knowledge on text comprehension (Flammer & Kintsch, 1982; McKeown et al., 1992; McNamara, 2001; Green, 2004).

Chinese language readers scored statistically significantly higher than English language readers in the prior knowledge task. Grade 5 Chinese language readers scored higher than both Grade 5 and 8 English language readers. The prior knowledge scores of Grade 8 Chinese language readers were almost double that of Grade 5 English language readers’ scores.

The prediction results showed different trends, where English language readers scored statistically significantly higher than Chinese readers. For the prediction task, readers needed to interpret the visuals metaphorically and predict the topic of the text, China and Australia.

Prediction results revealed differences in interpretations of the title and the visuals between the readers from two language groups. This was the only task where both Grade 5 and Grade 8 English language readers scored statistically significantly higher than Chinese language readers. Chinese language readers’ responses, including advanced readers, mostly comprised descriptions of the physical features of the roads on the cover. In other words, they described the situation in the photos literally not metaphorically. The prediction results of this study are consistent with the implications of linguistic relativity theory for conceptual
metaphors in cognitive linguistics (Lakoff & Johnson, 1980). According to the current
cognitive linguists’ Lakoff and Johnson’s theory (1980), conceptual or cultural metaphors we
use everyday reflect the way we think in that language. Another study which specifically
investigated Chinese in relation to conceptual metaphors. Ning Yu (1998) indicated that the
Chinese view the world in a more concrete way compared to perhaps English. This is
consistent with the results of Chinese readers’ performances in the prediction task. Due to the
differences between the cultures and the cognitive structures of English and Chinese readers,
they interpreted the titles and the visuals on the cover page statistically significantly
differently regardless of their levels of prior knowledge, ability levels and grades. This could
possibly find an explanation in the actual reading process in Chinese where readers can match
the meaning with characters in a very direct and structured way and one, which relies heavily
on context rather than abstract knowledge, as one would expect with prediction in English.
Another explanation for the differences in the prediction task relates to cultural differences. It
may be due to the differences between the reading activities in Chinese and English language
classes. Prediction is not usually part of reading in a Chinese class so it is not used as often as
in English classes in Australia. Prediction is known to facilitate motivation and engagement
with the text, which may not be considered as part of Chinese language reading activities in
China.

Overall, there is no doubt that prior knowledge influences readers’ comprehension in
both English and Chinese. However, its integration may well be determined by the system of
that language and it may not be so clear-cut. Due to the differences in their knowledge
structures and their language systems, English and Chinese language readers’ may possibly
be constructing situation models differently. First, the two language systems are quite
different and this naturally affects the reading process. Second, the culture and education
systems are different which impacts on the knowledge structure of readers in both languages. If the texts in this study were favouring one culture or a view, which is excluded in another culture or subculture, then comprehension of text situation or meaning would have been different and/or difficult for these readers. For example, if the journey of Australia in the second text or the invention of electromagnets in the first were told from subculture’s view such as Indigenous Australians the meaning would not have been in most readers’ schemas and comprehension would not have been achieved for those readers.

As part of further examining readers’ text processing through the use of prior knowledge and creating a situation model of the first text, readers were also asked to add titles and sentences to marked paragraphs in the text. The next section will discuss the results for these two tasks.

6.1.2.2 Adding titles and sentences

6.1.2.2.1 Adding titles

Readers were required to draw information from the text and their prior knowledge and integrate these to produce the desired outcome of adding an appropriate title for marked paragraphs. They needed to engage in certain constructive activities and process the text, making inferences between the ideas and information within the paragraph as well as between the paragraphs for accurate answers. For example, knowing or being familiar with the role of topic sentences and linking sentences assisted readers in processing the text using skimming as a strategy. Overreliance on the first sentences for example, copying the parts of these to create titles, indicated a lack of understanding of topic sentence ideas.

Low-skilled readers’ titles mainly comprised scattered words or sentences randomly selected from the paragraphs as titles, which were also the least constructive in nature. The
weaker the readers, the shorter, less relevant and less detailed were their titles. This proves that they were not able to process the text information even at paragraph level and as a result were not able to construct a situation model of the overall text meaning. It should be noted that Grade 5 language readers’ titles were the only ones written as questions, such as “What are magnets used for?” “Who invented it?” “How do magnets work?” “What are magnets made of?” “could you imagen?” [sic]. Most of these were copied from the first sentences.

Results of the titles task indicated that Grade 5 readers’ titles in each language group were similar, mainly in terms of the level of readers’ constructive activities. While Grade 5 Chinese and Grade 5 English language readers found writing titles for Paragraph 3 the most challenging and achieved the lowest score, Grade 8 English and Chinese language readers found writing titles for Paragraph 2 the most challenging, again based on their scores on Constructive Activity Measure.

Paragraph 3 in the Grade 5 text was about generation of electricity and it was a long paragraph with many competing bits of information and ideas in similar propositions. It also had complex cause-effect relationships within the different processes of generating electricity. This may possibly have presented challenges for the Grade 5 level for both languages. Paragraph 2 in the Grade 8 text was about the definition of electricity. This was the most technical and challenging paragraph in terms of its meaning structure and propositional network. It had many technical terms such as atoms, electrons and nucleus and many new words, which could not be easily associated with any other propositions or information in the text. The easiest or the least challenging paragraph to write titles for was the first paragraph about everyday uses of electricity. This is supported by readers’ think-aloud results in which most readers mentioned the first paragraph as the easiest and explained that they could relate to it and understand it the most.
None of the titles of Grade 5 English language readers were rated at Level 4, as opposed to 13 titles of Grade 5 Chinese and 26 titles of Grade 8 Chinese language readers. In terms of the differences between Chinese and English language readers’ titles, Chinese language readers at both grades were ranked as the top two groups for their use of prior knowledge in writing titles for selective paragraphs in the text. The prior knowledge results support these. Next, interpreting the results of the final task of adding sentences will complete the discussion on the construction of situation model.

6.1.2.2.2 Adding sentences

In addition to writing titles, the readers were asked to add sentences to other appropriately marked paragraphs for the purpose of describing their text processes further in constructing a situation model of the text. Students’ responses indicated that they found the task of adding sentences more challenging than the titles task. This may possibly be due to the fact that sentences are longer, consist of more linguistic elements such as word order and grammar and require the use of more constructive activities. The readers needed to ensure that the sentence they added encapsulated the main idea in the paragraph and added a new element to it. This was not required for the task of adding a title. Adding a new but relevant idea is a higher-level skill and it requires the readers to use their prior knowledge. There were no statistically significant differences between the grade levels but the difference between the two language groups again was statistically significant. Chinese language readers’ added sentences displayed a higher level of construction activities as well as the use of prior knowledge, which meant that they had a better representation of the parts of the situation in the paragraphs. There were four Level 4 sentences added by Chinese language readers, which
confirmed their high level of construction of a coherent situation model of the text in their minds.

Overall, Chinese language readers’ titles and sentences indicated that they had constructed a better mental model of the text in general. In terms of text comprehension theories described earlier in Chapter Two, these results provide evidence of the use of top-down processes such as inferences and prior knowledge better by Chinese readers than English readers. This confirms the prior knowledge as well as summarisation results and can be perhaps attributed to the structural differences between the two languages. Schmitt et al. (Schmitt, Pan, & Tavassoli, 1994) and Tavassoli (1999)’s comparative study on English and Chinese language readers’ use of memory in reading also confirms this result. According to Schmitt et al. and Tavasolli, based on their findings, the differences in the Chinese and English language readers’ mental models or text representations could be attributed to the structural differences between the two languages. Although this is the case there is certainly a need for more comparative studies between the two language groups and on text level comprehension in Chinese for more conclusive results.

Finally, the construction of a situation model could not be possible without a coherent textbase. Readers need to make sense of the text information before they integrate this understanding with their existing knowledge to construct the situation model. Local coherence in the text, therefore, becomes an important part of text comprehension. The influence of such coherence, which makes up the second hypothesis, will be discussed next.
6.2 The Influence of Coherence on Text Comprehension

The first part of this study examined how readers’ text processes and prior knowledge influence their comprehension. What readers bring to the reading process and how this affects their understanding of the text were explored. The second part of the study reflects the shift in text comprehension research from reader-based studies to text-based studies for which the influence of text properties on text comprehension has become significant. One of these text properties widely studied by constructivist theorists is text coherence. Four manipulated versions of a second reading text, *China and Australia*, are used for the second part of the study to measure the influence of coherence on readers’ text comprehension.

6.2.1 Comprehension and text coherence

The results suggest that Grade 5 and low skilled Grade 8 readers struggled more with poor macro-structure than poor micro-structure. This confirms Kintsch’s theory that the macro-structure of the text requires higher order skills than the micro-structure, in particular when constructing the situation model of the text. Readers were able to achieve better results with good coherent version of the text (Version 1) than the other poorer versions.

These results indicate that readers who are already better readers perform better with poor macro-structure because they are challenged and they treated reading comprehension as a problem-solving task. This is supported in Kintsch’s CI Model and also in the results of Eileen Kintsch’s study of summarisation and micro- and macro-processing (Kintsch, 1990). However, although highly skilled readers can overcome the difficulties of having poor macro-structure drawing on their high-level strategies and existing knowledge, this is not possible when the text is incoherent at both the micro- and macro-level.
It can be said that Above Average readers are able to access the text meaning at a higher level due to their existing high skills and the knowledge they bring to the reading process. They are able to use reading strategies better to deal with the difficulties incoherent texts may present. This is not true for weaker readers who do not have the capacity or resources to deal with incoherent text. The importance of accessing the meaning within the macro-structure of the text for better text comprehension is highlighted. The results confirm the influence of local text coherence for both Chinese and English language readers’ text comprehension. Other relevant studies described in Chapter Two such as McNamara’s (1993) study of 6th and 8th graders text comprehension support this study’s results above. Similar to the results above, McNamara suggests that the low-coherent textbase triggers more active processing for high-knowledge readers who in turn are able to construct situation models and achieve better text comprehension. Therefore, according to McNamara it is the readers’ high knowledge which controls the influence of text coherence on comprehension.

Furthermore, the level of influence of text coherence was not the same for both language groups. This is expected given the structural differences between the two language systems and the level of Chinese readers’ prior knowledge. Additionally, the organisation of words and sentences in Chinese, as discussed and demonstrated earlier, is not the same as in English and the world knowledge and cultural experiences between the two groups are also different. Different language systems organise meaning and information in a different way, based on the cultural context and understanding. Therefore, readers’ comprehension may also be affected by such structural organisation in writing. Despite studies that revealed different results (Mohan & Lo, 1985; Kirkpatrick, 1995), a recent study on the influence of Chinese rhetorical patterns by Ji Kangli confirmed the influence of modern Chinese prose structure qi-
It seems that Grade 8 English language readers had more difficulties with poorer micro-structure than Grade 8 Chinese language readers and Grade 8 Chinese language readers did much better than any other groups with (Version 3) poor macro-structure. It was particularly the advanced Grade 8 Chinese readers’ results that influenced their total results for Version 3. The success of Grade 8 Chinese readers with macro-structure also supports their high results in the first part of the study.

Chinese readers developed more advanced reading skills, which make it possible for them to construct the macro-structure of the text better than English language readers of the same age. Chinese language readers were able to score better with macro-words in the cloze task, suggesting that again they were able to construct a better textbase and a situation model of the first text as well. The above results no the influence of text coherence also find support in Mannes and Kintsch’s study (1987; Kintsch, 1994) using a technical text on microbes. Mannes and Kintsch concluded that a really well-organised textbase leaves no gaps to fill when it comes to inferences and problem-solving tasks which follow the reading. However, the contradictions or incoherent textbase provides opportunities for readers such as advanced Grade 8 Chinese language readers above to find ways to construct the situation model of the text for learning.

Another highly relevant study, also described earlier on in Chapter Two, is Long et al.’s (2006) study. Long et al. suggest that Chinese language readers presumably have different processes for construction of textbase and situation models. However, unlike the other studies before it such as McNamara and Kintsch’s this study did not find any influence of readers’ prior knowledge or coherence on text comprehension. The influence of test
coherence was also investigated through a summarisation task to see whether readers’ summarisation skills would yield similar findings for the influence of text coherence on readers’ understanding of the text. Therefore, question 10 in the second part of the study asked readers to summarise the text in 50 words. The next section will look at the nature of readers’ summaries to gain further clarification in relation to the role of coherence in text comprehension. The results and the discussion on summarisation follow next.

6.2.2 Summarisation and text coherence

According to Kintsch (1998), “an ideal summary is (should be) a text expressing the macrostructure” (p.50). This has been proved in the results of this study in which the higher-level summaries were assessed to be also the ones that reflected the macrostructure of the manipulated texts better than others. Chinese and English language readers' 50-word summaries of the manipulated versions of the second text, *China and Australia*, were similar in terms of the level of their constructive activity. This study found that summarisation skills are developmental across the two language groups. The readers who were able to construct a textbase with coherent macrostructure achieved higher text comprehension and produced better summaries regardless of their language background. This section will discuss the results in terms of the nature of readers’ summaries across the different groups and how these may have been influenced by each manipulated version of the second text.

6.2.3 Grade 5 readers’ summaries

The results, in terms of readers’ constructive activities displayed in their summaries, showed that Grade 5 English language readers made the least constructive effort and scored
the lowest. Their summaries scarcely related to the text and were affective in nature. These were the only ones to display a Pre-Propositional level of understanding. These readers were not all low-skilled readers from the Below Average ability group but were also from the Above Average group. This again demonstrates the influence of text coherence for Grade 5 English language readers’ understanding of Text 2.

The differences between Grade 5 and Grade 8 readers were similar for Chinese students. Grade 5 readers were not able to show evidence of understanding the main ideas in the text and they included the fewest number of text propositions from the text, regardless of the coherence version and the ability levels. Their summaries displayed scant evidence of inferences as a text-processing strategy. Grade 8 Chinese readers showed evidence of higher-level inferences, whereas Grade 5 Chinese readers only made use of simple inferences deduced from the information in the same paragraph through the use of priming (use of key emphasised words in the sentences).

Grade 5 Chinese language readers’ summaries shared a common quality with Grade 5 English language readers as well as with Below Average Grade 8 language readers. It was the way they started their summaries using formulaic structures such as, “The article describes to me…” or “It introduced…” or “The passage tells us…”.

Furthermore, readers’ summaries of each version displayed some common trends between the two language groups and grade levels regardless of their abilities. Summaries of Version 1, the original and the most coherent text out of the four versions, generated more fluent and cohesive summaries with evidence of higher-level inferences, relevant text propositions and the use of prior knowledge. In contrast, summaries of Version 4, the least coherent text, manifested increased demands on readers’ constructive efforts at both levels and even exhausted high-skilled readers’ ability to deal with a text that was poor at both the
micro- and macro-level. The readers could not access the text information at a higher level nor could they go beyond the micro-structure because there were too many constraints presented via the text’s poor local coherence. In contrast to Long et al.’s (2006) findings about the high-knowledge readers determining the influence of text coherence on comprehension, the results of Grade 8 skilled readers who read Version 4 indicate the significance of the level of local coherence on comprehension.

Hence, the summaries of Version 1 and Version 4 for Grade 5 and Grade 8 Chinese language readers further reveal the influence of text input and hence text coherence on text comprehension. There is evidence in their summaries, regardless of their reading ability, of the influence of the micro- and macro-structure of these texts on the readers’ level of constructive activities and strategies. Readers of Version 1 were able to organise their understanding in summaries more fluently and cohesively. Their summaries are more macro-relevant (relevant to the macro-structure of the text - how main ideas are organised into subtopics or headings in different sections). These summaries included an increasing level of important information from the text as well as evidence of inferences, elaboration and attempts at constructing a more cohesive summary of the macro-structure of the text. Additionally, the constructive strategies applied by Version 1 readers included identifying, explaining and assimilating different main ideas and their relationships in different parts of the text. Even the summaries of Version 1 Below Average readers, although not as good as Average and Above Average readers’ summaries, signaled better vocabulary knowledge, memory capacity and fluency.

Readers of Version 4 not only had to work through a poor text at the micro-level but also a poor text at the macro-level. This made increased demands of the reader’s constructive activities, as they had to construct a coherent textbase at two levels rather than one. Usually
with such high cognitive demands, students, who are weak readers with not many strategies to use, fail to process the text beyond the surface level. They then make affective/personal comments unrelated to the text because they revert to known information in their knowledge structure that is easier to access. The next section will discuss Chinese language readers’ summaries of the Version 3 text for each ability level. Unlike other groups, Grade 8 Chinese language readers achieved their highest summarisation score for Version 3.

6.2.3.1 Chinese language readers’ Version 3 (good micro-poor macro) summaries

The text propositions in Grade 8 Version 3 summary are derived from Paragraphs 4, 6, 3, 4, 2, 6, 3, and 5 in this order. Grade 8 Chinese language readers’ Version 3 summaries revealed more complex macro-structure than Grade 5 readers’ summaries. This is mainly due to the details and the number of text propositions incorporated in the summaries. For example, the Above Average Grade 8 Chinese language reader’s summary, following a comprehensive introduction, begins with the statement based on the topic sentence on China’s history in Paragraph 4 (see translations on the next two pages).

The Average ability Grade 8 reader’s summary of Version 3 also begins with an introduction statement and comprises text propositions on the subtopics China’s history, Chinese economy and Australia’s economy. If the reader had included a statement on Australia’s history, there would have been a mini macro-structure in the summary. Similar to the Above Average Grade 8 Chinese language reader, this reader also managed to make inferences of different types derived from Paragraphs 4, 2, 6 and 3, which prove the existence of more constructive activities at micro- and macro-levels than low-skilled readers.

Lastly, the Below Average reader’s summary of Version 3 also exhibits some different characteristics to the previous two Grade 8 readers’ Version 3 summaries. It has
inferences, use of affective comment (i.e., China is a popular country) and evidence of more re-orderings (changing the order of main ideas as they appear in the original text) than the other two readers’ summaries. This reader had to reread the information in Paragraphs 4 and 3 at least twice to understand the relationships between the text propositions. This is an indication of the more constructive efforts and the demands the text with poor macrostructure puts on the weak readers as well as how Grade 8 Chinese language readers treat Version 3 text as a problem solving task and were able to achieve higher scores for this version than any other versions compared to the performance of the other groups. Kintsch (1998) describes good readers as ‘top-down processors’ (p.283) and suggests that they use contextual information better than poor readers. In doing so, they make use of a range of inferences including bridging inferences which bridge the gaps in the text which has an incoherent textbase and macrostructure (p.305). Grade 8 Chinese readers’ summaries certainly display this very well.

Another significant difference, in terms of the text’s macro-structure relates to the use of topic sentences. Topic sentences carry the main ideas in the text. For Versions 3 and Version 4, however, some of these were swapped with other sentences, which do not carry main ideas but only detailed information. One example is the sentence that relates to Australia’s export of wool. The way this text proposition is represented in the readers’ summaries differed depending on the readers’ ability levels. Amongst all the examples above, the lowest level of constructive activity in relation to this proposition was given in a Grade 5 Below Average Chinese reader’s summary. The statement “Australia now exports wool” is copied character-for-character from the text. The highest level of constructive activity in relation to this statement can be found in the Grade 8 Above Average and Average readers’ summaries quoted below. The statements that relate to this text proposition showed higher-
level vocabulary and sentence structure and fluency compared to the other relevant statements.

6.2.3.3 Translations of sample summaries of Chinese language readers

6.2.3.3.1 Grade 5

Version3 (CS5_AA) S: In comparison, there are some differences and similarities between Australia and China. China has good policies. Australia is very rich and bountiful. Both China and Australia have a long history. China and Australia both have deserts. China and Australia both are suitable for human living. China and Australia are both strong nations.

Version 3 (CS5_A) S: China and Australia. There are many different factors for China and Australia, how they affected the countries. Most of the yellow soils cover the Northern parts of China, while the inland desert of Australia “outback” takes up 80% of the continent. Australia is exporting wool while we can grow rice in the Southern lands of our country. China is a country with a long history. Australia is a very young, yet very ancient country.

Version3 (CS5_BA) S: Summary. There are more varieties in the North than South in China. China has good policies. Australia now exports wool. China is a country with a long history. In the older China, it was ruled by nine dynasties. Australia is a very old yet very young country. China and Australia have their own past and recognition.

6.2.3.3.2 Grade 8

Version 3 (CS8_AA) S: Differences between Australia and China. There are many differences between China and Australia, however, it is certain that both countries
are developing with a great speed. China is a nation with long history. Its economy was at under developed in the past, but the difficulty has been solved. The Chinese made products are exported and improved the national economy. Now the Chinese economy ranks number four with 10% annual growth rate, China has developed. Australia mostly relies on export of wool; Europeans colonized Australia a long time ago, which also promoted the Australia’s prosperity. China and Australia will develop at a faster pace, with a greater degree of prosperity.

Version 3 (CS8_A) S: China and Australia are different in their developments, due to influences of various factors. China has a long history. The first emperor who had united China and built the Great Wall was Qing Shi Huang. With policies aiming to promote the economic developments, the Chinese economy is fast growing. Australia is renowned for its wool industry; in the early stage there was no wool industry in Australia, until Europeans brought sheep into Australia later.

Version 3 (CS8_BA) S: Summary of the article: This article describes the differences between Australia and China, and the factors that affecting the two countries. China is a popular country with a long history, and many dynasties. Each dynasty was formed by a large family with different rulers. The first ruler was Qing Shi Huang, he built the Great Wall to defence [sic.]. There are differences between the northern and southern parts of China, The Yellow River flows towards the South therefore rice is grown in the South. Australia’s main income is from wool. At the beginning, Australians live by gathering and hunting. The deserts in Australia was [sic.] called outback or bush.
6.2.3.4 Use of connectives in Version 3 summaries

One final feature of summaries found in this study is the use of connectives, particularly by Above Average level readers in the two grade levels and language groups. This can be seen in the examples above where the connectives are in bold. Grade 8 Above Average and Average Version 3 summaries have the highest number of connectives, with seven connectives used in the Above Average level summary and four in the Average. There is no doubt that poor macro-level is responsible for the use of such a strategy by Above Average readers when organising their inferences in their summaries. They are likely to have used the connectives to make up for the poor macro-structure in the Version 3 text. They made use of both bottom-up such as the use of connectives and top-down processes such as inferences at the same time to produce coherent summaries. This is again evidence of reading as an interactive activity in both Chinese and English and is consistent with previous research by Rummelhart (1994, 2004) and others (Stanovich, 1980; Perfetti, 1985).

Overall, high-skilled readers’ summaries displayed higher level, more complex structure and language use than low-skilled readers’ summaries. These summaries, both in Chinese and in English, had more details, text propositions, inferences and cohesion. Grade 8 Chinese readers’ Version 3 summaries also showed evidence of re-orderings despite a very well organised cohesive text using the qi-cheng-zhuai-he pattern. This means that these reorderings partly support Mo’s (1982) claim about the four-part pattern’s influence as the most common principle applied in structuring a paragraph in Chinese. For high-skilled readers there was evidence of high-level constructive efforts and text processes for constructing the textbase and the situation model, which included different types of inferences and scanning. This provides evidence that Chinese readers also make use of both bottom-up and top-down processes based on their level of skills and knowledge similar to
English readers. High-skilled readers are able to use both bottom-up and top-down processes but low-skilled readers from Below Average group in both languages struggled with top-down processes such as inferences in their summaries.

Poor macro-structure triggered more constructive effort which was clearly evident in summaries, as well as readers’ increased use of connectives. The use of connectives is not as common in the Chinese language as it is in English prose structure. In addition to the use of connectives to make up for the poor macro-structure in Version 3, Grade 8 Above Average readers also employed an increased number of pronouns in their summaries.

The summarisation results for different coherence versions of the text suggest that the influence of text coherence is inevitable for both language groups and it varies with the reader’s individual skills and the level of constructive activities. The more skilled the readers are, the less the influence of text coherence and access to higher level of text comprehension. Weaker readers’ access to a coherent representation of meaning is constrained by incoherent micro-structure. Their ability to construct a textbase or a situation model is constrained by poor macro-structure or the incoherent presentation of the situations in the text. When the text has an incoherent textbase with poor micro- and macro-structure, all the readers struggled with the coherent representation of text meaning in their summaries. This was not only true for English language readers but also for Chinese language readers, who also showed evidence of poor representation of meaning and construction of textbase.

As the second part of the study focuses on the influence of text coherence on Chinese language readers’ text comprehension, it is also worth further investigating their constructive activities via think-aloud protocols, just as was done in the first part of the study for both language groups.
6.2.4 Chinese language readers’ think-aloud protocols and text coherence

The think-aloud protocols included specific prompt questions on comprehension tasks that aimed to capture the strategies and the nature of readers’ constructive activities used to complete these comprehension tasks. These did not aim to elicit readers’ use of language or thinking in the traditional sense of think-aloud protocols. In this sense it is similar to Pressley and Afflerbach’s constructive responsive reading theory (1995), which uses think-aloud protocols and aims also at capturing reader constructions required for meaning when processing the text. Additionally, this study, as Pressley and Afflerbach (1995, p.118), also makes provisions for greater potential of think-aloud approach than it is traditionally applied. Similar to other recent studies of think-aloud, it emphasises the need for studying both reader and text features when investigating comprehension in comparative studies.

The verbalisations of think-aloud protocols revealed similar results to comprehension and summary results on the influence of text coherence. This further confirmed the results of the comprehension and summary tasks discussed earlier. The results, as expected, provided information on the three categories of activities identified by Schellings et al. (2006, p.552). These categories covered by prompt questions in this study are: construction of text meaning, monitoring or metacognition and evaluation (probe questions on specific parts of the text or the whole text). Although there were structural and cultural differences displayed in the nature of their responses, overall the think-aloud protocols of Chinese language readers yielded comparable results to Chinese and English language readers’ performances in the previous tasks. Next follows a detailed discussion of the results of think-aloud interviews with relevant samples of Grade 5 and 8 Chinese readers’ responses.
6.2.4.1 Grade 5 Chinese language readers’ think-aloud responses

Grade 5 Chinese readers’ verbalisations revealed gaps in basic understanding of ideas and information in the text. There was no evidence of meta-cognition or constructive activities, such as inferences or detailed explanation of the inter-propositional relationships in their responses. CS5_ BA4’s response to provide an example of China’s economic reforms from Version 3 showed evidence that was typical of this level of pre-propositional comprehension.

CT5: Student CS5_ BA4, can you give an example of a reform showing how China became richer.

CS5_ BA4 同学, 举出一个中国利用改革而使自己变得富裕的例子。

CS5_ BA4: some people took the country’s money during the reform.
有人在改革的时候拿了革命的钱。

CT5: what do you mean?
什么意思?

CS5_ BA4: Everybody uses money; some people may have taken the country’s money in order to make themselves rich.
现在用的都是钱,有些人让自己富裕,可能拿的是革命的钱。

CT5: Did you get this answer from the article?
你刚才这个答案是否从短文中获得的呢?

CS5_ BA4: I worked it out myself.
是自己想的。

CT5: Why didn’t you think of getting answer from the article?
为什么当时你没想到从短文中获得答案呢?

CS5_ BA4: I didn’t find any.
没找出来。

The question is an inferential type of question, which requires locating and understanding of the meaning of the character 改革 for ‘reforms’, locating and identifying different reforms in the text and separating these from the ones that relate to making China wealthier. In Version 3 of the text, this character/word is deliberately separated from the actual reform statement, making the micro- and macro-structure of the text poorer. The second part of the interview further confirms that the reader could not make the connections between the meaning of the character/word ‘reform’ and the statements that relate to China becoming wealthier, which are necessary to find the answer in the text. When the reader could not find the answer analysing the cues in the text, it was easier to refer to personal knowledge cued by the topic of ‘China Becoming Wealthier’.

The reader’s comment is mainly based on a lack of ability to understand the question sentence accurately when not able to find the answer in the text. The question below has the character for China 中国 at the start of the question and later on the character for self 自己 is used to refer to ‘China itself’. The character for self 自 is more commonly used to refer to people. The text is about China and Australia so the reader may not have paid attention to the use of the character for China used at the start of the question. Instead when the reader was reading the sentence, s/he heavily focused on the character 自己 meaning a person himself/herself/themselves. As a result the reader misinterpreted the question as to mean ‘who himself/herself took advantage of China’s reform to become wealthier?’ This leads to the reader’s actual answer below for this question on the answer sheet to start with the word “They…” and also the above think-aloud response to start with the character 有人 ‘someone’.

5. 举出 一个 中国 利用 改革 而 使
List one China makes use of reform so that enable take advantage

自己变得富裕的例子

self become wealthy example

The reader explained the response by saying that these people got richer because they took money that was meant to be used for ‘revolution’. However, another contextual error on the reader’s behalf is the use of the character, 革命 for ‘revolution’. Due to limited proficiency, the reader used the character 革命 inaccurately to mean reform, which is the character 改革. The reader used the two characters interchangeably without realising the difference between the two. This can only be attributed to the influence of visual coding in Chinese reading comprehension. Weak readers tend to rely more heavily on visual codes than high-level readers (Ren & Mattingly, 1992). This is one of the examples of structural differences that exist in the results between the two language groups. This and other examples again prove Schmitt et al.’s theory (1994) that the structural differences between the two languages influence the way they represent meaning in the text and the nature of their errors in processing.

Next, Grade 8 Chinese readers’ responses based on the results will provide more insight into the reading strategies and meta-cognitive knowledge of high-skilled readers and the influence of text coherence.
6.2.4.2 Grade 8 Chinese language readers’ think-aloud protocols

Grade 8 Chinese language readers’ think-aloud protocols reflected their level of thinking and text comprehension displayed in all the other tasks as the highest performing group of readers. The interviews further revealed the difference in their processing of text content and the use of prior knowledge in building a situational model of the text.

In terms of talking about their strategy use, low-skilled readers gave generalised responses such as “Read and understand the questions carefully, that’s all” given by CS8_BA2. This indicates that weak readers struggled with the poor micro-structure as in Version 2, which in turn blocks their access to the macro-structure of the text because they do not have the necessary resources or strategies to deal with the constraints at the micro-level. This and similar responses support Kintsch’s comprehension theory (1998) which accentuates the existence of constraint-satisfaction process in text comprehension. Readers use their prior knowledge to activate the network of meaning units in the text and they are not able to do this if they cannot pass different constraints presented in the text. This again reinforces the important role prior knowledge plays on comprehension.

When asked about the differences and similarities between reading texts in Chinese and reading this text, CS8_AA4 gave an explanation confirming the influence of coherence of macro-structure in Version 3.

CT8: Ok, now we will have CS8_AA3 to answer the following questions please. You have read the articles provided by Teacher Yasar, what differences and similarities have you found when comparing them with our usual Chinese reading?

好下面请寒同学回答问题, 你读过 YASAR 老师给我们提供的这些文章, 和平时所读的语文类的文章相比有什么不同?
CS8_AA4: *I felt the sentences of these articles were in a jumble as if there were many errors. This article describes the differences between China and Australia, instead of introducing China then Australia in order, it introduces these two countries at a same time. This has been a little confusing that the article has to be read after you clear your mind.*

我觉得文章比较杂乱一点,就是让人觉得有很多的病句.一句连不上一句.而且,这篇文章讲的是中国和澳大利亚的不同,它没有介绍完中国再介绍澳大利亚,而是两个国家掺和在一起介绍.让人读起来有点乱,得自己理清楚再读.

CT8: *Do you understand it now?*

那你读明白了没?

CS8_AA4: *Yes.*

明白了.

CT8: *Ok, please give an example demonstrating that China becomes richer as a result of its reform policies, what is the example you have?*

嗯,让你举一个中国通过改革变得富裕的例子,你举的是什么?

CS8_AA4: *The example that I have, is the policy to encourage foreign investments. In the past, China had a history of locking its door against the world and isolating itself from foreign countries. As a result its economic growth was restricted. After it implemented the foreign investment policies, it has linked itself to other economies and changed its economy significantly.*

我举的是制订的促进海外投资的政策.以前中国历史有一个闭关锁国的经历.就是把整个国家锁在国家里面,不与外界交流,也同时锁住了
自己的经济发展. 它制定了海外投资政策, 就象越洋一样, 把自己和别国的经济连在一起. 发展海外投资对本国经济有很大的改变. 老师: 好, 回答完毕.

This comment from CS8_AA4 indicated an awareness of the difficulties in the structure of the text. The latter part of the response shows the reader’s prior knowledge use integrated into his explanation of China’s foreign investment policy as an economic reform.

CS8_AA3 provided a detailed response after reading Version 4 in response to the same question indicating a level of understanding and use of prior knowledge to extrapolate the information in the text. The reader retrieved the information on Don Xiao Ping’s era to talk about the response in terms of Chinese economic reforms.

CS8_AA3: In the Deng Xiao Ping era, China implemented policy to fix farm output quotas and the contracted land responsibility system on the household basis; one of the good examples is the great harvest of crops in Xiaogang Village; since then China has become a society with a moderate living standard.

中国在邓小平时期实行了包产到户, 以及家庭为单位的土地责任制, 突出的表现是小岗村的粮食大丰收, 因此使中国步入了小康社会.

CT8: What was your consideration for this question?
那回答这个问题时你是怎么考虑的?

CS8_AA3: Because China is a populated country, it was a good achievement to feed the entire population. In China there is a saying that harvests depend on two “pings” – Deng Xiao Ping and Yuan Long Ping; I recall that Deng Xiao Ping’s era was also the era of Reform and Opening of the nation.
The reader was not only able to retrieve detailed information to explain and extrapolate the information in the text on Chinese economic reforms but was also able to explain a reading strategy used as well as the reasons why this was more difficult than the articles they read in the Chinese class. This revealed the level of meta-cognitive ability of the most advanced readers such as CS8_AA3.

CT8: What are the important factors in order to answer these reading questions correctly?

那你觉得要答好阅读题要具备哪些方面的因素呢？

CS8_AA3: Firstly you will need to understand the reading material, its main content and the main ideas that it tries to express.

首先需要把阅读材料读懂,并且知道阅读材料的中心以及所要表达的

思想是什么。

CT8: Comparing this article with the articles that you read at the usual Chinese class, which one do you find more difficult?

那你觉得你所读的这篇文章和平时语文课上所读的文章相比,哪个更有难?

CS8_AA3: This is more difficult one, because it lacks order and it was difficult to follow a clue during reading.

这个更难,因为文章更杂乱,读的时候没有一根线索。

Grade 8 Chinese language readers as well as Grade 5 Chinese language readers stated that this version of the text was easier than the texts they had read in Chinese classes.
CS8_AA1’s response for Version 2 mentions the text as having a similar structure to other Chinese texts but more difficult to understand. This suggests that the reader recognised the coherent macro-structure as well as the poor micro-structure as factors influencing text comprehension. The same student, when talking about the strategies used, talked about the use of ‘knowledge gained outside the normal class time’ for questions such as question 8.

Overall, Chinese language readers found incoherent textbase more difficult than coherent ones, regardless of whether it had poor micro- or macro-structure. When talking about their strategy use, these Grade 8 Chinese language readers also mentioned their awareness that some questions need the use of prior knowledge.

The think-aloud protocols of Chinese language readers supported the findings in the previous tasks on the influence of text coherence. This again proves the existence of both bottom-up and top-down processes which support the interactive nature of reading (Stanovich, 1980; Perfetti, 1985; Rummelhart, 1994, 2004). Readers’ think-aloud protocols at both grade levels suggest that the influence of text coherence also exists for Chinese language readers. Regardless of their abilities, the language system and the structural differences, readers find an incoherent textbase more difficult and need to actively construct a coherent textbase before they are able to process the text at a higher level. The results confirmed Hypothesis 2 on the influence of text coherence for Chinese readers’ comprehension. They are also consistent with the findings of McNamara et al.’s (1993) study of 6th and 8th graders. McNamara et al. concluded that high-knowledge readers or readers who had more prior knowledge than the others not only did 50% better in textbase and 200% better in the situation model tasks but also did better with low-coherence texts than the low-knowledge readers. This was also confirmed later on by other studies on the use of prior knowledge and text coherence (McNamara, 2001; Long et al., 2006). A more recent study on Classical
Chinese text comprehension processes of six ninth graders in Taiwan also used think-aloud protocols (Li-Chen, C., & Guey-Fa, C., 2015). The findings suggest that readers’ verbalisations of sentence meaning conjecture and word explanations were ranked the highest amongst the four comprehension processes.

The same Grade 8 Chinese language readers were also asked to complete the same tasks for Part 2 in English and their results are compared with both their earlier results in Chinese tasks and with the results of the Control Group. The next section discusses the results for these Grade 8 Chinese language readers for the influence of text coherence.

### 6.3 Grade 8 Chinese Language Readers’ English Results

The results of the same Grade 8 Chinese language readers (which for the purposes of this part are referred as the research group) and the control group of Grade 8 Chinese language readers in English presented further findings in terms of the influence of text coherence. Unlike their comprehension results in Chinese in which Version 3 scores were the highest, this was not the case in English. The highest scores were Version 1 scores. Another important finding was that it was the same Grade 8 Chinese language readers who achieved the highest results in English. This confirms the importance and the transfer of skills and knowledge acquired in first language when processing the text in the other. This suggests the transfer of processes and knowledge from first language to target language for Chinese language readers’ text comprehension.

Above Average readers were able to complete the most difficult Applied level questions, which required the integration of their existing knowledge with the textbase. They were even able to produce answers that they did not produce in Chinese. One reader mentioned ‘Food’ as another factor for a nation’s identity, which he did not mention in Chinese. Despite English not being their first language, Grade 8 Chinese readers were able to
show evidence of higher-level responses as also displayed by Above Average Grade 8 English language readers. If readers have developed the necessary skills and knowledge in their first language, then they are able to use these to comprehend texts in another language, or if they have not developed such skills then this will be more likely to impede their text comprehension in another language. In other words, cognitive and meta-cognitive skills and the processing of macro-structure as well as the role of text coherence in text comprehension are possibly universal in nature.

Both groups of Grade 8 Chinese readers’ summaries did not display similar scores in English. Undoubtedly, this is the result of their modest skills in English as a foreign language, which had not been acquired like Chinese as their first language but learned instead. The control group’s summaries mostly consisted of near-verbatim repetition of the sentences in the English text. Even Above Average readers did not have adequate linguistic resources to express their understanding of the text in English summaries. They were still able to show higher-level constructive activities and meta-cognitive skills. They used topic sentences or joined two topic sentences, used more connectives, identified main ideas and made simple inferences, unlike Average or Below Average readers. Another important finding was that Below Average Grade 8 Chinese language readers who did not use any affective personal comments in their Chinese summaries did so with their English summaries. This further suggests that, though reading comprehension skills in one language is transferable to the other, the way they behave as readers in a particular language depends on the level of competency in the target language. Version 3 summaries by Above Average readers generated better macro-structure, which again confirmed their higher text-processing skills even in English. These readers were able to use their prior knowledge and construct a better macro-structure in their summaries despite poor micro-structure, like all the other Grade 8
Chinese language readers. There were more text propositions in Above Average readers’ summaries than for Average and Below Average readers.

Overall, the results of comprehension tasks, which required different levels of text processing and the use of prior knowledge, as well as the results of readers’ summaries and think-aloud protocols proved that text coherence influences Chinese language readers’ text comprehension in Chinese as well as in English. Therefore, the influence of text coherence is possibly universal regardless of the language system and the differences in discourse organisation or how meaning is represented in different text in both logographic and alphabetic languages.

It seems that readers develop higher-level comprehension skills at Grade 8 to better deal with incoherent macro-structure of the text. The higher success of Above Average Grade 8 language readers in both English and Chinese in particular means that readers in Grade 8 are still developing higher-level text-processing skills and the readers who are already equipped with such high-level text-processing and meta-cognitive skills and knowledge are able to overcome the inconsistencies and incoherence in the expository texts they read at school.

The findings in this study highlight the significance of the text’s macro-structure and the readers’ level of constructive activities in text comprehension across the two languages. These were evident in readers’ comprehension results, summarisation, integration of prior knowledge and use of meta-cognitive skills during the think-aloud protocols. The results were discussed in the light of the theoretical framework provided by Kintsch’s CI Model. Although the CI Model accounts for most of the results and text comprehension processes of Chinese language readers, there is a further need for expanding the importance of the levels and the nature of readers’ constructive activities in terms of describing their construction of
textbase and use of prior knowledge. Chinese language readers are evidently more active in their construction of textbase and use of prior knowledge and have a better understanding of the macro-structure of the first text than English language readers. Grade 8 Chinese language readers’ comprehension scores correlated more closely with their prior knowledge compared to all the other groups.

The statistically significant difference between two language readers’ performances in constructing a situation model of the text also proves the influence of one’s prior knowledge during reading. The differences in readers’ linguistic and cultural knowledge undoubtedly influenced the way they accessed the macro-structure of the text and this needs to be further accounted for in any text comprehension model. The next section explores a constructive model of text comprehension based on a broader context that recognises the importance of the levels of readers’ constructive activity and knowledge structure in terms of processing the information in the text and integrating it with their existing knowledge.

6.4 Multi-Level Knowledge Activation Tapestry (MKAT) – A Text Comprehension Model

This study proposes a tapestry model of text comprehension to account for the results. The model suggested is a constructive activity based model and share similar features with Kintsch’s Construction-Integration Model (1998), Schema Theory (Anderson, 2013) as well as The Landscape Model (Van der Broek et al., 1999). This model proposes the existence of multi-level activators, which differentiate between the readers’ level of language and knowledge construction tapestry necessary for text comprehension. It views text comprehension as a consequential dynamic fusion of text knowledge and readers’ self-knowledge of the world. This model is briefly described and discussed in relation to CI
model, which forms the theoretical framework for this study. It suggests that comprehension is achieved in a tapestry of multi-level knowledge activation.

Text comprehension is an interactive process, which takes place between a reader and the text (Stanovich, 1980; Perfetti, 1985; Rummelhart, 1994, 2004). It is influenced by text-based features and reader-based features. These features can be described as both linguistic and non-linguistic in nature. Text-based linguistic features include everything Kintsch (1998) discusses that comprises the Linguistic or Surface Level textbase but they are language specific and their influence may change based on structural differences between the languages. As shown in this study, Chinese and English language readers use a range of processes both top-down and bottom-up in constructing meaning from text. The different tasks employed in this study and the readers’ responses to these revealed varying levels of constructive activities. The influence of text coherence and the use of readers’ prior knowledge are active at multiple levels and across both alphabetic and logographic language systems. This is consistent with previous research in text comprehension (Chan & Law, 2006; Law, 2008; Kintsch & Mangalath, 2010). In terms of textbase information and ideas, one can argue that meaning is constructed through the activation of language specific processes and concepts and situations at both micro- and macro-levels. This is influenced by how meaning is accessed, constructed and perceived by readers at linguistic, conceptual and situational levels but they are different in different languages and cultures, as was seen with the Chinese language readers in this study. This is what CI model does not account for or predicted as a model. The results of this study reinforce that the structural differences between the languages as well as the cultural and world knowledge of the readers cannot be ignored in any model of text comprehension.
Reader-based features can be described as linguistic and non-linguistic in nature. Linguistic features include readers’ level of ability in reading and the level of knowledge of that language. This influences their level of construction of meaning and their comprehension of the text. Reader-based non-linguistic features include readers’ knowledge structure and conceptual development as well as level of cultural understanding in that particular language. The language they are reading influences readers’ thought processes and perceptions. This theory is known as Sapir-Whorf Hypothesis or linguistic relativity. It suggests that the structure of a language determines or greatly influences thought patterns, culture and worldviews of the users of that language. This theory and its application to Chinese language have also been supported by recent research (Yu, 1998; Boroditsky, 2001; Jing, 2011). The present study goes further and suggests that the structure of language the readers read and their own knowledge structure, including their level of cultural knowledge, greatly influence the way they construct the situation model of the text and its comprehension at a deeper level. This also has support in Schema Theory (see Chapter Two).

Text comprehension takes place when the language, information and ideas constructed in the text activate readers’ retrieval of particular linguistic and non-linguistic resources. This is similar to constraint-satisfaction processes (Kintsch, 1998) but more detailed and complex as it includes both linguistic and non-linguistic resources unlike the CI model. The results of this study suggest that readers of both alphabetic and logographic languages work constructively with the text content at different levels in assimilating the network of information and ideas activated in the text to construct their comprehension framework or mental representation as suggested by CI model. It is evident that text comprehension processes readers use are influenced by the structure of that language and the local text coherence. The cloze task results indicated that Chinese language favours more the
activation of context and word recognition processes than English when constructing the
textbase and English language favours conceptual metaphors more than Chinese for
predicting the topic of the text.

Moreover, incoherent texts are found to influence text comprehension of readers
regardless of the language and they activate more constructive activities in particular for
high-skilled readers. These results are mostly consistent with previous research and the
current theories of text comprehension in particular Kintsch’s CI and CI-2 models (Kintsch,
1998; Kintsch & Malagath, 2010; Malagath, 2012). Although, the results confirm the current
theories, they also indicate a need to accommodate for language-and culture specific areas
that potentially influence the level of constructive processes necessary for text
comprehension. One of these areas relate to the use of prior knowledge, which is the most
significant finding of this study. It is the most important reason why Chinese language
readers were able to construct a better macro-structure and a situation model.

Readers need linguistic resources as well as cultural resources in order to fully
understand a text they read. For example, the readers of second language just like low-skilled
readers have even more difficult task in processing the text information and ideas because of
the limited resources available to them and hence limited activation during the time they are
processing the text. In order to account for the results above this study proposes four
linguistic and cultural knowledge activation and constructive activity levels of text
comprehension. These levels are based on the same rationale as in The Structure of the
Observed Learning Outcome (SOLO) taxonomy developed by Biggs and Collis (1982) and
also recognise learning through the developmental stages. They are adopted from Chan et al’s
(1992) and Law’s (2008) scales of constructive activity and fitted to the results of this study.
These aim to further describe and scaffold readers’ text comprehension processes for similar tasks employed in this study when they read-to-learn from expository texts at school.

6.4.1 Levels of text construction for comprehension based on MKAT model

6.4.1.1 Pre-constructive level

At this level, readers display very little or no constructive activity (no responses or responses such as “I do not know”) or understanding. In terms of CI Model, readers have limited understanding of textbase information and ideas and their knowledge is limited to linguistic features such as basic decoding or word level meaning. Activation is only at word level. Typical responses at this level include irrelevant affective or personal comments, responses to individual words, phrases or detail (Chan et al., 2008), stating the topic in general, chunks of word-for-word or character-for-character copied fragments or sentences from the text. Apart from no responses, examples of this in the students’ responses were, “I don't know” “attract to each other”, “without electricity”.

6.4.1.2 Partial constructive level

At this level, readers attempt at understanding the text information and ideas but readers’ constructive effort is only partial and is in response to a single idea, a sentence or a single aspect of the text information (Chan et al., 2008). The responses are usually in the form of declarative factual statements. This is similar to anaphoric/referential type of coherence activities suggested in The Landscape Model (Van der Broek et al., 1999). They do not include evidence of inferences and effort at activated connections between different ideas or idea networks in the text. In terms of CI Model readers are still working at micro-level information and ideas. They rely heavily on local surface features of the text. Examples
of this in the students’ responses were “in 1752, electricity was discovered”, “the magnets help many people by closing doors firmly”.

6.4.1.3 Inferential constructive level

The responses at this level show evidence of multi-level activation between network of ideas and information. There are inferences and high level of constructive activities in an attempt to make connections between propositions. This is the equivalent level as CI Model’s conceptual level. For the first time there is evidence of readers’ attempts at text representation and understanding text-based information and ideas. Readers are able to grasp micro- and macro-level structures and propositions in the text. Examples of this in the students’ responses were “Formation of magnets and the relationship”, “Electricity is a type of energy too and there are many sources of energy including, water, sun and wind”.

6.4.1.4 Construction-integration level

This is the level in which all the linguistic and cultural knowledge activation is processed and the text comprehension is achieved. Kintsch describes this level in which readers work towards constructing a situation model of the text information (1998, Kintsch & Mangalath, 2010). For the very first time readers are able to integrate their existing knowledge with text-based knowledge and information to full mental representation of the situation in the text and complete text comprehension. The readers’ approach is related to problem solving which includes evidence of activating own world knowledge to hypothesise, explain and offer resolutions to conflicts in the text. Examples of this in the students’ responses were “Effects of electricity and magnetism on life” and “As a result of this we are able to reduce the sizes of switches and other objects making them more portable”.
6.4.1.5 Proximal Development Level

This is where learning based on the extension of text knowledge takes place. Readers develop meta-cognitive awareness of the new learning and their proximal development from the text knowledge. They are able to first time extend and apply their new knowledge to other situations as evidence of their learning. Readers gauge and extrapolate their newly acquired knowledge to explain other situations, which are not in the text. Examples of this in the students’ responses were “the invention of Maglev train was based on the characteristics of the attraction between magnets” and “When a credit card is printed, there is a magnetic chip on the credit card”.

6.4.2 Think-aloud as a metacognitive tool for text comprehension

This model suggests that existing knowledge is context-activated and is continuous until readers develop meta-cognitive awareness of their new learning. Although the think-aloud protocols used in this study are guided by the probe questions unlike in other think-aloud studies, the results of think-aloud protocols from this study show evidence of readers’ integration of their existing knowledge with the text information during and after their reading. Readers’ think-aloud scores statistically significantly correlated with cloze and summarisation scores. It was revealed that think-aloud skills are possibly developmental and readers could be trained to improve their metacognition for text comprehension.

This model utilises readers’ think-aloud and metacognitive skills for increasing their text representation and comprehension. They are trained to use a range of thought provoking think aloud tools and strategies specific to before, during and after their reading stages to maximise their construction of textbase and integration of this with their prior knowledge.
Chapter Seven: Implications, Future Directions and Conclusions

This chapter concludes the thesis, summarises the major findings of the study, which provide answers to the two hypotheses raised in Chapter 1 and expounds on the theoretical implications for text comprehension based on the research findings. It also provides pedagogical implications for teaching comprehension to readers of English and Chinese languages at schools and future directions for conducting comparative research in text comprehension.

7.1 Theoretical Implications

This study explores the text comprehension processes of 72 Chinese and English Grade 5 and 8 readers in China and in Australia and the influence of text coherence when they read-to-learn at school. Since Bartlett’s work on reconstructive memory and ‘schematas’ (1932), many psycholinguistic theorists have attempted to explain text comprehension processes. In terms of current theoretical research on bottom-up and top-down approaches discussed in Chapter 2, the results of this study provide evidence that there are similarities and differences between the ways Chinese and English language readers process text. Both groups of language readers provided evidence of processing the text at multiple levels using similar reading strategies including the use of prior knowledge. In addition, text comprehension of the readers from both language groups was influenced by poor local text coherence. However, the results also suggest that different systems of language and culture may manifest different approaches at different levels when it comes to the mechanical parts and abstract processes involved in reading. For example, the Chinese language has loose sentence structure and holistic access to meaning through characters and mostly has
compound words. Therefore, Chinese language readers rely mostly on visual recognition and contextual cues and hence, use a top-down approach more than English language readers do. English language readers are constrained with more rigid grammar and sentence structure when accessing meaning. The results of this study imply that readers’ ability level also plays a significant role in determining how much of bottom-up or top-down approach they use when constructing the textbase and the situation model. While less skilled readers may make use of the bottom-up approach, skilled readers may opt for the top-down approach as most of their microlevel skills are automated. Therefore, depending on the system of language and/or different levels of construction, readers adopt both bottom-up and top-down approaches for text comprehension.

This qualitative study is based on a constructivist theory and precisely adopts the theoretical framework of Kintsch’s Construction-Integration Model for text comprehension (1944, 1998, 2004). The CI Model suggests that readers actively construct meaning derived from the text at multiple levels and integrate this with their prior knowledge to form a coherent mental model of the text and complete its comprehension in this cycle. To test the first hypothesis on text comprehension processes, the first part of the study included the cloze task, think-aloud protocols, summarisation, prediction and the use of prior-knowledge. The major finding for the first hypothesis is the nature of text processing that consistently exists for both Chinese and English language readers and is evident in their results for all the tasks listed above. The results indicated similarities between the text processes of Chinese and English language readers and confirmed the findings of Chan and Law (2002) and Kintsch’s CI Model of text comprehension. This was evident in the lack of statistically significant differences between their performances in cloze, think-aloud and summarisation tasks. Furthermore, the results were also consistent for each of the ability groups. Overall, Above
Average readers achieved higher results than Below Average readers in all the tasks including readers’ verbalisations during think-aloud protocols. All this confirms the CI theory and the findings of other studies in the field that advanced readers are able to access the text meaning at a deeper level (Keenan & Jennings, 1995; Kintsch, 1991, 1998; Lau, 2006; Law, 2008).

On the other hand, the results also revealed many differences in readers’ processing as a result of the nature of their language and cultural knowledge. The prediction task provided evidence for Chinese language readers’ lack of metaphorical interpretations. This again highlights the significance of readers’ cultural knowledge structures when processing text information and ideas. There are also differences in readers’ constructive effort, their use of prior knowledge and the construction of a situation model. The findings also indicate a further need to investigate the possible links between the role of readers’ constructive efforts, the different types of knowledge structures and the processes in comprehension.

The limitation of the cloze task used in the study lies in its comparative nature in which the original text was created in the English language rhetoric. The cloze gaps in the first translation of the text in English had to be modified to reflect the natural flow of Chinese language. To that extent, this brings to mind the question about the nature of translations. Is it ever possible to accurately translate? Although this helped with the comparison between the two language groups and revealed major differences, any future study may also benefit from confirming the results in a cloze text originally created in Chinese. Perhaps deliberate manipulation of different types of gaps (e.g., different types of compounds) for exploring different text processes can be achieved in separate cloze texts. In addition, reading a text in a discourse type other than an expository and/or a culture-specific text may further reveal the possible influence of cultural thinking structures and the level of constructive activities in text
comprehension. In this way, Chinese word segmentation and different character features, together with the context, can be manipulated to find out even more about their role in text comprehension.

Besides the cloze task, the think-aloud protocols used in this study revealed the importance of readers’ metacognitive skills in understanding the text meaning at a deeper level. This was possible with deliberate, consistent and carefully designed prompt questions to investigate common strategies during the interviews, which further revealed readers’ text processes. As also suggested in other studies, think-aloud protocols conducted during the reading provide more reliable information on high-level constructive activities (Pressley & Afflerbach, 1995; Law, 2008). Readers’ think-aloud protocols indicated that their particular thinking processes and strategy use are impacted by their previous experiences with texts in class, the context, their prior knowledge and their culture. This was the case for both the texts.

Readers’ think-aloud skills statistically significantly predicted their comprehension scores and in particular their micro- and macro scores. Chinese readers’ verbalisations during the reading of the second text revealed more explicit influence of prior knowledge than their reading of the first text due to the nature of the topic. This again supports the view that readers’ cultural knowledge on the information and the situations on China and Australia may have fitted in their schemas more than English readers (Anderson, 2013). Readers’ ability groups statistically significantly predicted their think-aloud scores. Explicit use of think-aloud protocol questions focusing on different skills, constructive activities, areas of knowledge and knowledge structures in different orthographies will benefit future research in this area. In particular, the influence of culture-specific knowledge and context on text processing is an area in which the CI Model could be further extended to investigate.
Exploring middle year students’ or second language learners’ cultural knowledge structure and its influence on their construction of situational model will no doubt yield valuable information with further implications for text comprehension.

Kintsch references previous studies, which prove the significant role of cultural and rhetorical schemas in the formation of macro-structure (Kintsch, 1999, pp.67-9). This study proves that the importance of the interaction between micro-structure and the macro-structure of the text can vary depending on the micro-processes that are language specific and applied differently in different language systems. Morphological awareness and syntactic structures are found to be a significant factor in this study as well as in other comparative studies between English and Chinese. It is said that morphological awareness contributes to readers’ text comprehension through vocabulary as well as through the recognition of syntactic relations and by freeing up some of the skills needed during text comprehension (Zhang et al., 2014).

Readers’ summaries in both language groups showed propositions in the text as key constituencies of readers’ constructive activities. This is also consistent with the CI Model (Kintsch, 1998). One way that propositions are processed is through parsing, identifying these in grammar units such as adjectives, verbs, and adverbs. As Chinese parsing would naturally be different, as it is a logographic and morphosyllabic language, the processing of these propositions by Chinese readers is different. Despite cultural and pedagogical differences in how summarisation is used in classes, the way the readers constructed their summarisation was not different. Similar to other studies on Chinese readers’ constructive activities (Law, 2008), this study was able to show, through students’ think-aloud protocols and summaries, that both Chinese and English language readers’ ability to use higher-level constructive activities increases with Above Average and hence, is developmental for both
English and Chinese language readers. Although Grade 8 English language readers achieved equally high scores in the cloze task, Chinese readers’ understanding and representation of macro-structure were better than these readers in general. The reason for better macrostructure is Chinese language readers’ higher level of prior knowledge than English language readers. This also confirms the findings, in the previous studies, which concluded that high-knowledge readers’ processing of information, access to macro-structure and construction of situation model are better than low-knowledge readers (McNamara, 1993; Kintsch, 1993).

The results for the second part of this study provided evidence in support of Chinese high-knowledge readers. To further test the second hypothesis on the role of text coherence, prediction, three-level guide comprehension questions, summarisation and think-aloud protocols were used. The results of think-aloud, comprehension and summarisation all proved the influence of local text coherence on Chinese readers’ text comprehension. Chinese language readers did very well with Version 1 (Good Micro/Good Macro), the most coherent version and struggled with Version 4, the version with the poorest local text coherence at both micro- and macro-level. The results were the same for Grade 5 and 8 English readers. One exception, which needs to be acknowledged, relates to Grade 8 Chinese language readers who did better with Version 3 than all the other coherence versions. Chinese language readers also explicitly talked about “…opening sentences followed by the content…” and the different sequence of events (by Version 3 readers) as factors that made the text easier or more challenging compared to the texts they usually read in Chinese classes.

Grade 8 and Above Average readers, overall, did better than Grade 5 and Below Average readers in all of the tasks and with all four coherence versions of the text. This further confirms that Chinese readers’ text comprehension is more likely to occur in Chinese
with more coherent representation of the text rather than incoherent. Above Average Chinese readers also showed resemblance to the high-skilled college readers’ results in Eileen Kintsch’s summarisation study (Kintsch, 1990). They achieved unusually better scores with Version 3 (Good Micro/Poor Macro) and their think-aloud verbalisations confirmed that this was due to their higher level of prior knowledge on the topic as well as on the level of their constructive activities. Similar to the high-skilled college readers in Eileen Kintsch’s study, Grade 8 Chinese language readers in the present study treated comprehension as a problem-solving activity activated by the challenges presented with the Good micro- and Poor macro-structure. This was also supported in Chinese readers’ levels of constructive activities identified in their results for the adding of titles and sentences task.

More recent statistical models of semantics such as Latent Semantic Analysis and the Topic Model are computerised text comprehension analyses. The studies on mental models have shifted the focus of text comprehension theories away from the texts to readers and their knowledge. This also forms the basis of the Construction-Integration Model and the situation models. In his discussion on models of text comprehension, Kintsch talks about multilevel situation models in literary texts in which the author’s intention is for readers to construct situation models at different levels. However, in order for one to further understand the construction of such multilevel models, there needs to be expert knowledge on the situation or situations at each level. Kintsch mentions the need for domain knowledge for such understanding. However, the results of this study, particularly in the second part on China and Australia, imply that cultural knowledge is also necessary for understanding such multilevel situation models. It is suggested that the future studies on situation models should include the influence of cultural context and cultural knowledge as well as their integration in text comprehension. The significant differences between the ways the readers access meaning
within the two language systems manifest themselves in the way the readers of two language groups integrate existing knowledge to construct a situation model of the text.

It is said that low-skilled readers have a low short-term memory span (Kintsch, 1998, pp. 241-4). Chinese language readers recalled the text with more details, but again this could be explored in other short-term or working memory-based comparative studies, which can look at the role of working memory for Chinese language readers’ text comprehension. While this is the overall picture, this study revealed some gaps in the theories of text comprehension, in particular, in explaining the nature of the interaction between the use of prior knowledge and the context. While Malagath and Kintsch’s CI-2, dual-memory model (Kintsch & Malagath, 2010) and Malagath’s CI-II model (Malagath, 2012) explore the influence of context and background knowledge through the use of computerised analyses, it is also shown many times that the human mind is spontaneous and so is the way that context activates different levels of knowledge during reading. The present study’s new proposed model Multi-level Knowledge Activation Model presents implications for future research in this area. It provides measures for the tasks used in this study and encourages its use with other similar comprehension tasks.

The present study collected additional data on control group and the research group asking Chinese language readers to complete the tasks in English. The results suggested that if readers are skilled in one language it is more likely that they will also succeed in text comprehension in the other language. This has theoretical implications on future comparative studies between readers of other orthographies and their construction of meaning in texts written in these languages.
7.2 Pedagogical Implications

This section provides practical and pedagogical understanding and the implications of the results.

Text coherence and readers’ existing knowledge seem to be two prominent factors that influence text comprehension and learning from text according to the CI Model which is supported by the present study’s findings. The results in this study of Middle Years Chinese and English language readers need to be addressed in a reading literacy program to ensure success at school. The reading tasks used in this study may attest to the ways students develop and apply higher-level reading and comprehension skills and strategies. These tasks include cloze task, think-aloud protocols, summarisation, prior knowledge, prediction, three level guide as well as adding titles and sentences to paragraphs. They demonstrate how readers process the text at text-based (micro-macro-level) as well as at situational levels in constructing meaning at deeper level beyond text content. Any reading measures adopted must accommodate these levels and the strategies for a variety of purposes to stimulate Chinese and English language readers’ text comprehension. Texts and task design as well as reading measures should reflect the linguistic, conceptual, situational and cultural levels of knowledge to assist readers’ learning from texts. Texts and teacher manuals should be designed to include strategies and instructions, which help activate readers’ prior knowledge. This is consistent with previous research such as Schema Theory (Anderson, 2013).

The results also showed that in order for learning from text or deeper comprehension to occur, Chinese readers need to be active agents and constructors of meaning, making maximum use of the resources provided by their language and the cultural knowledge structure. The evidence demonstrated that the higher the level and the number of constructive activities in which readers were engaged, the deeper was their understanding of the text
propositions. The deeper the understanding of the text propositions, the greater the likelihood of more learning. This suggests the universality of meaningful, higher level constructive activities that lead to learning from text. Higher levels of constructive activities involve the integration of readers’ existing knowledge with the text information to construct a mental model of the text. Therefore, text comprehension activities in class must stimulate more engagement with the text at a higher level, which will lead to learning from the text, not just remembering or recalling the text information. The text comprehension constructive levels identified in this study provide a valuable tool for teachers and educational practitioners alike to adopt the use of the levels and the tasks to assess students’ text comprehension as well as their readiness for learning from texts with more complex language (including the local text coherence) and content.

When constructing the textbase or text representation at higher levels, Chinese language readers make use of a range of cognitive and metacognitive strategies. The results of this study showed that these included making different types of inferences such as generalisations, readers’ self-monitoring and the use of existing knowledge. Making inferences requires understanding of different text propositions and different spatial and/or causal relationships throughout the whole text (Van der Broek et al., 1999). Generalisations, which require assimilation of text propositions and main ideas in the text, are mostly evident in high-skilled readers’ summaries in both languages. Self-monitoring as a metacognitive skill is stimulated and was evident in Chinese language readers’ think-aloud protocols. The results of the study strongly reveal that while reading programs should include explicit teaching of the cognitive and metacognitive strategies mentioned above, this should start at an earlier age. In particular, in the Australian context, the Grade 5 English language readers showed less use of such strategies when compared to their Chinese peers. The use of existing
or prior knowledge is evident in almost all tasks and is almost always used by skilled readers of both languages.

The construction of a situation model constitutes an area of pedagogical interest for many recent studies. This mental model stems from the CI Model and is said to impact on learning more than any other comprehension processes. The CI Model strongly and consistently emphasises that in learning from the text, readers must construct a coherent representation of the text, which should successfully ‘hook’ into readers’ existing knowledge (Kintsch, 1998). The responses of Grade 5 and Below Average readers showed that, despite some using their existing knowledge, the key was the successful integration of this into their representation of the textbase in other words using it to extend, explain and extrapolate the text-based information and ideas in order for learning to take place. Understandably, if the readers are not able to or do not have the linguistic, conceptual or cultural resources and knowledge to form such a coherent text representation, their integration will not lead to learning and they will be limited to remembering or inferences of text propositions. Similarly, as shown in the second part of the study, if the text does not present a coherent organisation of ideas, in particular its main ideas, low-skilled readers will still struggle to learn from such a text. The main reason for this is that, unlike high-skilled readers, low-skilled readers do not have the level of prior knowledge to engage in higher levels of constructive activities necessary to fill in the gaps in meaning that are not literally defined in the text and certainly not in incoherent texts. It seems that high level of prior knowledge makes text representation less of an effort for complete comprehension to occur.

In juxtaposition to the skills and knowledge the readers bring to text comprehension, text characteristics form the basis of other factors that may act as stimulants or constraints for learning from texts. One such characteristic is text coherence at both local and global levels.
Local coherence relates to the meaning within different parts of the text and global coherence to the overall meaning of the text. Text coherence is considered both at the micro- and macro-levels for the purposes of this study. The results of the present study showed that, while Grade 8 and Above Average readers in general were able to overcome difficulties caused by a text with only poor micro-structure or a text with only poor macro-structure, they experience difficulty with a text with both poor micro- and macro-structure. Although the use of readers’ prior knowledge plays a significant role for deeper understanding of the text, if the text is incoherent at both levels, this is not sufficient (McKeown et al., 1992). The success of Above Average Chinese language readers showed that incoherent macro-structure of the text activated higher-level processes such as problem solving (See Kintsch, E., 1991). This was not the case for Above Average Grade 8 English language readers and this relates to the level of prior knowledge and the way it is integrated into readers’ understanding of the text-based information within that language system. Although Grade 5 Chinese language readers’ level of prior knowledge was also higher than Grade 5 and Grade 8 English language readers, for these readers, they lacked ability for high level macro-processes such as problem solving. This is evident in the statistically significant differences between grade levels, which indicated different levels of text representation at macro-level.

The more coherent the text at micro- and macro-level, the better it is comprehended by the readers. This study firmly supports this with the results for both Chinese and English language readers. The implications of this for classroom practice lie in material development and constructive activities to improve text coherence and hence its learnability (McNamara & Kintsch, 1996; Kintsch, 1998). Adding bridging inferences, connectives, highlighting the hidden links within and between the text and the prior knowledge can lead to more coherent text representation and the construction of a situation model of the text information by both
Grade 5 and Grade 8 language readers in Chinese and English. The optimal level of coherence for learning from the text is when that text more or less matches what Kintsch calls students’ ‘zones of learnability’ similar to what Vygotsky defines as ‘zones of proximal development’ (Vygotsky, 1986). The manipulation of text coherence in target text as it was done in this study is one way to achieve this. This is so there is adequate challenge and room for constructive activities, which are not automatic for high-skilled readers and are accessible for low-skilled readers. This study suggests that these constructive activities at micro- and macro-level need to be identified and utilised in reading programs at schools for ensuring success for readers at all levels. The comprehension tasks and the reading strategies in this study such as cloze, think-aloud and summarisation demonstrate how this can be achieved.

The significance of readers’ prior knowledge use in both languages represented salient traits in their text processing and has pedagogical implications for educational practice. This study’s results displayed evidence that readers continuously use linguistic, conceptual and cultural knowledge, making use of the semantic relationships within and between the text and their knowledge schemas during reading. Readers’ schemas play a very significant role in the way readers make associations at word, sentence and text levels (Tracey and Marrow, 2012). Readers’ schemas, the way their knowledge is organised, are also influenced by culture.

### 7.2.1 Chinese Language Readers

Chinese language readers seem to prioritise knowledge-use based on the contexts presented by the text and the level and the structure of their knowledge at different stages during their reading. Pre-tests on the structure and the level of different knowledge can be measured before reading for optimal use and further enrichment of readers’ prior knowledge during reading and after reading. This can be used to expand and extrapolate the knowledge
and situations in the world of the text for learning to take place. One way of doing this for teachers is to use a range of measures to determine a knowledge continuum for the levels of a student’s existing knowledge including cultural knowledge needed to construct a coherent situation model. In addition to inclusive educational practices to stimulate more constructive activities and prior knowledge use to increase learnability from text, one needs to consider the practical implications of other cultural and language-specific attributes indicated in the results of this study.

The results of this study are consistent with the view that Chinese language readers process texts differently from English language readers at linguistic and cultural level (Mei-yi Lin & Akamatsu, 1997; Li & McBride-Chang, 2014). The two main areas of difference in Chinese language readers’ text processing were evident in their cloze task results. Although Chinese language readers share many attributes with English language readers in text comprehension, however, the uniqueness in their cloze-task responses showed the differences in their text processes such as word recognition, use of context and syntax. This is plausible as when one considers how laborious it is to learn to read and write Chinese with 2,400 characters of which majority are homophones and compounds (Guan et al., 2016). Chinese language readers also showed evidence of lack of inflections and loose sentence structure, which offered greater variety of character/word orderings (Jing, 2011; Li & McBride-Chang, 2014). This resulted in more rapid semantic access to word meanings and meaning relations than English language readers who had to deal with more rigid sentence structure and grammar rules for accessing meaning. This suggests that Chinese readers’ access to meaning is more immediate than English language readers’ (Mei-yi Lin & Akamatsu, 1997; Tong et al., 2009). Due to this orthographical difference, the Cloze task, originally written in English, provided evidence for more active construction of meaning by Chinese language readers, in
particular by Grade 8 Chinese language readers, who had a higher level of prior knowledge than other participants. In practical terms, these results suggest that reading programs can manipulate text meaning in different ways to challenge Chinese readers’ text comprehension and provide many ‘activators’ into their knowledge structure for learning. These will activate their knowledge and aid their construction of meaning at multiple levels.

Chinese readers’ think-aloud responses during their reading of both texts indicated their strength in recalling text information and weakness in reasoning. This and their reliance on text and context indicate that Chinese readers as well as English readers would benefit from tasks which would challenge their metacognitive and metalinguistic skills. Readers who were able to explain their thinking processes during their reading did better in the cloze task. This demonstrated that ‘self-talk’ during reading helps readers construct a more coherent mental model of the text information. Chinese readers would benefit from training in critical reading tasks in which they take an active role in considering and explaining their choices.

Furthermore, Chinese language readers’ think-aloud responses also revealed the influence of their culture on their thinking processes and prior knowledge use, regardless of their ability levels. This is critical in terms of text comprehension as readers use their existing knowledge to form situation models of the text information and, if the textbase contradicts their prior knowledge, then readers will not complete the text comprehension and/or are not able to achieve comprehension at a deeper level. Hence, the situations, concepts and language used in the text make it easier or more difficult for comprehension if the readers are not familiar with the culture of the situations in the text (Jing, 2011).
7.3 Future Directions

The present study used Kintsch’s CI Model of text comprehension framework to investigate Grade 5 and 8 Chinese and English language readers’ text comprehension processes and the role of text coherence in reading in these two linguistically and culturally different languages. Studies on text comprehension have long moved from the text only research of the past to the readers as active constructors of meaning.

The results of this study indicate very clearly that any future study will need to further investigate the influence of different linguistic systems and thought patterns on readers’ prior knowledge and their sociocultural background in learning from text. The extent of readers’ knowledge structure is the central determinant in the zone of learnability from the text in addition to the language and the context. This will be crucial for understanding how readers’ knowledge and experiences are stored in long-term memory for successful retrieval and how they use this knowledge within episodic memory and integrate it with text information at both the micro- and macro-levels. Other comparative studies on text comprehension could explore Chinese language readers’ or English language readers’ text comprehension processes with other language readers in similar or different linguistic, educational and/or cultural systems. In particular, comparing readers’ constructive activities necessary for different styles of texts and scripts will be highly beneficial. As proven many times within this study, the readers’ influence is undoubtedly more significant than the influence of the text when reading for deeper level comprehension and in particular when learning from text. Hence, the future focus should continue in the cognitive and metacognitive fields to ascertain more about the constructive reading strategies and thought processes applied by skilled and low-skilled readers. One area of importance for future educational research, revealed in this study, is the use of think-aloud as a strategy to improve readers’ text comprehension. The area of
metacognitive processes and strategies, including the use of self-talk and their role in text comprehension deserves further exploration. Additionally, this study was able to briefly touch on language learning, which should be included in text comprehension research in the future. The results of the study confirm that some text comprehension strategies, such as inferences and the use of prior knowledge, are transferable across languages. There already exists considerable research in second language learning and acquisition. However, comparable studies using the CI or CI-II framework would benefit from more detailed and focused investigation on the role of different types and levels of prior knowledge on text comprehension in the second and/or additional language-learning context. Hence, more comparative research on second language learners would help understand more about text comprehension processes and improve reading instructions and outcomes at schools. Furthermore, reading is defined as mapping of the symbols used for written representation to speech. As the speech is represented differently in different language systems, visual and linguistic level processes involved in this mapping or reading also differ.

Lastly, the results of this study are consistent with the view that text comprehension processes are affected by different sources such as text features, reader’s knowledge and skills, constructive activities as well as the contextual understanding including the cultural context. Snow (2002) emphasises the significance of these four resources and suggests that any literacy research to be conducted should primarily aim at improving text comprehension outcomes for all students not just for poor readers. This is consistent with the purpose and the rationale for this study that have implications for not only native English language readers but also for other non-alphabetic language readers such as Chinese as well as second language readers.
7.4 Conclusion

With the ever-changing face of global communication, social and finance systems, the importance of readers’ environment and literacy skills becomes very critical. Literacy is still a significant factor and a cornerstone for success before, at and after school as a cognitive skill. Learning from texts in different modes and for different purposes also makes reading and text comprehension different but these remain the most critical challenges in 21st century learning at schools.

This study demonstrates that reading is still one of the most complex processes performed by the human mind and it has long fascinated researchers from different fields, such as education, science, linguistics and psychology. During reading, text comprehension is most relevant when it comes to learning at schools. Learning at school, a very complex process itself is constantly supported through texts and their comprehension. Understanding learners as readers within the relevant sociocultural context as well as the processes of text comprehension and construction of meaning provide crucial information about learning and literacy at school. Literacy will no doubt continue to form the basis of all educational tasks and assist readers with new technology. One clear example relates to searching for online information where critical readers with high knowledge are able to distinguish between various forms of information and opinion in coherent and incoherent forms.

The present study’s findings confirm that while there are many similarities between Chinese and English language readers’ text comprehension processes, there are also differences in their construction of meaning from text. This is also evident in the role of local text coherence as a text feature, which was found to be equally significant for readers of both Chinese and English. It was found that Grade 8 and Above Average readers who engaged in higher level of constructive activities were able to construct more complex and coherent
mental representation of the texts. This fills in the gap in the text comprehension research of Chinese readers completed by Law (2008) with primary school children in Hong Kong.

The reading tasks used in this study further reveal how readers of two distinctively different orthographies process expository texts at different levels through their employment of high level constructive activities such as inferences, think-aloud, summarisation and integration of prior knowledge to expand, explain and extrapolate text-based information during reading. A new proposed model, Multi-level Knowledge Activation Tapestry identifies five levels of constructive activity which help activate readers’ knowledge in peeling the layers of meaning and constructing their mental model of it. These levels are proposed to be used for learning from texts at school as well as for developing differentiated reading programs to cater for readers and learners at different reading levels.

It is proposed that while CI Model of text comprehension accounted for much of the this study’s findings, it falls short of explaining and describing the influence and the reasons for the differences between readers’ prior knowledge retrieval and construction of the textbase and situation model in different language and cultural systems. This needs further investigation, perhaps using both authentic and non-authentic texts to test the influence of discourse patterns and other text and sociocultural features on comprehension. While we must use the findings of the present study to help assist both English and Chinese language readers’ text comprehension and learning, there is a need for more comparative research on Chinese text comprehension processes to further enhance our understanding and help develop better comprehension and literacy skills for readers at school.
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Green, M. C. (2004). Transportation into narrative worlds: The role of prior knowledge and perceived realism. Discourse Processes, 38, 247–266.


27.


## Appendix A

Table 20

20. Prior knowledge Test

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>POSSIBLE CORRECT ANSWERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In which subject are you more likely to study about electricity at school?</td>
<td>Science</td>
</tr>
<tr>
<td>2. Name one well-known scientist who worked on electricity?</td>
<td>Benjamin Franklin, Thomas Edison, Allessandro Volta etc.</td>
</tr>
<tr>
<td>3. How is the wind related to electricity?</td>
<td>Wind turbines, wind turning the generators, source of electricity.</td>
</tr>
<tr>
<td>4. What is the most important characteristic of magnets?</td>
<td>They can pull or push other objects without touching them.</td>
</tr>
<tr>
<td>5. What are magnets made of?</td>
<td>Iron, cobalt, nickel or combination of the three.</td>
</tr>
<tr>
<td>6. Name one source of electricity.</td>
<td>Water, atoms, fossil fuels, sun or wind</td>
</tr>
<tr>
<td>7. Give one example of using electricity in everyday life.</td>
<td>Light, cars, entertainment gadgets (CD player, video, TV etc.)</td>
</tr>
<tr>
<td>8. Give one example of using magnets in everyday life.</td>
<td>Holding notes on the fridge doors, compass, keeping cupboard doors closed.</td>
</tr>
<tr>
<td>9. What happens when the same ends of the two magnets face each other?</td>
<td>They push/pull/attract/repel each other</td>
</tr>
<tr>
<td>10. What is the name of the reaction when electricity and magnets are put together?</td>
<td>Electromagnetism</td>
</tr>
<tr>
<td>Levels</td>
<td>Description of Each Level</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
</tr>
</tbody>
</table>
| **LEVEL 1** | Knowledge of subject area that relates to electricity or magnets  
Knowledge of a scientist  
Knowledge of an example of an electrical item related to water or wind  
Knowledge that magnets can attract other metals  
Knowledge that magnets are made of metals  
Knowledge of source of electricity to appliances  
Knowledge of an item that works with electricity or its use in everyday life  
Knowledge of magnets or their use in everyday life  
Knowledge that when the same ends of the magnets face they repel  
Knowledge that electricity and magnets together can create something else |
| **LEVEL 2** | Knowledge of a scientist who worked on electricity  
Knowledge of cause and effect between wind or water and electricity  
Knowledge of different ends of magnets repelling and/or attracting  
Knowledge of a specific metal found in magnets  
Knowledge of an item or place related to the production of electricity  
Knowledge of cause and effect between electricity and magnets |
| **LEVEL 3** | Knowledge of wind or water as sources of electricity  
Knowledge of a source of electricity  
Knowledge of reactions |
| **LEVEL 4** | Knowledge of electromagnetism |
## Table 21

### 21. Think-aloud Task – Probe Questions for Teachers

<table>
<thead>
<tr>
<th>INTERVIEW QUESTIONS</th>
<th>STUDENT RESPONSES</th>
<th>HYPOTHESES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ok. This passage of 10 paragraphs is about electricity and magnets. Now, I will ask you to think-aloud about what the text tells us. What is the text about?</td>
<td>Well, the text is about the invention of electricity and magnets. And the, the ehm, how the atoms and the attraction was invented by certain people and in certain times. Eehm, and how electricity helps us today.</td>
<td>Identify student’s recall of the main ideas and or underlying theme. This tells whether student is able to process macro-level ideas, which require higher thinking and meaning of the whole text. Identify student’s knowledge of grammatical distinctions. Hence, Kintsch’s knowledge of micro-structures – Text processing. Identify student’s self-perception as a reader and link this with their metacognition. This potentially may indicate a pattern to identify a difficulty area in processing. As above, this may lead to a pattern across individuals about the areas of processing which is less complicated than others. Familiarity with the vocabulary and the topic here. This may also link with the responses to prior knowledge questions. Student’s self-perception of prior knowledge. This links with the hypothesis that prior knowledge is a very good indicator of comprehension.</td>
</tr>
<tr>
<td>2. Next can you tell me what word would go best in the gap? Could or would it be a verb or a noun?</td>
<td>Eehm, well, it could ...it’s more likely a noun because the text ehm is speaking towards ...to me by asking ... it’s hard (whispering)</td>
<td>Student’s self-perception of ‘simple words’. Is there a pattern with other students? Also indicates text processing, starting from micro-level to macro-level structures. The role of working memory in comprehension. Repetition; rereading for confirming meaning as a comprehension strategy.</td>
</tr>
<tr>
<td>3. Can you explain what part you found more difficult? Why?</td>
<td>I found the first part more difficult. First of all cause I did not understand the sentences and how it all fit together. But then I realised and then it became more clearer and easy for me to do the rest.</td>
<td></td>
</tr>
<tr>
<td>4. Ok. Can you explain what part you found easier? Why?</td>
<td>I found the second part a lot easier because it I, I knew what I was, ehm, I knew what the text was talking about. I knew what the text was talking about so I found it a lot easier to answer the gaps and the questions.</td>
<td></td>
</tr>
<tr>
<td>5. Ok. Question 5. Do you think it would help you if you knew or studied this topic in Science before or read about the topic beforehand? Please explain the reasons.</td>
<td>I would, well, if I studied it before I would have found it easier because the knowledge that I had, would have had, would have helped me remember and... the thing... and do the things on... the paper.</td>
<td>Student’s perception of ‘simple words’. Is there a pattern with other students? Also indicates text processing, starting from micro-level to macro-level structures. The role of working memory in comprehension. Repetition; rereading for confirming meaning as a comprehension strategy.</td>
</tr>
<tr>
<td>6. Ok. The sixth question is what are some of the strategies you used to find the word?</td>
<td>Ehm, well, I tried different, ehm, simple words like ‘the’ and ‘was’ and ‘that’. Ehm and read the sentence in my head over and over again with different words to find the ...proper word.</td>
<td></td>
</tr>
<tr>
<td>7. Ok. Ee, next question. How could you use the sentence or the words in the sentence to help you find the right word?</td>
<td>reading it over and over again?</td>
<td></td>
</tr>
<tr>
<td>8. Yeah. Ok. And the last one, did you use punctuation, grammar and spelling and how?</td>
<td>Well, ehm, I used little bit of grammar. With the nouns and all this stuff and may be a little bit of punctuation on you know capitals and bigger words...</td>
<td>Student’s knowledge of grammar, spelling and punctuation and how they see their role in comprehension.</td>
</tr>
</tbody>
</table>
### Appendix B

#### Table 22

**22. List of Micro- and Macro-words for Cloze Task**

<table>
<thead>
<tr>
<th>Words from Micro-structure at Linguistic and Conceptual Levels</th>
<th>Grade 5</th>
<th>Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. think 2. or 3. day/night 4. many/one/any/all 6. been 7. much/far/even/a lot 8. This 9. Later/Further 11. Not 13. his/the 14. It/Electricity 15. Most/some 16. Are/include 17. steam 19. Electricity/ energy 22. for 23. The 24. Lastly/also 27. and 29. different/many 30. The 31. they 34. Magnets/They 35. is 36. more 37. Why 38. down 40. end 42. when 43.each 48. a 53. can 54. Are 55. an 56. we</td>
<td>1. you/us 2. How/what 3. an 4. more 5. long 7. the 8. an 10.the 11. negative 16. lightning 17. form/state/condition 18. fuels 19. this 20. then 21. parts 23. are/include 24. to 27. use 29. other/such/some 31. the 32. most/many/some 33. on /for 36. of 37. is/becomes 39. ends 40. magnet 42. end/pole 44. negative 47. a 48. an 49. makes/creates 50. know 51. generate/produce/make 52. as 54. the 55. and 56. are</td>
<td></td>
</tr>
</tbody>
</table>


Table 23

23. Text 1: Prior Knowledge and Comprehension Scores

<table>
<thead>
<tr>
<th>Participants</th>
<th>Grade 5 English</th>
<th>Grade 8 English</th>
<th>Grade 5 Chinese</th>
<th>Grade 8 Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PK</td>
<td>CO</td>
<td>PK</td>
<td>CO</td>
</tr>
<tr>
<td>AA_1</td>
<td>7</td>
<td>29</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>AA_2</td>
<td>9</td>
<td>28</td>
<td>13</td>
<td>53</td>
</tr>
<tr>
<td>AA_3</td>
<td>6</td>
<td>37</td>
<td>11</td>
<td>45</td>
</tr>
<tr>
<td>AA_4</td>
<td>8</td>
<td>28</td>
<td>8</td>
<td>43</td>
</tr>
<tr>
<td>AA_5</td>
<td>12</td>
<td>19</td>
<td>12</td>
<td>42</td>
</tr>
<tr>
<td>A_1</td>
<td>12</td>
<td>23</td>
<td>9</td>
<td>40</td>
</tr>
<tr>
<td>A_2</td>
<td>4</td>
<td>32</td>
<td>12</td>
<td>45</td>
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<tr>
<td>A_3</td>
<td>6</td>
<td>22</td>
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<td>41</td>
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<td>A_4</td>
<td>3</td>
<td>23</td>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td>A_5</td>
<td>7</td>
<td>26</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>BA_1</td>
<td>5</td>
<td>20</td>
<td>9</td>
<td>26</td>
</tr>
<tr>
<td>BA_2</td>
<td>8</td>
<td>25</td>
<td>11</td>
<td>32</td>
</tr>
<tr>
<td>BA_3</td>
<td>9</td>
<td>25</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>BA_4</td>
<td>7</td>
<td>11</td>
<td>8</td>
<td>27</td>
</tr>
<tr>
<td>BA_5</td>
<td>3</td>
<td>25</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td>TOTAL</td>
<td>104</td>
<td>373</td>
<td>142</td>
<td>561</td>
</tr>
</tbody>
</table>

| STDEV        | 2.7  | 5.98 | 2.26 | 8.49 | 4.62 | 9.53 | 3.32 | 5.84 |

| Correlation  | -0.18| 0.40 | 0.82 | 0.08 |
Table 24

24. Comprehension Responses for Each Reader and Version

Question Levels= LITERAL= 2, 3, 4   INFERENTIAL= 5, 6   APPLIED= 1, 8, 9

RAL= Reader Ability levels: AA=Above Average; A= Average; BA= Below Average

<table>
<thead>
<tr>
<th>LOCAL COHERENCE, COMPREHENSION LEVELS and QUESTION TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>RAL</td>
</tr>
<tr>
<td>Question Levels</td>
</tr>
<tr>
<td>LITERAL A A</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>INFERENTIAL A A</td>
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<tr>
<td></td>
</tr>
<tr>
<td>APPLIED A A</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Macro-structure Level Scoring – adapted from Eileen Kintsch’s study

Maximum score: 17.846 = 18 – (If it is 121 points maximum possible in 678 words then how many maximum possible for 100 words)

GRADE 8 TEXT – 67 – (121 points)

Level 1: Topic and Conclusion (3 statements) 5 points (15)

1. Title – It is about Electromagnetism
2. Explanation
3. Conclusion: Both useful and important but together more useful

Level 2: Inferred Subtopics (4 statements) 4 points (16)

1. Introduction – Life without electricity and magnets
2. Electricity
3. Magnets
4. Electromagnetism

Level 3: Subheadings (9 statements) 3 points (27)

1. Historical Background - Previous Experiments and scientists

Electricity

2. Definition
3. Many Sources of Energy / Electricity

Magnets

4. Definition

5. Examples of the use of permanent magnets

6. Magnetism / Magnetic Force

Electromagnetism

7. Background information

8. Definition

Conclusion

9. Advantages of electromagnets

**LEVEL 4 Main Ideas (10 statements) 2 points (20)**

Introduction

1. We rely on electricity and magnets everyday

2. How electricity was invented

Electricity

3. What electricity is made up of

4. How electricity is produced

Magnets
5. Definition of magnets

6. What magnets are made of

7. How magnets work

Electromagnetism

8. How electromagnets are invented

9. How electromagnets are produced

Conclusion

10. Electromagnets have more advantages than permanent magnets

Level 5: Details (43 statements) 1 point

Introduction

1. Electricity and magnets important part of life

2. We use electricity and magnets everyday

3. We rely so much on electrical and magnetic tools

4. Electricity has been very important in the past

5. Today more useful with magnets

Electricity

6. Ancient history

7. Amber and attraction
8. William Gilbert identified properties of electric force
9. Benjamin Franklin’s experiment with a kite
10. Electricity and lightning
11. Alessandro Volta and steady electricity
12. Atoms in universe
13. Electrons and electricity
14. Energy flow from negative to positive
15. Lightning as electrical energy
16. Most electricity from burning fossil fuels
17. Burning for heat and steam
18. Used in nuclear power stations
19. Water and steam turn turbines
20. Turbines generate electricity
21. Sunlight and wind other sources of electricity

**Magnets**

22. Origin of the word magnet
23. Pulling and pushing without touching
24. Different shapes and sizes
25. Many uses in households
26. Also in compasses for navigation
27. Made of cobalt, nickel, iron or combination
28. Ends more magnetic
29. When upside down point to north-south direction
30. Therefore known as poles
31. Same poles repel
32. Opposite poles attract

Electromagnetism

33. Important link between electricity and magnets
34. Coil of wire and magnet produce electricity
35. Magnetic field generate electricity and vice versa
36. Known as electromagnetism

Conclusion

37. Electromagnets more advantageous than magnets in today’s technology
38. Can be switched on and off
39. Small
40. Reason why we can listen to i-pod,
41. Speak on mobile phones,
42. Have speakers, earphones, faster trains
43. Switch on car
Macro-structure Level Scoring – adapted from Eileen Kintsch’s study
Maximum score: 16.9= 17 –(If it is 118 points maximum possible in 697 words then how many maximum possible for 100 words
(Summary students were asked to write was 100 words on the sheet))

GRADE 5 TEXT  - 65 (118 points)

Level 1: Topic and Conclusion (3statements) 5 points (15)

1. Title – It is about Electromagnetism
2. Explanation
3. Conclusion: Both useful and important but together more useful

Level 2: Inferred Subtopics (4 statements) 4 points (16)

1. Introduction – Life without electricity and magnets
2. Electricity
3. Magnets
4. Electromagnetism

Level 3: Subheadings (9 statements) 3 points (27)

1. Historical Background - Previous Experiments and scientists

Electricity

2. Definition
3. Many Sources of Energy

Magnets

4. Definition
5. Examples of the use of permanent magnets
6. Magnetism/Magnetic Force

Electromagnetism

7. Background information

8. Definition

Conclusion

9. Advantages of electromagnets

LEVEL 4 Main Ideas (10 statements) 2 points (20)

Introduction

1. We rely on electricity and magnets everyday

2. How electricity was invented

Electricity

3. What electricity is made up of

4. How electricity is produced

Magnets

5. Definition of magnets

6. What magnets are made of

7. How magnets work

Electromagnetism
8  How electromagnets are invented

9  How electromagnets are produced

Conclusion

10  Electromagnets have more advantages than permanent magnets

Level 5: Details (40 statements) 1 point

Introduction

1. Electricity and magnets important part of life
2. We use electricity and magnets everyday
3. We rely so much on electrical and magnetic tools
4. Electricity has been very important in the past
5. Today more useful with magnets

Electricity

6. Ancient history
7. Amber and attraction
8. Benjamin Franklin’s experiment with a kite
9. Electricity and lightning
10. Alessandro Volta and first battery
11. Form of energy
12. Flow from negative to positive
13. Most electricity from burning fossil fuels
14. Burning for heat and steam
15. Water, wind and steam turn turbines
16. Turbines generate electricity
17. Solar panels use sunlight for solar energy
18. Windmills other source of electricity

**Magnets**

19. Origin of the word magnet
20. Pulling and pushing without touching
21. Different shapes and sizes
22. Many uses in households
23. Also in compasses for navigation
24. Made of cobalt, nickel, iron or combination
25. Ends more magnetic
26. When upside down point to north-south direction
27. Therefore known as poles
28. Same poles repel
29. Opposite poles attract

**Electromagnetism**

30. Important link between electricity and magnets
31. Coil of wire and magnet produce electricity
32. Magnetic field generate electricity and vice versa
33. Known as electromagnetism

**Conclusion**

34. Electromagnets more advantageous than magnets
35. Can be switched on and off
36. Small
37. Reason why we can listen to i-pod,
38. Speak on mobile phones,
39. Have speakers, earphones, faster trains
40. Switch on cars

Level 3: Subheadings (18 statements) 3 points (54)

China
1. Landscape – North and South
2. Climate/Farming

Australia
3. Landscape
4. Climate/Urbanisation

China
5. Ancient Nation
6. China’s Dynasties
7. Emperor Qin Shihuang
8. Population
PRIOR KNOWLEDGE INTERVIEW QUESTIONS

- Please read and answer the following questions about electricity and magnets

1. What subject are you more likely to study about electricity at school?

2. Name one well-known scientist who worked on electricity?

3. How is the wind related to electricity?

4. What is the most important characteristic of magnets?

5. What are magnets made of?

6. Name one source of electricity.

7. Give one example of using electricity in everyday life.

8. Give one example of using magnets in everyday life.

9. What happens when the same ends of the two magnets face each other?

10. What is the name of the reaction when electricity and magnets are put together?
YEAR 5

ELECTRICITY OR MAGNETS?

1. Can you imagine life without electricity or magnets? I don’t ________
    so. How many of us would spend a day without a phone ________ a
    computer? The answer is none of us. What about a ________ without
    television, oven, radio, light bulb, microwave or an ipod? Not ________
    of us would say yes. We cannot deny it. Electricity and ________ are
    part of our daily lives more than ever. ________ has ________ very
    important to us for a long time. Today, electricity is ________ more
    useful for us with magnets.

2. How did it all start? ________ is how everything started. In the old days,
    people knew that ________ fur on amber made an attraction. However,
    this was not explained. ________ on, in 1752, inventor Benjamin
    Franklin had an experiment with a ________. This proved the link
    between electricity and lightning. Still, he was ________ the first to build
    the tool for electricity. It was a ________ called Alessandro Volta in
    1800. Today, he is well known for ________ invention of the first battery.

3. Electricity is a form of energy. ________ flows from negative to
    positive. There are many sources of energy. ________ of our electricity
    is made from burning fossil fuels. These fuels ________ coal or oil.
    Burning fuels give heat. This heat makes steam. The ________ then
    drives a steam turbine. The turbine is an engine. It ________ the
    generator that makes electricity. Moving water is another source of
    ________. This time this is done by water turning the turbines. The
    ________ and the wind are other sources of energy. We use ________ to
    turn heat into energy. This is known as solar energy. ________ this, we
    use solar panels on the roofs. Solar panels absorb ________ sunlight.
    Sunlight makes heat. This heat is then stored for energy. ________,
    windmills use the wind to turn turbines.

What are magnets? The ________ ‘magnet’ itself is from the Greek word
‘Magnetis lithos’. It means ________ stone. Magnets are objects that can
pull other objects like iron _______ pull or push other magnets with no contact.

4. # How do magnets _______ like and how do we use them? Magnets can be in _______ shapes and sizes. The metal bar and the horseshoe magnets are _______ most common. There are many ways in which we use magnets. _______ are used to hold notes on the fridge door, and in _______ to find the way. They are also used in switches and _______ cupboard doors to keep them shut.

5. What are magnets made of? _______ are made of iron, nickel, cobalt, or combination of these. This _______ why magnetic forces only work with these metals. Magnet’s ends are _______ magnetic than the middle part. These ends are known as poles. _______ are they called the poles? When we hang a magnet upside _______, it would always try point to north-south direction. As a _______, we call the north end the north pole and the other _______ the south pole. What is magnetic force? It is when the _______ poles of two magnets face, they would push each other. Also, _______ two magnets with north and south poles facing they would pull _______ other. This is called magnetic force. This is stronger _______ magnets and weaker as we get further away.

There is an _______ link between electricity and magnets. An Italian and a Danish scientist _______ that if they moved a coil of wire close to a _______, it caused an electric current. When they moved it in and _______ of the coil, this made a continuous alternating current (AC). As _______ result of this, they were able to make electricity. We now _______ that magnetic field generate electricity. Electricity generates magnetic fields. This interesting _______ is now known as electromagnetism.

# There are more advantages of having _______ than permanent magnets in today’s technological world. One is that they _______ be switched on and switched off. Another one is that they _______ very small. This is why we are able to listen to _______ iPod or speak on our mobile phones. This is also how _______ have speakers and earphones and are able to switch on our cars and have _______ trains.
ELECTRICITY OR MAGNETS?

1 # We cannot imagine life without electricity or magnets. How many of ______ could spend a day without a mobile phone or a computer? ______ about a day without television, oven, radio, light bulb, microwave or ______i-pod? Electricity and magnets are becoming part of our daily lives ______ than ever. Electricity has been very important to us for a _______time. Today, it is much more useful with magnets.

2 In ancient ______, people knew rubbing fur on amber made an attraction. However, it ______ not until the English scientist William Gilbert made progress. He identified _______properties of some substances as electric force. Later on in 1752, ______ American inventor Benjamin Franklin made an experiment with a kite. This ______ the link between electricity and the lightning. Still, he was not _______first person to invent the tool for making steady electricity. He _______ also not the first to find the transmission using positive and _______connectors. These were done by Italian scientist Alessandro Volta in 1800.

3 # _______ in the universe is made up of atoms. Centre of each ________ is called nucleus and the tiny pieces moving around it called ________. Electricity is the movement of these tiny pieces. It is a _______ of energy and a flow of power from negative to positive. _______ is an electrical energy but it is not in a usable ________.

4 Most of our electricity is produced from burning fossil fuels. These ______ are coal or oil. Burning fuels give heat that produces steam. _______ steam then drives a steam turbine to turn the generator. This, ________, makes the electricity. Nuclear power stations use atoms split into two _______ to make this heat. Hydro-electrical power
comes from moving water. Water ________ turbines that turn generators to make electricity. Other sources of energy ________ the sun and the wind. Through solar energy, we use sunlight ________ turn heat into energy. Windmills in windy areas also use the ________ of wind to turn turbines to make electricity.

We use electricity ________ in many ways. Although not many of us know, we also ________ magnets. The word ‘magnet’ originated from the Greek word ‘magnetis lithos’; ________ magnetic stone. Magnets are materials or objects that can pull on ________ materials like iron as well as attract or repel other magnets ________ touching them.

5 # Magnets can be in many different shapes and sizes. ________ most common ones are the metal bar and the horseshoe magnets. ________ people use magnets to hold notes on the fridge door, and ________ compasses for navigation. They are also used in switches and on ________ doors to keep them shut.

5. Magnets are made of cobalt, nickel, ________, or combination of these. Hence, magnetic forces only work with any ________ these metals or their combination. Closer to the magnets, magnetic force ________ stronger. As we get further away, it becomes weaker. In addition, ________ of the magnets are more magnetic than the middle part. These ________ are known as poles of the magnet. When we hang a ________ upside down, it would always try to point to north-south direction. ________, we call the north end the north pole and the other ________ the south pole. Lastly, if the same poles of two magnets ________, they would repel each other. On the other hand, like the ________ and positive charged objects, two magnets with north and south poles ________ would also attract each other.

There is an important link between ________ and magnets. An Italian and a Danish scientist discovered that if ________ coil of wire is moved close to a magnet, this made ________ electric current. Moving the magnet in and out of the coil ________ a continuous alternating
current (AC). This can produce electricity. We now ________ that electricity generate magnetic fields and magnetic fields in turn can ________ electricity. This interesting link between electricity and magnets is known ________ electromagnetism.

# There are many advantages of having electromagnets instead of permanent ________ in today’s technological world. Their advantages are ________ fact that they can be switched on ________ off and that they are very small. This is why we ________ able to listen to an i-pod or speak on our mobile ________, have speakers, earphones, switch on our cars and have faster trains.

INSTRUCTIONS

- Please read the text “Electricity and Magnets’ and respond to the questions below.

QUESTIONS

1. Read the text silently and fill in the gaps with correct words.

2. Write a brief summary of the text you read in 100 words on the given blank sheet.

3. Find the numbered paragraphs in the text (indicated on the side) and write appropriate titles for each one.

TITLES

1. ______________________________________________________

2. ______________________________________________________

3. ______________________________________________________
4. Find the paragraphs with # and add an extra sentence that fits in with the main idea and the structure of the rest of that paragraph.

ADDED SENTENCES

1. 

2. 

3. 

4. 
CHINA and AUSTRALIA
YEAR 5

China and Australia – 1
(GOOD MACRO and GOOD MICRO STRUCTURE)

If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

China’s north is different from its south. Soft, yellow soil called (loess) covers most of the dry, dusty deserts of the north. The Huang He or ‘Yellow River’ flows towards the south. This makes the south rich for growing rice.

On the other hand, Australia’s inland desert, the ‘outback’ covers 80% of the land. Its red soil is attractive. The coastal landscape is wet and fertile. This is the reason why many people choose to live here.

China is an ancient nation. Ancient China was ruled by dynasties. A dynasty is when the rulers are from the same family. Seven dynasties have ruled China. They were The Qin, The Han, The Tang, The Song, The Yuan, The Ming and The Qing dynasties. The first emperor was Qin Shihuang. He made China one country for the first time. He also built the first Great Wall of China to keep out the enemies. Today, most Chinese people’s ethnicity is named after the Han Dynasty.

Australian is both a very old and a very new nation. It is as old as 40,000 years. It first started with the Aborigines. Then British arrived 200 years ago. The first arrivals were explorers, then, the convicts came on boat prisons. Free settlers came later. These people were looking for a better life. Together they built colonies. A colony is when a group of people come to a new land and claim it for themselves. The colonies were built on the Aboriginal land and damaged their culture. In 1901, all colonies have become one nation.

Australia did not become wealthy overnight. It took a lot of time and effort. Aborigines were hunters and gatherers. The Europeans were farmers. They raised sheep. Australia now exports wool. Later, many migrant workers also came from Europe. They also worked very hard. Now, it has 21 million people. Today, it is one of the wealthiest countries.

China has also become wealthy after a long time. It had economic hardships in the past. These were partly overcome with economic reforms. Foreign investment and cheap manufacturing were some. The One-child policy was also successful. Today, it is the fourth largest economy in the world. It is growing at a rate of 10% a year.

Both China and Australia have their own past and identities. They have both become proud and powerful nations.
If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

China’s north is much diverse from its south. The yielding, pale, less arable loess blankets most of the parched, sand dunes of the north. However, ‘The Huang He’ pours into the south like a jewel. This feeds enough supply into the rice fields.

On the other hand, the inland terrain, the ‘outback’, extends over most of Australia. This red land is very alluring. The shoreline is moist and fertile. This lured many people to reside here.

China is an ancient nation. Older China was run by dynasties. A dynasty is when the rulers are from the same descendants. Seven dynasties ran China. They were The Qin, The Han, The Tang, The Song, The Yuan, The Ming and The Qing dynasties. The first emperor was Qin Shihuang. This was the first time China was one state. The Great Wall was made at this time to push the foes out.

Australia is both a very old and a very new nation. Its story goes back 40,000 years ago. First, there were the Aborigines. Then British drop anchor 200 years later. The first arrivals were explorers. Then, convicts came on boat gaols. Free settlers came later. These people were in quest of a better life. Together they raised colonies. A colony is when a group of people come to a new land and declare it theirs. Aboriginal land and culture were marred after this. Soon, all colonies were combined. Finally, in 1901, they formed the federation.

Australia did not instantly turn prosperous. It was gradual. Indigenous people were hunters and gatherers. The Europeans were farmers. They lived on the farms and raised sheep. Australia now exports wool. It is one of the leaders in this field. Later, many migrant workers also came from Europe. They also worked very hard. Now, it has a population of 21 million. It is one of the wealthiest countries.

China has also turn wealthier after a long time. It had economic mishaps in the past. These were overcome with economic reforms. Foreign investment and cheap manufacturing were some. The One-child policy was also endorsed. Today, it is the fourth largest economy in the world. It is growing at an annual rate of 10%.

Both China and Australia have their unique past and identities. They have both become proud and powerful nations.
If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

Soft, yellow soil called (loess) covers most of the dry, dusty deserts of the north. China’s north is different from its south. China made good policies. Foreign investment and cheap manufacturing were some. The One-child policy was also successful. A dynasty is when the rulers are from the same family.

Australia now exports wool. Aborigines were hunters and gatherers. Later, many migrant workers also came from Europe. They also worked very hard. Its red soil is also attractive. Today, it is one of the wealthiest countries. The Europeans were farmers. Together they built colonies. Now, it has 21 million people. It is as old as 40,000 years.

China is an ancient nation. It had economic hardships in the past. These were partly overcome with economic reforms. The first emperor was Qin Shihuang. He made China one country for the first time. He also built the first Great Wall of China to keep the enemies out.

On the other hand, Australia’s inland desert, the ‘outback’ covers 80% of the land. Australia did not become wealthy overnight. It took a lot of time and effort. It first started with the Aborigines. Then British arrived 200 years ago. These built on the Aboriginal land. They damaged their culture. Later on, all the colonies have become one nation. They raised sheep.

Ancient China was ruled by dynasties. Seven dynasties have ruled China. They were The Qin, The Han, The Tang, The Song, The Yuan, The Ming and The Qing dynasties. China has also become wealthy after a long time. Today, it is the fourth largest economy in the world. The Huang He or ‘Yellow River’ flows towards the south. This makes the south rich for growing rice. It is growing at a rate of 10% a year.

Australia is both a very old and a very new nation. The coastal landscape is wet and fertile. This is the reason why many people choose to live here. A colony is when a group of people come to a new land and claim it for themselves. The first arrivals were explorers. Then, convicts came on boats. Free settlers came later. These people were looking for a better life. Finally, in 1901, they formed the federation.

Both China and Australia have their own past and identities. They have both become proud and powerful nations.
If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

The yielding, pale, less arable loess blankets most of the parched, sand dunes of the north. China’s north is much diverse from its south. China made good policies. Foreign investment and cheap manufacturing were some. The One-child policy was also endorsed. A dynasty is when the rulers are from the same descendants.

Australia now exports wool. It is one of the leaders in this field. Indigenous people were hunters and gatherers. Later, many migrant workers also came from Europe. They also worked very hard. This red land is very alluring. It is one of the wealthiest countries. The Europeans were farmers. Together they raised colonies. Now, it has a population of 21 million. Its story goes back 40,000 years ago.

China is an ancient nation. It had economic mishaps in the past. These were overcome with economic reforms. The first emperor was Qin Shihuang. This was the first time China was one state. The Great Wall was made at this time to push the foes out.

On the other hand, the inland terrain, the ‘outback’, extends over most of Australia. Australia did not instantly turn prosperous. It was gradual. First, there were the Aborigines. Then British drop anchor 200 years later. Aboriginal land and culture were marred after this. Soon, all colonies were combined. They lived on farms and raised sheep.

Older China was run by dynasties. Seven dynasties ran China. They were The Qin, The Han, The Tang, The Song, The Yuan, The Ming and The Qing dynasties. China has also turn wealthy after a long time. However, ‘The Huang He’ pours into the south like a jewel. This feeds enough supply into the rice fields. It is growing at an annual rate of 10%. Today, it is the fourth largest economy in the world.

Australia is both a very old and a very new nation. The shoreline is moist and fertile. This lured many people to reside here. The first arrivals were explorers. Then, convicts came on boat gaols. Free settlers came later. A colony is when a group of people come to a new land and declare it theirs. These people were in quest of a better life. Finally, in 1901, they formed the federation.

Both China and Australia have their unique past and identities. They have both become proud and powerful nations.
If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

North China is different from South. Soft, yellow soil called loess covers most of the dry and dusty deserts. The Huang He or ‘Yellow River’ flows towards the south. This makes it rich for growing rice.

On the other hand, Australia’s deserts are called the ‘bush’ or the ‘outback’ and cover 80% of the country. The red soil is easily captured from above. A large part of population settled in the wet and fertile lands of the coasts.

China is an ancient nation. China’s history helps us understand China as a nation. A dynasty is when the rulers are from the same family. Five major dynasties ruled China. The first emperor was Qin Shihuang. He united all of the states for the first time. 90% of Chinese people call themselves ‘People of Han’ from ‘Han Dynasty’.

Australia is both a very old and a very new nation. It started 40,000 years ago with the Aboriginal people. Two hundred years ago, the settlers and the convicts from Britain arrived in Australia. They built colonies on the Aboriginal lands. This damaged their culture. In 1901, they joined and formed the federation of Australia.

Australia did not become wealthy overnight. Aboriginals were hunters and gatherers but the Europeans were farmers who raised sheep. Australia is a leading wool exporter. From the 1950s-1960s, many European migrants came to work in Australia. Australia has 21 million people and is one of the wealthiest and most liveable countries.

China has also managed to become wealthier despite its policies and population. This was possible with western economic reforms. These were foreign investment, one-child policy and cheap manufacturing. Today, China is the fourth largest economy in the world, which is growing at an average rate of 10 % a year.

Both China and Australia have become proud and powerful nations with their distinctive identities.
If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

China's north is much diverse from its south. The yielding, pale, less arable loess blankets most of the parched, sand dunes of the north. However, 'The Huang He' pours into the south like a jewel, which feeds enough supply into the rice fields.

On the other hand, the inland terrains are called the 'bush' or the 'outback' and extend over 80% of the country. The red plain is easily captured from above. Its ever-stretched shoreline is moist and fertile and as a result, many were lured to reside here.

China is an ancient nation. China's history helps us identify China as a nation. Ancient China was governed by dynasties. A dynasty is when the rulers are from the same descendants. Seven major dynasties ruled China. The first ruler was Qin Shihuang. He summoned all of the states for the first time. Today, 90 percent of Chinese people descend from the proud Han Dynasty.

Australia is both a very ancient and a new nation. Its story goes back 40,000 years with the Aboriginal people. Then, 200 years ago the British dropped anchor. The first arrivals were explorers. Then, convicts came on boat gaols but soon free settlers accompanied these. These people were in quest of a more prosperous life. Together they raised colonies on Aboriginal land and culture, which were marrad as a result. Soon, when all the colonies were adjoined, in 1901, the federation was declared.

Australia did not instantly turn prosperous. Indigenous people were hunters and gatherers but the Europeans raised sheep. Over time, Australia has become a leading wool exporter. From the 1950s - 1960s, many European migrants came to work in Australia. Now, Australia has 21 million people and is one of the wealthiest and most livable countries.

China has also become wealthier after a long time. Past economic mishaps were not enough to hold China from developing into the gigantic tiger amongst the world's developed economies today. The past debacles were overcome with economic reforms. Foreign investment and cheap manufacturing played major roles in this. The One-child policy was also endorsed by many. Today, it is the fourth largest economy in the world and it is growing at an annual rate of 10%.

Both China and Australia have become proud and powerful nations with their distinctive identities.
If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

**Soft, yellow soil called loess covers most of the dry and dusty deserts. North China is different from south. China made some great economic policies.** These were foreign investment, one-child policy and cheap manufacturing. A dynasty is when the rulers are from the same family.

Australia is a leading wool exporter. Aborigines were hunters and gatherers but the Europeans were farmers who raised sheep. From the 1950s-1960s, many European migrants came to work in Australia and together they built colonies. The red soil is easily captured from above. Australia has 21 million people and is one of the wealthiest and most livable countries. It started 40,000 years ago with the Aboriginal people.

China is an ancient nation. It had economic hardships in the past. These were partly overcome with western economic reforms. **The first emperor was Qin Shihuang.** He united all of the states for the first time. The first Great Wall of China was also constructed during this time in order to keep the enemies out.

On the other hand, Australia’s deserts are called the ‘bush’ or the ‘outback’ and cover 80% of the country. Australia did not become wealthy overnight. Two hundred years ago, the explorers, the convicts and the settlers from Britain arrived in Australia. They built colonies on the Aboriginal lands and damaged their culture.

Seven major dynasties ruled China. 90% of Chinese people call themselves ‘People of Han’ from ‘Han Dynasty’. China’s history helps us understand China as a nation. **China has also become wealthier despite its policies and population.** Today, China is the fourth largest economy in the world, which is growing at an average rate of 10% a year. **The Huang He or ‘Yellow River’ flows towards the south. This makes it rich for the rice fields.**

Australia is both a very old and a very new nation. A large part of population settled in the wet and fertile lands of the coasts. First, the convicts came on boat prisons and later free settlers joined them. All come to a new land and colonised it themselves searching for a better life. In 1901, they united all the colonies and formed the federation of Australia.

Both China and Australia have become proud and powerful nations with their distinctive identities.
If we compare Australia and China, we see how different factors influence nations. Different factors influence nations.

The yielding, pale, less arable loess blankets most of the parched, sand dunes of the north. China’s north is much diverse from its south. China made some great economic policies. Foreign investment and cheap manufacturing played major roles in this. The One-child policy was also endorsed by many. Ancient China was governed by dynasties. A dynasty is when the rulers are from the same descendants.

Over time, Australia has become a leading wool exporter. Indigenous people were hunters and gatherers but the Europeans raised sheep. Australia did not instantly turn prosperous. From the 1950s -1960s, many European migrants came to work in Australia. The red plain is easily captured from above. Now, Australia has 21 million people and is one of the wealthiest and most livable countries. Its story goes back 40,000 years with the Aboriginal people.

China is an ancient nation. Past economic mishaps were not enough to hold China from developing into the gigantic tiger amongst the world’s developed economies today. The past debacles were overcome with economic reforms. The first ruler was Qin Shihuang. He summoned all of the states for the first time. The first Great Wall of China was also constructed during this time in order to keep the enemies out.

On the other hand, the inland terrains are called the ‘bush’ or the ‘outback’ and extend over 80% of the country. Then, 200 years ago the British dropped anchor. Together they raised colonies on Aboriginal land and culture, which were marred as a result.

Seven major dynasties ruled China. Today, 90 percent of Chinese people descend from the proud Han Dynasty. China’s history helps us identify China as a nation. China has also become wealthier after a long time. Today, it is the fourth largest economy in the world and it is growing at an annual rate of 10%. However, ‘The Huang He’ pours into the south like a jewel which feeds enough supply into the rice fields.

Australia is both a very ancient and a new nation. Its ever-stretched shoreline is moist and fertile and as a result, many were lured to reside here. First, the explorers came. Then, the convicts but soon free settlers accompanied these colonising the land. These people were in quest of a more prosperous life. Soon, when all the colonies were adjoined, in 1901, the federation was declared.

Both China and Australia have become proud and powerful nations with their distinctive identities.
SECTION A: Reading Comprehension

2. Comprehension questions for the passage ‘China and Australia’.

SECTION A

1. Look at the title page and guess what the text will be about in one sentence. (E)
   The Comparison of Australia and China: Through history, economy and geography.

2. Why do a lot of people choose to live along the coast in Australia? (I)
   People live along the coast in Australia because it is fertile and wet.

3. How did the convicts arrive in Australia? (L)
   Convicts arrived on boats.

4. How big is the Chinese economy? (L)
   China has the fourth economy in the world.

5. Give one example of reforms China made to become wealthier. (L)
   Cheap manufacturing or one child policy or foreign investment.

6. What are the two differences between Chinese and Australian histories? (I)
   One is very ancient and the other one new and old. One was ruled by dynasties and one Colonies.

7. Write an appropriate title for Paragraph 3. (I)
   1. Australian landscape/outback/environment   2. Australian Landscape, or Outback environment
   3. Australia’s Economy              4. The Ancient China

8. What is the author’s view in the passage about both China and Australia? (E)
   Although two nations had different pathways they both managed to become wealthy and proud nations.

Write one other factor that would influence the identity of a nation apart from the ones mentioned in the passage? (E)
   Religion, government, culture, military power, education, society, technology (Any of these).

SCORING: Correct answer: L = 1; I = 2 and E = 3 Incorrect answer: 0
Total = 18/18

SECTION B – The percentage based on the number of statements in each level in the macrostructure used for scoring the summary same as how PART ONE summary was scored.

1. Write a short summary (50 words or equivalent in characters) of the passage in your own words?
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Author/s:
Duyal, Yaar

Title:
Chinese and English language readers' text comprehension processes

Date:
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