PSYCHOLINGUISTIC AND COGNITIVE FACTORS THAT INFLUENCE INFERENTIAL READING COMPREHENSION BY PRIMARY SCHOOL STUDENTS

Judith M. Carter

B.Arts (Ed.), B.Ed., M. Ed.

(ORCID No: 0000-0002-9422)

September, 2018

Submitted in total fulfilment of the requirements for the degree of Doctor of Philosophy in the Melbourne Graduate School of Education, University of Melbourne.
Abstract

The ability to engage in inferential reading comprehension is central to success as a reader. Many readers at the primary and secondary school levels have difficulty with this type of text comprehension.

This study of 150 primary school students across the grade levels 2-6, examined the relationship between inferential reading comprehension of both narrative and factual texts and psycholinguistic and cognitive factors, such as vocabulary knowledge, short term working memory, text interrogative ability, and paraphrasing ability. Few studies have examined this range of factors on developmental trends in the acquisition of inferential reading comprehension across these primary school grades.

Results of this study demonstrated that inferential reading comprehension was more difficult than explicit comprehension across each of the grade levels, and that at each grade level some inference types were more difficult than others. Significant results were indicated in both the relationship between inferential reading comprehension of factual texts and expressive vocabulary, and inferential reading comprehension of factual texts and figurative language across each of the grade levels 2-6. Significant results were also evident between working memory and inferential reading comprehension of factual text across each of the grade levels 2-6. Results for the relationship between paraphrasing and inferential reading comprehension, as well as self-questioning and inferential reading comprehension, were also significant in relation to factual text across the grade levels 2-6.

Results indicating a positive relationship between inferential reading comprehension of factual text and both paraphrasing and self-questioning tasks, are of particular significance as this relationship has not been investigated previously across the grade levels 2-6. Based on the results of this study, recommendations for classroom programs are made to support the development of inferential reading comprehension across the primary school grade levels 2-6.
Declaration of Originality

(a) This thesis comprises original work only towards Doctor of Philosophy, except where indicated in the preface.

(b) Due acknowledgement has been made in the text to all other material used, and

(c) the thesis is fewer than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.
Acknowledgements

This thesis could not have been completed without the support of Professor John Munro (ACU), who has been a constant source of wisdom and encouragement throughout this lengthy process. Thanks also to Dr. Vicki McKenzie who has been incredibly generous and helpful in supporting me through the latter stage of completion. Immense gratitude also to my husband Ross, who has provided ongoing encouragement, patience and support throughout the long and challenging period it has taken me to complete this thesis.
# Table of Contents

**Abstract**                                                                                          .......................................................... 1

**Declaration of Originality**                                                                         .......................................................... 2

**Acknowledgements**                                                                                  .......................................................... 3

**Table of Contents**                                                                                  .......................................................... 4

**List of Figures**                                                                                   .......................................................... 8

**List of Tables**                                                                                     .......................................................... 9

**Chapter 1** **Introduction**                                                                          .......................................................... 11

1.1 Reading: an essential cultural capacity                                                          .................................................. 11

**Chapter 2** **Comprehension: Reading to understand and the role of inference**                       .......................................................... 14

2.1 Historical context                                                                               .......................................................... 14

2.2 Classification of inferences: The need to classify the various types                               .......................................................... 15

2.2.1 An alternative approach to classification of inferences: text-based versus schemabased          .......................................................... 19

2.2.2 The factors that influence the relative ease with which readers make various types of inferences. .......................................................... 22

2.2.2.1 Whether the inference can be made automatically or demands focused attention that includes explicit retrieval of knowledge. .......................................................... 22

2.2.2.2 Whether inferences made linking text information are easier than inferences made by linking with existing knowledge. .......................................................... 23

2.3 How is reading comprehension defined in the literature?                                           .......................................................... 25

2.4 Models of reading comprehension                                                                  .......................................................... 26

2.4.1 Information processing model                                                                 .......................................................... 26

2.4.2 Minimalist model (McKoon & Ratcliff, 1992)                                                      .......................................................... 27

2.4.3 Construction-integration model (Kintsch, 1998)                                                  .......................................................... 28

2.4.4 Capacity constrained model (Just & Carpenter, 1992)                                             .......................................................... 28

2.4.5 Combined model: (Goldman & Varma, 1995)                                                        .......................................................... 28

2.4.6 Situation Model: (Gernsbacher, 1990, Kintsch, 1998)                                             .......................................................... 29

2.5 What is an inference? How has the process of inferencing been defined?                             .......................................................... 30

2.5.1 The role of inferencing in reading comprehension: Why is it important?                           .......................................................... 31

2.5.2 The important role of inference in reading comprehension for children                           .......................................................... 34

2.5.3 Skilled and less-skilled comprehenders and inferencing ability                                 .......................................................... 36

2.5.3.1 Skilled and less-skilled comprehenders: literal understanding versus a mental model           .......................................................... 36

2.5.3.2 Skilled and less-skilled comprehenders and instantiation                                     .......................................................... 38

2.5.3.3 Skilled and less-skilled comprehenders and monitoring                                      .......................................................... 39

2.5.3.4 Poor comprehenders and processing text                                                      .......................................................... 40

2.5.3.5 Poor comprehenders and knowledge availability                                               .......................................................... 40

2.5.3.6 Poor comprehenders and type of inferences encountered                                     .......................................................... 41

2.5.3.7 Poor comprehenders and ability to make inferences spontaneously                           .......................................................... 41

2.5.3.8 Poor comprehenders and ability to draw inferences at the appropriate time                  .......................................................... 42

2.5.4 Progress to an adult model of inference making                                                .......................................................... 43

2.6 Concluding Remarks                                                                               .......................................................... 44

**Chapter 3** **Learning to infer**                                                                         .......................................................... 45

3.1 Developmental trends in learning to infer                                                        .......................................................... 45

3.1.1 Developmental considerations                                                                   .......................................................... 46

3.1.2 Proposed developmental sequence for narrative comprehension (van den Broek, et al., 2005)      .......................................................... 52

3.1.3 Developmental studies of inferential reading comprehension in expository texts                .......................................................... 53

3.2 The coherence of the text:                                                                         .......................................................... 53

3.3 Associated areas of knowledge                                                                      .......................................................... 55
Test Questions and answers ......................................................................................................... 256
Texts for each of the tests ............................................................................................................. 264

Appendix C: ............................................................................................................ 271
Copyright Request (ICAS) .............................................................................................................. 271
Copyright Approval (ICAS) ............................................................................................................. 274
Copyright request (Macmillan) ..................................................................................................... 275
License to use copyright material (Macmillan) ............................................................................. 276
Paraphrasing Task (Group Administration) .................................................................................... 279
Paraphasing Task (Student worksheet) ......................................................................................... 280
Paraphrasing Task (Guidelines for scoring) ................................................................................... 282
Questioning Task (Group Administration) ...................................................................................... 284
Information for Primary Principals (Letter) ................................................................................... 287
Parent Consent Form (Participation in Study) ................................................................................ 288
Consent Form (Primary Principal) ................................................................................................ 289
Plain Language Statement ............................................................................................................. 290
List of Figures

Figure 6.1: Mean scores for inferential and explicit comprehension in narrative text for each grade level 2-6. Standard Error of Measurement at each level indicated by error bars. ....... 146

Figure 6.2: Mean scores for inferential and explicit comprehension in factual text for each grade level 2-6. Standard Error of Measurement at each level indicated by error bars. ....... 147

Figure 6.3: Mean scores for inferential comprehension in narrative and factual text for each grade level 2-6. Standard Error of Measurement at each level indicated by error bars. ....... 151

Figure 6.4: Mean scores for explicit comprehension in narrative and factual text for each grade level 2-6. Standard Error of Measurement at each level indicated by error bars. ....... 152

Figure 6.5: Means for ease of inferring five inference types in narrative text for grade 2 students. Standard Error of Measurement represented by Error Bars. ........................................ 156

Figure 6.6: Means for ease of inferring five inference types in factual text for grade 2 students. Standard Error of Measurement represented by Error Bars. ........................................ 157

Figure 6.7: Means for ease of inferring five inference types for grade 3 students in narrative text. Standard Error of Measurement represented by error bars. ........................................ 159

Figure 6.8: Means for ease of inferring five inference types in factual text for grade 3 students. Standard Error of measurement represented by error bars. ........................................ 160

Figure 6.9: Ease of inferring five inference types in narrative text for grade 4 students. Standard Error of Measurement represented by error bars. ........................................ 162

Figure 6.10: Ease of inferring five inference types in factual text for grade 4 students. Standard Error of Measurement represented by error bars. ........................................ 163

Figure 6.11: Ease of inferring five inference types in narrative text for grade 5 students. Standard Error of Measurement represented by error bars. ........................................ 166

Figure 6.12: Ease of inferring five inference types in factual text for grade 5 students. Standard Error of Measurement represented by error bars. ........................................ 167

Figure 6.13: Ease of inferring five inference types in narrative text for grade 6 students. Standard Error of Measurement represented by error bars. ........................................ 169

Figure 6.14: Ease of inferring five inference types in factual text for grade 6 students. Standard Error of Measurement represented by error bars. ........................................ 170

Figure 6.15: Means for paraphrasing task at each grade level 2-6. Standard Error of Measurement represented by Error Bars. ........................................ 184

Figure 6.16: Mean scores for questioning task at each grade level 2-6. Standard Error of Measurement represented by Error Bars. ........................................ 187
List of Tables

Table 2.2: Types of inference proposed by Magliano & Graesser (1991), from text based on fable ‘How Leisure Came’ by Ambrose Bierce (1970). ................................................................. 21
Table 2.3: Kintsch’s (1993) classification system for inferences in reading comprehension (after Guthke, 1991). .................................................................................................................. 22
Table 2.4: Elaborated Classification system for inferences in reading comprehension (Adapted from Kintsch, 1993). Details in italics describe the processes that deliver outcomes for readers. .................................................................................................................. 77
Table 2.5: The means for each type of comprehension for each type of text at each grade level ............................................................................................................................................. 108
Table 2.6: Inferential and explicit comprehension in narrative text for grades 2-6, showing Means, Standard Error, Skewness, and Kurtosis indices for each task at each grade level 2-6. ............................................................................................................................................ 146
Table 2.7: Inferential and explicit comprehension in factual text for grades 2-6, showing Means, Standard Error, Skewness and Kurtosis for each task at each grade level 2-6......... 147
Table 2.8: Indicators of the comparison between inferential and explicit comprehension at grades 3-4, and 5-6 in both narrative and factual texts. Note: * p = < .01** p = < .05........ 149
Table 2.9: Inferential comprehension in narrative and factual text grades 2-6, showing Means, Standard Error, Skewness and Kurtosis for each task at each grade level 2-6............. 151
Table 2.10: Explicit comprehension of narrative and factual text grades 2-6, showing Standard Error, Skewness and Kurtosis indices for each task across the grade levels 2-6............ 152
Table 2.11: Means and standard deviations for five different inference types in narrative and factual text at each grade level 2-6........................................................................................................... 155
Table 2.12: Pairwise comparisons for Inference types in narrative and factual text for grade 2 students (*p = < .05 **p = < .01) ............................................................ 156
Table 2.13: Inference in five inference types in narrative text for grade 2 students, showing Means, Standard Error, Skewness and Kurtosis................................. 156
Table 2.14: Ease of inferring five inference types in narrative text for grade 2 students, indicating Standard Error, Skewness and Kurtosis indices for each of the tasks .......... 158
Table 2.15: Pairwise comparisons for Inference types in narrative and factual text for grade 3 students. ( * p = < .05 **p = < .01) ............................................................ 159
Table 2.16: Ease of inferring five inference types in narrative text for grade 3 students indicating Standard Error, Skewness and Kurtosis indices for each task.................................................. 160
Table 2.17: Ease of inferring five inference types in factual text for grade 3 students indicating Means, Standard Error, Skewness and Kurtosis indices for each of the tasks. ........ 161
Table 2.18: Pairwise comparisons for Inference types in narrative and factual text for grade 4 students. ( * p = < .05 ** p = < .01) ............................................................ 162
Table 2.19: Ease of inerring in five inference types in narrative text for grade 4 students, indicating Means, Standard Error, Skewness and Kurtosis indices for each task .................................. 162
Table 2.20: Ease of inferring five inference types in factual text for grade 4 students showing Means, Standard Error, Skewness and Kurtosis indices for each task.............................................. 164
Table 6.17: Pairwise comparisons for Inference types in narrative and factual text for grade 5 students (* p = < .05    ** p = < .01) ................................................................. 165
Table 6.18: Showing Means, Standard Error, Skewness and Kurtosis indices for each of the inference types for grade 5 students inferring in narrative text.............................................. 166
Table 6.19: Ease of inferring inference types in factual text for grade 5 students showing Standard Means, Standard Error, Skewness, and Kurtosis indices for each task. ...................... 167
Table 6.20: Pairwise comparisons for Inference types in narrative and factual text for grade 6 students (* p = < .05    ** p = < .01) ................................................................. 168
Table 6.21: Ease of inferring five inference types in narrative text for grade 6 students showing Means, Standard Error, Skewness, and Kurtosis indices for each task. ...................... 169
Table 6.22: Ease of inferring five inference types in narrative text for grade 6 students showing Means, Standard Error, Skewness, and Kurtosis indices for each task. ...................... 170
Table 6.23: Total number of students at each grade level 2-6 who correctly answered the five inference questions in both narrative and factual text........................................ 171
Table 6.24: Correlations for Test of Word Knowledge (Expressive Vocabulary) and Inferential and explicit comprehension in Narrative and Factual texts Notes: *p < .05, **p < .01 .......................... 175
Table 6.25: Correlations for Test of Word Knowledge (Synonyms) and Inferential and explicit comprehension in Narrative and Factual texts Note: *p < .05, **p < .01 .................... 177
Table 6.26: Correlations for Test of Word Knowledge (Figurative Usage) and Inferential and explicit comprehension in Narrative and Factual texts Note:*p < .05, **p < .01 .................... 178
Table 6.27: Correlations for Short Term Memory (Digit Recall test), and Inferential and explicit comprehension in Narrative and Factual texts Note: * p < .05     **p < .01 ................. 181
Table 6.28: Correlations for Backwards Digit Recall test, and Inferential and explicit comprehension in Narrative and Factual texts Note: * p < .05 ** p < .01 ......................... 183
Table 6.29: Results for paraphrasing Task showing Standard Error, Skewness, and Kurtosis indices for each task ................................................................. 185
Table 6.30: Correlations for Paraphrasing task and inferential and explicit comprehension in Narrative and Factual texts Note: * p <.05     **p < .01 .............................................. 186
Table 6.31: Results for Questioning Task showing Standard Error, Skewness, and Kurtosis indices for each task ................................................................. 187
Table 6.32: Correlations for Questioning task, and Inferential and explicit comprehension in Narrative and Factual texts Note: * p <.05     **p < .01 .............................................. 189
Chapter 1  Introduction

1.1  Reading: an essential cultural capacity

The important role of reading in human society is captured by van den Broek & Kremer, (2000), who argue that one of the unique cognitive characteristics of being human is the ability to read. This complex skill they note, is crucial for successful participation in contemporary society. Implicit in this statement is the notion that reading involves the process of understanding, or comprehension of what has been read (Gambrell, Block & Pressley, 2002). As noted by the National Reading Panel (2000), “Comprehension is critically important to the development of children’s reading skills and therefore to the ability to obtain an education” (p.13).

However, as suggested by (Yuill & Oakhill, 1991), despite accurate word reading, poor comprehension is experienced by approximately 10% of children between the ages of 7 and 11 years. Yuill and Oakhill argue that this situation has serious consequences for many children in both primary and secondary schools.

The critical role played by reading comprehension is highlighted by Biancarosa & Snow (2006), who make the observation that previous generations of students such as those educated in the 1950’s, were still able to achieve a reasonably satisfying and comfortable lifestyle, despite not having completed secondary school, due to poor reading comprehension skills. Biancarosa & Snow (2006), argue that this is no longer the case as there are fewer opportunities for students dropping out of secondary school, to maintain a comparable way of life. Furthermore, they suggest that students who do not acquire strong literacy skills, “find themselves at a serious disadvantage in social settings, as civil participants, and in the working world” (p.3).

Moore, Bean, Birdyshaw, & Rycik (1999), add further to these claims, suggesting that:

“Adolescents entering the adult world in the 21st century will read and write more than any other time in human history. They will need advanced levels of literacy to perform their jobs, run their households, act as citizens, and conduct their personal lives. They will need literacy to cope with the flood of information they will find everywhere they turn. They will need literacy to feed
their imaginations so they can create the world of the future. In a complex and sometimes even dangerous world, their ability to read will be crucial.” (p. 3).

But what exactly are Moore, et al., (1999), referring to when they speak of the need for ‘advanced levels of literacy’? (p.3). As argued by van den Broek & Kramer (2000), while basic processes such as the identification and mapping of letters onto sounds, word recognition, and syntax, are involved in successful reading, the ultimate goal is for students to acquire not only these basic processes, but higher order processes as well. Inference is one of these higher order processes.

McNamara & Kendeou, (2011), refer to the process of inference generation as the linking of information with other information within the text, or with what is already known, and forming conclusions from this information, that have not been stated explicitly in the text. Although extensive research over the past two decades has shown that successful reading comprehension involves the reader in using a variety of strategies to make meaning (Dole, Duffy, Roehler, & Pearson, 1991), some strategies involved in the generation of inferences appear to be more significant than others (Cain, Oakhill, Barnes, & Bryant, 2001; Garnham & Oakhill, 1996; Kendeou, 2015).

While the important role played by inferencing is emphasised in the extensive body of research cited in the literature, much concern has also been expressed highlighting the problems many students have with this type of processing (Cain & Oakhill, 1999; Cain, Oakhill, Barnes, & Bryant, 2001; Garnham & Oakhill, 1996). The argument has been made that unless difficulties with inferential processing are addressed for these children, they can have a major impact on reading comprehension throughout their lives (Cain & Oakhill, 1999; Oakhill, Cain, & Bryant, 2003).

These concerns have led to a major focus in research on the important role played by inference generation in reading comprehension. While studies have examined inferential comprehension skills at various primary and secondary school levels, this study examines the process of inferential reading comprehension for students across each of the school levels, grades 2 -6 (children aged between 8.0 – 12.3 years of age).

Studies have suggested that inferential reading comprehension is acquired developmentally (van den Broek, 1989a), and that these developmental stages have important implications for student learning. While a developmental sequence in
narrative text has been proposed in the literature, (van den Broek, Kendeou, Kremer, Lynch, Butler, White, & Lorch, 2005), few studies have examined developmental aspects of inferential reading comprehension in expository text. This study examines development aspects of inferential reading comprehension in both narrative and expository text across the primary school grade levels, 2-6.

Studies have also demonstrated the important role of a number of psycholinguistic and cognitive factors in the development of inferential reading comprehension, including the role of vocabulary network knowledge (Cain, Oakhill & Lemmon, 2005), and working memory (Just & Carpenter, 1992). While these studies have concentrated on various grade levels across the primary and secondary school years, this study extends this body of work by examining the role of vocabulary network knowledge and working memory, and their relationship to inferential reading comprehension of both narrative and factual texts, for primary school students, over 5 grades in one primary school.

Other variables have been noted in the literature which may contribute to the ease in which students make inferences, such as the skill of paraphrasing (Munro, 2006), and students developing their own questions based on texts (Munro, 2006). The relationship between these variables and inferential reading comprehension has not been examined previously across primary school grade levels. This study examines both paraphrasing and student self-questioning, and their relationship with inferential comprehension of both narrative and factual texts for students across the primary school grade levels 2-6 (students in the present study in these grade levels were between the average age of 8.0 years - 12.3 years).

It is important to acknowledge that a number of studies cited in this study are well over 30 years old. However, they are still considered relevant to the understanding of the topic examined in the present study.
Chapter 2  Comprehension: Reading to understand and the role of inference

The current chapter provides an historical context for the study of inference within the broader framework of reading comprehension as well as setting out a theoretical framework for reading comprehension. This is followed by an examination of the way in which inferences have been classified and categorised in the literature, and the factors that influence the ease in which readers make various types of inferences. The following section examines how reading comprehension is defined in the literature, and the various models of reading comprehension developed by researchers. The remaining section looks at the important role of inference in supporting children’s progress to an adult model of reading comprehension.

2.1  Historical context

The important role played by inference in understanding texts became apparent to psychologists in the early 1970’s. This was in response to the predominant view of the 1960’s, “that the mental representations of sentences correspond to their linguistic representations” (Yuill & Oakhill, 1991, p. 16). Yuill & Oakhill (1991), note that this approach resulted from a revival of interest in the work of Bartlett (1932), who argued that “meaning is not inherent in a text, but must be constructed by the reader” (Yuill & Oakhill, 1991, p. 16).

For many years (including the 1970s), reading comprehension was based on a concept of reading as the application of a set of isolated skills such as finding main ideas, identifying cause and effect relationships, comparing and contrasting, and sequencing. It was thought that comprehension could be taught by providing specific instruction in these discrete skills (Duffy, Duffy & Roehler, 1991). Typical classroom instruction at this time followed what Durkin (1978-1979), refers to as a mentoring, practising and assessing procedure. This approach, claims Durkin, did little to help students learn how, or when to use the skills they practised, nor were the skills shown to enable comprehension.
Beginning in the 1980s, research began to focus on how people think and learn. Several studies focussed on how readers create meaning as they read by decoding language units and constructing a coherent mental representation of the text (Graesser, Singer, & Trabasso, 1994; van den Broek, 1994; Zwaan & Rapp, 2006). For example, Palincsar & Brown (1984), identified six functions important to the development of building a coherent mental model of text: (1) understanding the purposes of reading, both explicit and implicit; (2) activating relevant background knowledge; (3) allocating attention so that concentration can be focussed on the major content at the expense of trivia; (4) critical evaluation of content for internal consistency, and compatibility with prior knowledge and common sense; (5) monitoring ongoing activities to see if comprehension is occurring, by engaging in such activities as periodic review and self-interrogation; and (6) drawing and testing inferences of many kinds, including interpretations, predictions, and conclusions (p. 118).

These studies, along with many other studies, have demonstrated that reading is a complex, strategic, and active process of constructing meaning, not simply a set of skills to be mastered (Graesser, Gernsbacher, & Goldman, 2003; Zwaan & Rapp, 2006). According to this extensive body of research, comprehension can be seen as a family of skills that develop simultaneously, rather than a unitary phenomenon (Cutting & Scarborough, 2006; van den Broek, Kendeou, Kremer, Lynch, Butler, White, & Lorch, 2005). These skills enable readers to integrate relationships between text features and prior knowledge, and include the important processes involved in the generation of inferences (Kendeou, White, van den Broek & Lynch, 2009).

### 2.2 Classification of inferences: The need to classify the various types

A number of systems for classifying inferences have been proposed within the literature according to how and when during the reading process the reader makes the inference, and the ways in which they synthesise the text information with their existing knowledge.

Inferences have been classified according to:

1. The types of question they answer.
2. When the inference was made either during or after reading. Inferences made during reading are commonly referred to in the literature as ‘online’, and those made after having read are referred to as ‘off-line’.

3. The ‘depth of processing’; some inferences are made automatically while others are made following the investment of conscious attention.

4. Whether the inference is text-based and logical or schema-based and informal.

In referring to the cognitive nature of the ‘on-line’ process, Van den Broek et al., (2011), note the complexity of the processes involved such as connecting and integrating information from the text with information that occurred previously, as well as information from background knowledge. They also note that ‘some of these processes are quick, automatic and relatively effortless’ (p. 260), whereas others are ‘slow, strategic, and relatively effortful ‘(p. 260). Van den Broek et al. (2011), argue that the on-line and off-line processes are causally related, as the “off-line memory representation of the text and relevant background knowledge” (p, 260), emerges from the strategies and processes undertaken by the reader as part of the reading process. In other words suggest Van den Broek et al. (2011), ‘if the on-line processes fail, so does the the final representation’ (p. 260).

Think aloud procedures have been used to examine inferencing during the reading process, for example on-line studies by Long, Opy, & Seely (1994), & Oakhill, (1982). With a think-aloud procedure readers are asked to comment on the text as they are reading. These comments, referred to in the literature as verbal protocols, are used by researchers to determine the frequency and types of inferences made during the course of reading.

Off-line measures refer to tasks performed at the conclusion of the reading process for recall purposes. Although off-line measures come in a variety of forms, the most common of these are test questions, for example free, recall, short answer, and multiple choice (Kintsch & Rawson, 2007).

The present study draws on the types of inferences described in terms of 3. & 4. above. The approach to categorization based on the type of question answered, is not pursued further here as it is not seen as relevant to the study.
Although many different types of inferences have been identified, Kispal (2008), sets out below the main categories that are frequently mentioned in the literature, with examples and explanations, as cited in the summary of her review ‘Effective Teaching of Inference Skills for Reading’(2008).

**Coherence or Intersentence connecting inferences:** For example ‘Peter begged his mother to let him go to the party’. This inference maintains textural integrity as the reader would have to realise that the pronouns ‘his’, and ‘him’, refer to Peter, to fully understand this sentence.

**Elaborate, gap-filling, or knowledge-based inferences:** For example ‘Katy dropped the vase. She ran for the dustpan and brush to sweep up the piece’. This inference enriches the mental representation of the text as it draws on life experiences and general knowledge. The reader would need to realise that the vase broke to supply the connection between these two sentences.

**Local inferences:** For example coherence inferences which create a coherent representation at the local level of sentences and paragraphs, and antecedent causal inferences, for example where ‘Dan stood his bike against a tree,’ and the reader would need to realise that the tree is assigned to a location, and antecedent causal inferences, for example ‘he rushed off, leaving his bike unchained,’ the reader would need to infer that Dan was in a hurry and left his bicycle vulnerable to theft.

**Global inferences:** For example inferences about the theme, main point or moral of a text, where the reader would need to create a coherent representation of the whole text, inferring over-arching ideas by drawing on local pieces of information.

**Online inferences:** For example superordinate goals of characters or causal antecedents that explain why something is mentioned in the text. These inferences are necessary for understanding and are drawn automatically during reading.

**Off-line inferences:** For example forecasting future episodes in a text. These inferences are drawn strategically after reading, usually during a later retrieval task, and are not essential to understanding.

Distinctions have also been made in the literature between different types of inference according to the action taken by the reader. For example the action taken can be classified as automatic or strategic (McKoon & Ratcliff, 1992), text-connecting or
knowledge based/extra textural (Graesser et al., 1994), local or global (Gygax, Garnham, & Oakill, 2004), coherence or elaborative (Barnes, Dennis, & Haefele-Kalvaitis, 1996), unconscious or conscious (Pressley & Afflerbach, 1995), intersentence/text-connecting or gap-filling (Cain & Oakhill, 1998), coherence or elaborative/knowledge-based/evaluative (Bowyer-Crane & Snowling, 2005), anaphoric/text-to-text or background-to-text (Cromley & Azevedo, 2007).

The suggestion has been made that while distinctions between two or three types of inferences have been the focus of the majority of work completed, the work of Graesser, Singer, & Trabasso (1994), and Pressley & Afflerbach (1995), stand out due to the extensive research undertaken to catalogue as many inferences as possible from the literature (Kispal, 2008).

A summarised version of their lists is set out below (Table 2.1), noting that Pressley & Afflerbach (1995), used the think aloud protocol to collect their data. The ‘Think Aloud protocol’ encourages students to think aloud as they read. The inferences collected therefore, were described by the researchers as those which the readers used directly to describe what they were thinking about as they read.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Referential</td>
<td>Referential</td>
</tr>
<tr>
<td>2. Case structure role assignment</td>
<td>Filling in deleted information</td>
</tr>
<tr>
<td>3. Antecedent causal</td>
<td>Inferring meanings of words</td>
</tr>
<tr>
<td>4. Superordinate goal</td>
<td>Inferring connotations of words/sentences</td>
</tr>
<tr>
<td>5. Thematic</td>
<td>Relating to prior knowledge (further divided into 12 sub-types)</td>
</tr>
<tr>
<td>6. Character emotion</td>
<td>Inferences about the author (5 types)</td>
</tr>
<tr>
<td>7. Causal consequence</td>
<td>Characters or state of world as depicted in text (6 types)</td>
</tr>
<tr>
<td>8. Instantiation noun category</td>
<td>Confirming/ disconfirming previous inferences</td>
</tr>
<tr>
<td>9. Instrument</td>
<td>Drawing conclusions</td>
</tr>
<tr>
<td>10. Subordinate goal action</td>
<td></td>
</tr>
<tr>
<td>11. State</td>
<td></td>
</tr>
<tr>
<td>12. Reader’s emotion</td>
<td></td>
</tr>
<tr>
<td>13. Author’s intent</td>
<td></td>
</tr>
</tbody>
</table>


While both the Graesser et al (1994), and the Pressley & Afflerbach (1995) lists share some overlap, for example making inferences about characters and the author, Graesser’s approach is to look at the focus of the inference, while Pressley &
Afflerbach lists the processes involved (for example, confirming, concluding, relating), (Kispal, 2008).

2.2.1 An alternative approach to classification of inferences: text-based versus schema-based

An alternative approach to classifying inferences has been proposed by Magliano & Graesser (1991). The researchers proposed eleven types of inferences that exemplify text based versus schema-based categorization. Whilst not purported to be an exhaustive list, Magliano & Grasesser argue that the order in which these inference types are presented (1-11), is roughly aligned to the focus they have received in cognitive psychology.

1. Anaphoric references
2. Causal antecedents
3. Causal consequences
4. Instruments
5. Instantiation of noun categories
6. Superordinate goals/actions
7. Subordinate goals/actions
8. States
9. Themes
10. Emotion
11. Author’s intent

An example of each of these types is shown in Table 2.2, taken from Magliano & Graesser (1991), for readers reading the following passage, ‘How Leisure Came’ by Ambrose Bierce (1970), cited in Magliano & Graesser (1991).

“A Man to Whom Time Was Money, and who was bolting his breakfast in order to catch a train, had leaned his newspaper against the sugar bowl and was reading as he ate. In his haste and abstraction he stuck a pickle-fork into his right eye, and on removing the fork the eye came with it. In buying spectacles the needless outlay for the right lens soon reduced him to poverty, and the Man

<table>
<thead>
<tr>
<th>Types of inferences</th>
<th>Descriptions below by Magliano &amp; Graesser, 1991</th>
<th>Text that elicits the inference</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaphoric references (Magliano &amp; Graesser, 1991)</td>
<td>Readers generate these inferences when they need to find the antecedent to a referent (e.g. a pronoun that refers to a previously stated noun in the text), in order to maintain text coherence.</td>
<td>‘on removing the fork the eye came with it’. (Bierce, 1970, p. 107-109, cited in Magliano &amp; Graesser, 1991).</td>
<td>Fork is the referent for it (Magliano &amp; Graesser, 1991).</td>
</tr>
<tr>
<td>Causal antecedents (Magliano &amp; Graesser, 1991)</td>
<td>These bridging inferences are sometimes referred to as ‘backward inferences’. Coherence is often established by the reader causally relating an incoming explicit event with a previous event in the text.</td>
<td>‘In his haste and abstraction he stuck a pickle fork into his right eye’ (Bierce, 1970, p. 107-109, cited in Magliano &amp; Graesser, 1991).</td>
<td>The man misaimed his fork (Magliano &amp; Graesser, 1991).</td>
</tr>
<tr>
<td>Causal consequences (Magliano &amp; Graesser, 1991)</td>
<td>These inferences are sometimes referred to as ‘forward inferences’ or expectations. Readers generate these inferences when they predict future events.</td>
<td>‘...on removing the fork the eye came with it’ (Bierce, 1970, p. 107-109, cited in Magliano &amp; Graesser, 1991).</td>
<td>The man will be blind in his right eye (Magliano &amp; Graesser, 1991).</td>
</tr>
<tr>
<td>Instruments (Magliano &amp; Graesser, 1991)</td>
<td>These inferences are an example of an elaborate inference that is not required to maintain text coherence. They are made when readers infer a tool, resource, or part of the body that an agent uses to perform an intentional action.</td>
<td>‘The Man To Whom Life Was Money had to sustain life by fishing from the end of the wharf’ (Bierce, 1970, p. 107-109, cited in Magliano &amp; Graesser, 1991).</td>
<td>The man uses a rod and reel (Magliano &amp; Graesser, 1991).</td>
</tr>
<tr>
<td>Superordinate goals/actions (Magliano &amp; Graesser, 1991)</td>
<td>Readers generate inferences about superordinate goals when they infer why characters perform intentional actions. These inferences provide information about a character’s motivation or plan behind an action.</td>
<td>‘A Man To Whom Time Was Money, and who was bolting his breakfast in order to catch a train’ (Bierce, 1970, p. 107-109, cited in Magliano &amp; Graesser, 1991).</td>
<td>The man wanted to get to work (Magliano &amp; Graesser, 1991).</td>
</tr>
<tr>
<td>Subordinate goals/actions</td>
<td>Readers generate inferences about subordinate actions when they infer how characters achieve their goals.</td>
<td>‘Who was bolting his breakfast’ (Bierce, 1970, p. 107-109, cited in Magliano &amp; Graesser, 1991).</td>
<td>The man grasped his fork and moved it towards his mouth (Magliano &amp; Graesser, 1991).</td>
</tr>
<tr>
<td>States (Magliano &amp; Graesser, 1991)</td>
<td>Readers generate these inferences when they infer some on-going condition or state of the world.</td>
<td>‘The Man To Whom Time Was Money had to sustain life by fishing from the end of a wharf’ (Bierce, 1970, p. 107-109, cited in Magliano &amp; Graesser, 1991).</td>
<td>Fishermen are poor (Magliano &amp; Graesser, 1991).</td>
</tr>
<tr>
<td>Themes (Magliano &amp; Graesser, 1991)</td>
<td>These inferences are generated when readers infer the main point or ‘gist’ of the story.</td>
<td>The entire passage (Magliano &amp; Graesser, 1991).</td>
<td>The man’s situation was made worse by his haste (Magliano &amp; Graesser, 1991).</td>
</tr>
</tbody>
</table>
Table 2.2: Types of inference proposed by Magliano & Graesser (1991), from text based on the fable ‘How Leisure Came’ by Ambrose Bierce (1970).

The categorisation system used by Pressley (2002), also exemplifies the text based versus schema-based categorization. This system focuses on the units of meaning in the text, and suggests that good readers make many types of inferences.

For example Pressley (2002), notes that some of the inferences good readers make as they read include referents of pronouns, meanings of unknown words and phrases, explanations for events, elaborations of ideas based on knowledge of the text or the content area, how concepts or ideas in a text relate to one’s own theories and experiences, intentions and characteristics of characters in the text, the authors purpose for writing the text and their assumptions about the nature of the world.

These two categorising approaches while differing in their orientation, share common features. Each of those identified by Pressley (2002), can be categorised in terms of one or more of Magliano & Graesser’s (1991) categories. Both approaches are based on the outcomes of the inference.

An alternative approach that integrates the two approaches described above (Pressley, 2002, & Magliano & Graesser, 1991), has been proposed by Kintsch (1993). He proposes an approach that categorises inferences in terms of two criteria: the outcomes of the inference and the processes used to generate the inference. He extended a framework developed by Guthke (1991, cited in Kintsch, 1993), that classifies inferences in two ways: in terms of (1) the inferential outcomes; and (2) whether the inferential process was automatic or attention demanding.

Guthke (1991), proposed that some inferences involve adding knowledge retrieved from the reader’s long-term memory while others involve generating new knowledge. He noted also that some processes involved using existing rules and conventions (for example, using noun-pronoun agreement; he referred to as ‘automatic’) while others
involved cognitive activity on the part of the reader (he referred to as ‘controlled’ processes).

Kintsch (1993), cautions that not all inferences fit neatly into Guthke’s categories. He proposes an additional classification that Guthke mentioned, but did not include in his scheme, namely whether inferences add information (accreditation of information), or reduce information (reduction of information). These classifications are shown in Table 2.3.

<table>
<thead>
<tr>
<th>Accreditation of Information</th>
<th>Reduction of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrieval Generation</td>
<td>Deletion Generation</td>
</tr>
</tbody>
</table>

**Table 2.3:** Kintsch’s (1993) classification system for inferences in reading comprehension (after Guthke, 1991).

The types of inferences in Table 2.4, (Kintsch, 1993), described in terms of activity required, differ in their ease of generation. This ease of generation is examined in the following section.

### 2.2.2 The factors that influence the relative ease with which readers make various types of inferences.

A number of researchers suggest that the following factors influence the relative ease with which readers make inferences. For example:

- Whether the inference can be made automatically or demands focused attention that includes explicit retrieval of knowledge.
- Whether inferences made linking text information are easier that inferences made by linking with existing knowledge

#### 2.2.2.1 Whether the inference can be made automatically or demands focused attention that includes explicit retrieval of knowledge.

As inference generation is believed to consume valuable cognitive resources (Kintsch & Rawson, 2007; Perfetti, Landi, & Oakhill, 2007), much research has been devoted to
establishing whether particular classes of inferences are generated by adult readers “on-line” during comprehension (McKoon & Ratcliff, 1986; Singer, 1980), or “off-line” where they are generated during retrieval tasks, for example a recall task (Graesser & Kreuz, 1993; Kintsch & Rawson, 2007).

According to Kintsch (1988), on-line inferences are either generated quickly and automatically during comprehension, generated within 650 milliseconds after a sentence is read, or more time and effort is required in their construction. Magliano & Graesser (1991), suggest that the latter category of inferences, whilst not generated automatically (taking more than 650 milliseconds), are inevitably and invariantly generated on-line. On the other hand, van den Broek, Tzeng, Risden, Trabasso, & Basche (2001), argue that some categories of inferences are strategically, but not invariantly generated on-line depending on the reader’s goal, while Mills & Graesser (1994), note that it may also depend on the nature of the text genre.

McKoon & Ratcliff (1992) argue from a ‘minimalist’ position, that the only inferences encoded automatically during reading are those that are based on information that is easily available, either from explicit statements within the text, or from prior knowledge, and those that are necessary for local coherence. McKoon & Ratcliffe (1992), suggest that only minimal automatic processing of inferences occurs during the reading process. In other words, “readers do not automatically construct inferences to fully represent the situation described by the text” (p. 440).

2.2.2.2 Whether inferences made linking text information are easier that inferences made by linking with existing knowledge.

Perfetti, Landi, & Oakhill (2007), claim that the adult model of inference making is not straight forward as readers make only some of the possible inferences within a narrative. The complexity of this adult model they suggest, is underpinned by two broad principles. Firstly, that the generation of inferences is “costly to processing resources” (p.231), and secondly, that “the reader strives to develop some degree of coherence in the mental model” (p.231). Perfetti et al., (2007), note that making inferences that are not costly to resources, such as the mapping of pronouns onto antecedents, are more likely than inferences that are demanding of resources (Perfetti, Landi, & Oakhill, 2007). For example inferring that an action referred to in the text in an abstract way, such as ‘going to school’, elaborated as ‘taking a bus to
school’. In other words, readers are more likely to make inferences that support coherence, rather than inferences that only elaborate (Perfetti et al., 2013).

Support for the claim by Perfetti, Landi, & Oakhill (2007), that inferences linking text information are easier than inferences made by linking with existing knowledge, comes from a study of level 8 and 10 children by Chikalanga (1993). Results of Chikalanga’s study found that pronominal inferences (involving resolution of referents or antecedents of pronouns such as ‘he’, ‘they’, ‘it’), appeared to be the easiest inference type, while logical informational inferences (those which determine the people, things, time, place and general context of given events), were the next most difficult type of inference. Elaborative inferences (based on information outside the text), with familiar material, were more difficult again. The most difficult inference type in Chikalanga’s study were elaborative inferences with unfamiliar material.

Additional findings in the literature include a number of studies examining the relationship between causal inferences and more and less-skilled comprehenders. These studies by Trabasso & van den Broek, (1985), van den Broek, (1988), & Trabasso & Sperry, (1985), argue that the number of causal connections in statements to other statements have a direct effect on how well they are remembered and comprehended; the more causal connections between statements the easier the drawing of inferences.

Other findings in the literature propose that:

(1) causal inferences are more difficult than relational inferences (Dewitz & Dewitz, 2003), and skilled readers make more causal inferences than less-skilled readers (Long, Oppy, & Seely, 1997), in an effort to make sense of actions in a story that would otherwise be unconnected (Trabasso & Suh, 1993),

(2) causal consequences are more difficult to infer than causal antecedents (Graesser & Bertus, 1998), and

(3) little cognitive resources are used when readers infer characters’ emotional states (Gernsbacher, Hallada, & Robertson, 1998), suggesting that readers draw these inferences relatively easily.

(4) inferences made in relation to emotional states of characters in a text are less specific than noted in previous research (Gygax, Oakhill, & Garnham, 2003; Gygax, Garnham, & Oakhill, 2004), and that the information readers infer when they are
reading about emotions is too general in nature to interpret particular types or states of emotion (Gygax, Garnham, & Oakhill, 2004).

2.3 How is reading comprehension defined in the literature?

While there are many definitions of reading comprehension, Paris & Hamilton (2009), suggest that little consensus has been achieved in this regard due to a lack of clarity around the boundaries of the topic. They argue that:

“Reading comprehension is only a subset of an ill-defined larger set of knowledge that reflects the communicative interactions among the intentions of the author/speaker, the content of the text/message, the abilities and purposes of the reader/listener, and the context/situation of the listener” (Paris & Hamilton, 2009, p. 32).

While early definitions of reading comprehension, for example, Thorndike (1917), focused on thinking and reasoning about text, more recent definitions describe reading comprehension more extensively as a task that draws on a range of different cognitive skills and processes (Cain, Oakhill & Bryant, 2000; Kintsch, 1994; Linderholm, Everson, van den Broek, Mischinski, Crittenden, & Samuels, 2000).

The complex and interactive nature of reading comprehension has been described in various ways by a number of researchers. For example Block, Gambrell & Pressley (2002), define reading comprehension as “the process of extracting and constructing meaning through interaction and involvement with written language” (p. 24). This process they note, includes three dimensions: the reader, the text and the context, with the word text referring to a variety of materials ranging from books to computer screens (Block et al., 2002). Munro (2002), also stresses the interactive nature of reading comprehension as a process in which progressive representations of the text are developed by text-induced linking, matched against aspects of the readers existing knowledge, and evaluated for consistency through semantic monitoring and summarizing. Harris & Hodges (1995), describe reading comprehension as an intentional, problem solving, process.

While the RAND Report (Snow, 2002), describes reading comprehension as a complex, interactive process, the National Centre for Educational Statistics (2005), provides the
following clarification: that in order for this process to be successful, it needs to be “appropriate to type of text, purpose and situation” (p.2).

A number of models of reading comprehension have been proposed that differ in how they conceptualise the reading process. The following section describes these models.

2.4 Models of reading comprehension

Various models of reading comprehension have been suggested by researchers. The current section describes these models and how they differ in conceptualising the reading process. These models include:

1. Information processing model

2. Minimalist models

3. Construction-integration model

4. Capacity constrained model

5. Combined model

6. Situation model

2.4.1 Information processing model

The first of these information processing models describes the process of reading in terms of ‘input’ and ‘output’. The input stage involves the mental operations between text and reader, and the output stage refers to comprehension of the text. Within this model, learning to read makes these processes automatic (Paris & Hamilton, 2009). As an example of this model, Paris & Hamilton cite the work of La Berge and Samuels (1974), where the researchers describe children as “reading factories” (Paris & Hamilton, 2009, p.33). In this view “raw materials (texts) are processed by four production machines (visual memory, phonological memory, semantic memory, and situated memory),” (Paris & Hamilton, 2009, p.33). The primary focus of early instruction in this model is developing automatic word recognition and decoding, as comprehension is a result of word recognition (Paris & Hamilton, 2009). Paris & Hamilton note that as LaBerge & Samuels (1974), treat cognitive processes involved in comprehension as an automatic consequence of decoding words rapidly, little description of them is provided in this model.
A second type of information processing model proposed by Rumelhart (1994,) and Stanovich (1980), describes reading as a process of bottom-up (decoding and understanding words), and top-down (integration of background knowledge with the text) interaction. This model, note Paris & Hamilton (2009), “is compensatory because readers are believed to use strong skills to compensate for weak skills” (p.33).

An example of this integration model, proposed by Freebody & Luke (1990), identifies four roles or areas of skill that readers use in the process of reading:

(1) as code breakers, by using their knowledge of the relationship between spoken words in language and the graphic code and symbols used to represent those sounds,

(2) as meaning makers by using their knowledge of the meaning patterns operating in written and spoken texts,

(3) as text users by using their knowledge of the functions of various kinds of literacy and

(4) as text analyst by using knowledge of the ways texts represent different points of view.

2.4.2 Minimalist model (McKoon & Ratcliff, 1992)

While most theories of text processing assume a constructionist view of processing (for example Kintsch, 1998; Trabasso & van den Broek, 1985), an alternative view, referred to as the ‘minimalist hypothesis’ has been proposed by McKoon & Ratcliff (1992). This hypothesis argues for minimal automatic processing of inferences during reading. It assumes that readers do not automatically make the inferences necessary to create an adequate representation of what they have read and assume that it is inadequate. McKoon & Ratcliff claim that only two types of inferences are constructed by readers in the ‘absence of specific, goal-directed strategic processes’ (p. 440), inferences that establish coherent representations of parts of text at a local level which are processed concurrently, and those dependent on easy and quick access of information. This hypothesis therefore, makes the distinction between inferences that are labelled automatic (processed concurrently), and those that are referred to as strategic (rely on information that is quickly and easily available). Minimalist models such as those
proposed by McKoon & Ratcliff (1992), stand in direct opposition to the constructionist models.

2.4.3 Construction- integration model (Kintsch, 1998)

Another model, Kintsch’s (1998), construction- integration model examines what readers do during the process of text comprehension. According to Paris & Hamilton, (2009), this model is one of the most popular models, describing the processes in which adults process text as they read. In Kintsch’s (1998) construction-integration model, reading comprehension is understood to be an information processing, goal oriented activity. Readers identify various types or levels of text information, and process them simultaneously. These interrelated chunks of text information stored in memory, and referred to as text propositions, comprise letters, words, and simple clauses at the lowest level, to meanings of sentences and complex connections between sentences, at the intermediate level.

2.4.4 Capacity constrained model (Just & Carpenter, 1992)

Just & Carpenter’s (1992), capacity constrained model, stresses the importance of cognitive capacity in constructing the foundation of textural representations. Support for Just & Carpenter’s model comes from studies that demonstrate reading time slows as working memory reaches its capacity (Schneider & Pressley, 1997), demands of text comprehension exceeds limitations of working memory, and comprehension performance deteriorates (Brainerd & Pressley, 1985), and readers with high working memory spans enjoy advantages in comprehension (Pressley & Brainerd, 1985).

2.4.5 Combined model: (Goldman & Varma, 1995)

This model by Goldman & Varma (1995), combines elements of Kintsch’s construction-integration model (1998), and Just & Carpenter’s capacity constrained model (1992), and emphasizes the influence of prior knowledge and cognitive capacity on the construction of text representations by readers. While the construction-integration model represents a more general model of comprehension, the combined model views reading as a goal-orientated, information processing activity in which readers identify various types of text information: word meanings, sentence propositions, conceptual relationships, the topic or theme of the text and the writer’s disposition to the topic.
Within this model, a reader’s comprehension of a text can be described in terms of the representation of the text constructed. It can be explained as a synthesis of these aspects of knowledge (Kintsch, 1988; Singer, 1990; van Dijk & Kintsch, 1983; van Dijk, 1987). Within this model various types of representation that differ in levels of complexity can be identified (Munro, 2002). These levels of complexity vary in the extent to which they differ from the original text. The simplest representation, referred to as the surface structure, is a verbatim representation of part of the text. Construction of meaning is related to letters, words, and simple clauses. A more complex representation, referred to as the propositional textbase (Kintsch, 1998), represents the semantic meaning of the text. Meanings of sentences and the connections between them are constructed. These are referred to as text propositions and derive from the readers’ existing knowledge. They represent the characters, goals, events, actions, and setting as specified explicitly in the text, and are retained in working memory during reading.

### 2.4.6 Situation Model: (Gernsbacher, 1990, Kintsch, 1998)

A still more complex representation, referred to as the situation model (Gernsbacher, 1990; Kintsch, 1998), involves a greater integration of material read, with the reader’s knowledge. The characters, goals, events, actions, and setting are interpreted in terms of the reader’s existing knowledge. Semantic propositions in the reader’s existing knowledge are used to interpret the text propositions. This level of meaning can modify previous constructed representations and can influence subsequent constructions (Kinnunen & Vauras, 1995). Each of these types of representation specify individual sentences and links between them. They are referred to as ‘microstructure’ representations of the text (Kinnunen & Vauras, 1995).

As they read, readers integrate these representations to form an overall impression or ‘macrostructure’ representation of the text. The outcome of this multiple-level text processing is comprehension, or the construction of meaning (Kinnunen & Vauras, 1995). Actions readers take in this integration process include paraphrasing and visualising the text, deciding answers to questions, and predicting and summarising (Munro, 2002). These actions enable readers to synthesise ideas abstracted from the text with their existing knowledge.
Studies have demonstrated empirically that it is possible to discriminate between these levels of text representation (Fletcher & Chrysler, 1990; Kintsch, 1998; Mani & Johnson-Laird, 1982). A critical distinction between the propositional textbase and the situation model is the richness of inference (Kintsch, 1998; Perfetti 1989).

The important role of inference making in the process of understanding text became apparent to psychologists in the early 1970’s (Yuill & Oakhill, 1991). Psychologists came to the conclusion “that the predominant view of the 60’s - that the mental representation of sentences correspond to their linguistic representations - was inadequate” (Yuill & Oakhill, 1991, p. 16).

Difficulty with drawing inferences has been implicated in studies of skilled and less-skilled comprehenders (Cain & Oakhill, 2004; Cain, Oakhill, Barnes & Bryant, 2001; Oakhill & Cain, 2004). The following section provides an overview of how inference has been defined in the literature, and presents studies with children demonstrating the important role of inferencing in reading comprehension.

2.5 What is an inference? How has the process of inferencing been defined?

The current section describes the various ways in which researchers have described the actions taken by readers in making inferences. As noted by Munro (2002), making inferences, involves readers going beyond what is stated explicitly, and linking ideas that were not linked directly in the text. This action is necessary note Brown & Yule (1983), in moving from the literal meaning of what is written, to what the writer intended to convey.

The process of inferencing has also been described by Anderson & Pearson, (1984), as one of judging, concluding or reasoning from given information. According to Van den Broek, Fletcher & Risden (1993), an inference occurs when “when the reader activates information that is evoked by, yet goes beyond, the information that is provided explicitly in the text” (p. 170). This understanding of reader activity has also been described by researchers such as Baretta, Tomitch, McNair, Lim, & Waldie (2009), who suggest that the ability to draw inferences is “a constructive cognitive process in which the reader strives for meaning and expands knowledge by formulating and evaluating hypotheses about the information in the text” (p. 138). Further definitions have been provided by researchers such as Van den Broek, Risden, & Husebye-Hartmann, (1995),
who conceptualise inference as “any information about events, relations, and so on that the reader adds to the information that is explicitly presented” in discourse (p. 353).

McKoon & Ratcliff (1992) suggest that an inference refers to “any piece of information that is not explicitly stated in the text” (p. 444), and note that this definition refers to both necessary inferences, for example those which connect a pronoun to its referent, and more complex inferences such as those that require the reader’s deliberate attention and interpretation.

The fact that there can be between 12 to 15 inferences for every statement expressed in a narrative or expository passage (Weaver & Kintsch, 1991), demonstrates the critical role this process plays in maintaining text cohesion. It is of no surprise then, that this ability has been variously described as the glue that cements the construction of meaning (Suh & Trabasso, 1993), and the heart of the reading process (Anderson & Pearson, 1984). As noted by Dole, Duffy, Roehler, & Pearson (1991), “Even the simplest of texts requires inferencing” (p. 245).

The following section examines the important role played by inference in reading comprehension generally, and then focusses on the role played by this important skill in the development of successful reading comprehension for children.

### 2.5.1 The role of inferencing in reading comprehension: Why is it important?

The current section provides an examination of the important role of inference generation in reading comprehension generally, followed by a closer examination of the role played by inference in reading comprehension for children.

Shears & Chiarello (2004), in highlighting the important role played by the process of inferencing in reading comprehension, provide the following example:

*Jane left early for the party. She spent an hour shopping in the mall.*

Shears & Chiarello (2004), suggest that most readers are able to infer from these two sentences that the reason Jane left early for the party was possibly to purchase a birthday gift. As noted by Perfetti, Landi, & Oakhill (2007), the language of any spoken or written text is not completely explicit and the reader is required to make the necessary inferences to bridge elements in the text and enable successful
comprehension to take place. By creating a situation model for the two sentences above, Shears & Chiarello (2004), note, the reader is able to infer what Jane was doing at the shopping centre.

A significant body of research has demonstrated that the ability to make inferences plays a vital role in understanding and integrating text, and the development of a situation model (Gambell, Block & Pressley, 2002; Cain & Oakhill, 2004; Cain, Oakhill, & Bryant, 2004), and is central to success as a reader (Currie & Cain, 2015; Oakhill, Cain & Yuill, 1998; Pressley, 2002). Based on the comprehensive nature of this evidence, the ability to draw inferences is considered to be “one of the hallmarks of skilled comprehension processes” (Prat & Yamasaki, 2015, p. 224).

By drawing inferences, readers establish a coherent, functional mental representation of the meaning of the text (Kintsch & Rawson, 2007; Oakhill & Bryant, 2004; Tompkins, Guo, & Justice, 2013).

In emphasising the important role of inferencing, Oakhill (1994), suggests that to make sense of even the simplest of texts, inferences need to be generated. Oakhill (1994, p. 822), illustrates this point in the following story about a birthday party.

*Jane was invited to Jack’s birthday.*

*She wondered if he would like a kite.*

*She went to her room and shook her piggy bank.*

*It made no sound.*

As Oakhill notes, this story “can only be understood against a background knowledge about birthday parties, the convention of taking presents to them, the need for money to buy presents, and so on” (p. 822).

Kintsch & Kintsch, (2005), argue that “going beyond the text requires inferences, not only of the gap-filling kind needed to construct a coherent text base, but also to construct a coherent situation model” (p. 78). As noted by Kintsch & Kintsch (2005), some inferences are easily generated and are activated automatically during reading, especially if the topic is a familiar one. “This automatic activation is dependent on rich and deep retrieval structures” (Kintsch & Kintsch, 2005, p.78). In other situations
however, the reader may need to “actively work to infer what is unsaid in the text, and what they need for their personal understanding” (Kintsch & Kintsch, p. 78).

Kintsch & Kintsch cite the following example where the reader must make the connection that the water is river water.

_The river was broad. The water flowed swiftly._

(Kintsch & Kintsch, 2005, p. 78)

Or the gaps may be global, as when the theme of a story is not explicitly stated and left for the reader to construct, or when a reader must realize that a particular paragraph in an essay provides an example for a point made earlier. While this gap filling process has been traditionally labelled ‘inference’, Kintsch & Rawson (2007), note that “this is somewhat unfortunate terminology because it lumps together processes that are quite distinct psychologically and that differ dramatically in the demands they make” (p 219), of the reader. In emphasising these differences Kintsch & Rawson argue that inferences can be viewed as a continuum ranging from those easily and automatically processed, to those which demand the reader’s attention. They also note that a further aspect of the inference process in reading comprehension relates to whether the inferences are based on prior knowledge of the reader, or are text-based.

To illustrate this point, Kintsch & Rawson (2007), provide the following example, firstly, of a knowledge based inference, and secondly, a text-based inference:

(a) A knowledge-based inference where the reader knows that cars have doors

_Fred parked the car. He locked the door,

where the reader must realize that the door is the car door._

(b) A text-based inference where the reader lacks the knowledge to make the comparison between Fred and Tim, and as a consequence needs to extract the information from the text.

_Fred is taller than Mary and Mary is taller than Tim.

where the reader uses the information from the text, to work out that

_Fred is taller than Tim._

(Kintsch & Rawson, 2007, p. 219).
Kintsch & Rawson (2007), argue that not all readers actually make all inferences in every situation. They note in response to the following question, “so what do skilled readers actually do?” (Kintsch & Rawson, p. 9), that what skilled readers actually do is not as straightforward as it would seem, as it depends on a number of factors. They suggest for example that a reader may take a ‘minimalist’, position, making only the inferences required for comprehension of the text, by making a bridging inference. On the other hand, as suggested by Graesser, Singer & Trabasso, (1994), readers may take a more proactive approach. This approach may take the form of routinely inferring causal antecedents, and if the conditions are right, predictive inferences (Klin, Guzman, & Levine, 1999).

The following section examines the way inference operates in successful reading comprehension for children.

2.5.2 The important role of inference in reading comprehension for children

Research has consistently highlighted the important role played by inferencing in reading comprehension for children. For example numerous studies by researchers such as Block, Gambell & Pressley, (2002), Cain, Oakhill, & Bryant, (2004), Pressley, (2002), Tomkins, Guo, & Justice, (2013), have demonstrated that drawing inferences is an essential step in establishing reading comprehension in primary school-aged children.

Further confirmation of the important role played by inference in reading comprehension, comes from the review ‘Effective Teaching of Inference Skills for Reading,’ (Kispal, 2008). A key finding in this report was that “the ability to draw inferences predetermines reading skills: that is, poor inferencing causes poor comprehension and not vice versa” (p. 2). Furthermore, argues Kispal (2008), that in order to be competent at the process of inferencing, students need to take an active approach in striving to make sense of what they read, by monitoring their comprehension, and repairing any misunderstandings. They must also possess a rich vocabulary as well as an efficient working memory. Being an active reader by constantly monitoring one’s own comprehension, is a crucial precondition for successful inferential reading comprehension. In support of this finding it has been suggested that rather than a by-product of good reading comprehension, possessing...
effective skills in generating inferences enables the reader to successfully comprehend text (Cain & Oakhill, 1999).

Cain, Oakhill, Barnes and Bryant (2001), provide strong support for the claim that skilled readers regularly monitor their comprehension as they proceed through text. They note that skilled readers understand that inferences need to be made to fill in missing details, in order to make sense of the texts they are reading, and argue that as a consequence of this monitoring behaviour, skilled readers make more inferences.

An important piece of research demonstrating the important role of inference generation in reading comprehension, comes from a study by Kail, Chi, Ingram, & Danner (1977). Kail et al., note that even second grade children in their study were able to draw inferences using their background knowledge. Children in this study were given sentences such as:

Mary was playing a game.

She was hit by a bat.

Although baseball was not mentioned in these sentences, children in the study were able to use their background knowledge to infer that Mary must have been playing baseball, and establish the causal sequences of actionsl (Kail, et al., 1977).

Further support for the integral role of inference comes from the findings of a number of studies demonstrating that making inferences is a unique skill which supports readers’ comprehension beyond decoding, vocabulary, and verbal skills (Cain, Oakhill, Barnes & Bryant, 2001; Cain, Oakhill, & Bryant, 2004). In the study by Cain, Oakhill, & Bryant (2004), researchers implemented a battery of reading-related measures such as decoding, vocabulary, verbal ability, working memory, inference-making skill, comprehension monitoring, and knowledge of story structure, in a longitudinal analysis of 102 seven-to eight-year-old children. After removing the effects of decoding skill, verbal ability, and working memory, inference-making and comprehension monitoring were the only independent variables contributing unique variance to comprehension.

The following section examines studies from the literature of both skilled and less-skilled comprehenders noting their ability to generate inferences, or in the case of the less-skilled comprehenders, their difficulty in drawing inferences. It describes how the
skill of drawing inferences impacts on the comprehension of these two groups of children, the skilled comprehenders, and the less-skilled comprehenders. Researchers have observed in a number of studies that both of these groups display a number of characteristics or behaviours which enable them to make, or have difficulty in making, the necessary inferences for successful reading comprehension. The first part of the following section makes some general observations from studies in the literature comparing both groups, the skilled and the less-skilled comprehenders. This is followed by descriptions of studies from the literature noting some of the difficulties less-skilled comprehenders experience in making inferences.

It is important to clarify at this point that while the majority of studies cited use terms such as ‘poor comprehenders’, and ‘less skilled comprehenders’, interchangeably, these labels both refer to children with a similar reading profile. Both groups have been labelled this way due to the difficulty they experience in making inferences.

2.5.3 Skilled and less-skilled comprehenders and inferencing ability

As noted by Perfetti, Landi, & Oakhill (2007), deep comprehension requires the reader to build a situation model. This action involves the reader in making the necessary inferences to support the cohesion of the text, and comprehension to occur. Studies have demonstrated that skilled comprehenders make many types of inferences, when and where necessary as they proceed through text (Cain, Oakhill, Barnes & Bryant, 2001; Cain, Oakhill & Bryant, 2004; Kintsch, 1994). For example skilled readers regularly make inferences such as bridging inferences which are essential for developing and maintaining coherence (Kintsch, 1994), while less skilled readers, particularly those with reading difficulties, often fail to do so (Cain & Oakhill, 1998; Carr, Dewitz & Patberg, 1989, Casteel, 1993).

2.5.3.1 Skilled and less-skilled comprehenders: literal understanding versus a mental model

As demonstrated in numerous studies, while poor comprehenders tend to generate a literal understanding of text and process this text in a passive way, skilled readers go beyond the words on the page and actively develop an integrated mental representation of what they read (Bower-Crane & Snowling, 2005; Cain, Oakhill, Barnes, & Bryant, 2001).
As noted by Davey & Macready (1990), inferential comprehension requires more cognitively complex skills compared to literal comprehension. Numerous studies have confirmed this observation in studies examining the differences between skilled and less-skilled comprehenders. The difference between these two groups has been attributed to the difficulty poor comprehenders have in the more cognitively complex skills involved in the processes of inferencing and integrating text (Bowyer-Crane & Snowling, 2005; Cain, Oakhill & Elbro, 2003; Laing & Kamhi, 2002; Oakhill & Cain, 2004; Tompkins, Guo, & Justice, 2013). Importantly, as noted in the literature, the ability to make inferences is a strong predictor of successful reading comprehension (Cain & Oakhill, 1999; Cain, Oakhill & Elbro, 2003; Cain, Oakhill, & Lemmon, 2004). In other words, note Yuill & Oakhill (1991), “skilled children seemed to integrate ideas and construct a coherent mental model, whereas the less-skilled comprehenders tended to generate a representation closer to the verbatim text” (p. 111).

Further studies demonstrating the different ways in which poor comprehenders and skilled comprehenders process text, comes from studies by Oakhill (1984), and Yuill & Oakhill (1991). The study by Oakhill (1984), compared the ability of children under two conditions to answer comprehension questions requiring the generation of an inference. Oakhill’s study was designed to establish whether poor comprehenders difficulties were due to difficulties with inferencing or other factors such as memory for previously read premises in the text. In the first condition children were permitted to look at the text, whilst in the second condition they were not permitted to look at the text, with comprehension questions answered from memory. Results indicated that the less-skilled comprehenders’ ability to generate inferences was still diminished, despite being able to look at the text in the first condition.

The study by Yuill & Oakhill (1991), compared the reading comprehension of both skilled and less-skilled primary school students. The 7 and 8 year old children in the study were matched for age and reading accuracy, but demonstrated significant differences in reading comprehension, based on a norm-referenced, standardized test that measured both aspects of reading separately. Results of the study indicated that compared to the less-skilled comprehenders, the skilled comprehenders understood pronoun references, made accurate inferences from words in the text, and made more global inferences from parts of the text that were not adjacent.
In comparing the attributes of skilled and less skilled comprehenders, researchers have also found that skilled comprehenders make many different types of inferences compared to less skilled comprehenders as they proceed through text (Pike, Barnes, & Barron, 2010). They make more anaphoric inferences, (Oakhill, 1993; Oakhill & Yuill, 1998; Yuill & Oakhill, 1988, 1991), and more causal inferences (Long, Oppy, & Seely, 1997; Graesser & Kruez, 1993; Trabasso & Suh, 1993). Anaphoric inferences are often referred to in the literature as ‘necessary’ inferences, as they are one of the most common types of inferences. When making these types of inferences, readers are required to connect a pronoun, noun, or phrase, to information presented earlier in the text (Cook & O’Brien, 2015). Explanatory inferences refer to the action taken by the reader in connecting current information to former information in order to make an inference based on this information (Laing & Kamhi, 2003). Causal inferences refer to the action taken by the reader to establish the reason or cause of a situation or action (Trabasso & Suh, 1993).

Skilled comprehenders also integrate information across stories better than do less-skilled comprehenders (Long, Oppy & Seely, 1997), and are more skilled in identifying the main point of a story than less-skilled comprehenders (Yuill & Oakhill, 1991, 1988).

A study by Yuill & Oakhill (1991), compared two groups of 7-8 year olds across a number of studies. Students were matched for reading accuracy and chronological age but differed significantly in results of a standardized norm-referenced reading comprehension test. As noted by the researchers, the skilled comprehenders who were at, or slightly above the expected level for their chronological age in relation to reading comprehension, obtained higher scores than the other students in the study in regard to both word knowledge and sentence comprehension. For example, they demonstrated a good understanding of pronoun references, were able to draw the appropriate inferences including global inferences from separate parts of the text, used their background knowledge, and applied monitoring strategies.

2.5.3.2 Skilled and less-skilled comprehenders and instantiation

A further study of skilled and less-skilled comprehenders by Oakhill (1983), examined the role of instantiation, a term used to describe the process of inferring meanings of words based on their context and world knowledge. Oakhill used a cued recall paradigm to investigate the relationship between 7 to 8 year olds’ skill at “reading with
a series of short sentences, and either the general noun that had appeared in the original sentence, or a particular noun that fitted the context, was given as a cue” (p. 441). Results indicated that both groups of students involved in the study, the skilled and less skilled comprehenders, performed equally well on recall of the original sentences. However, when given the particular word cues, the skilled group used the instantiation process more efficiently. These results notes Oakhill (1983), were independent of superior general knowledge as a control test was used in the study.

### 2.5.3.3 Skilled and less-skilled comprehenders and monitoring

A number of researchers such as Dole, Duffy, Roehler, & Pearson (1991), claim that “monitoring distinguishes the expert from the novice reader” (p. 249). They suggest that “Good readers are better than poor readers, not only at reading, but also at monitoring, controlling, and adapting their strategic processes while reading” (p. 246). Similar findings were apparent in the results of a study by Baker & Brown (1984), who noted that poor comprehenders not only demonstrate little awareness of problems that may exist in their understanding of a text, but are unable to solve them even if they have been brought to their attention. However, Cain & Oakhill (1998), paint a slightly different picture, and suggest that when poor comprehenders are informed of their lack of understanding, they are able search for information and create links in the text.

Further support for the important role of monitoring comes from studies by Perfetti, Landi & Oakhill (2007), Baker (1984), Garner (1980), and Hacker (1997). Perfetti et al., argue that successful readers who strive to make meaning from what they read, must monitor their understanding of text. As noted in their studies of skilled and low-skilled students, both Baker (1984), & Garner (1980), argue that while skilled comprehenders use apparent inconsistencies as a signal for rereading and repair, less-skilled comprehenders fail to do so. A study by Hacker (1997), while confirming the findings by Baker (1984), and Garner (1980), argues that this pattern occurs regardless of age. For example in Hacker’s study of eleventh and ninth grade students with low monitoring performance, students from the eleventh grade cohort were no better at monitoring for coherence than the ninth grade students. This demonstrates that age or grade level is not positively associated with skill in monitoring (Hacker, 1997).
2.5.3.4 Poor comprehenders and processing text
A number of studies have looked particularly at characteristics of poor comprehenders in relation to their processing of text, and how this action affects their inferential reading comprehension. These studies have examined the ways in which poor comprehenders monitor text, their difficulty generating certain types of inferences, their difficulty in making inferences spontaneously, and in drawing inferences at the appropriate time.

The role of monitoring in poor comprehenders was examined by Cain, Oakhill, Barnes, & Bryant (2001). The researchers suggest that skilled comprehenders generate more inferences than less-skilled comprehenders due to the way in which they regularly monitor their comprehension, and make inferences when and where necessary. This possibility was also investigated in studies by Oakhill (1982), who found that at the text level the less-skilled comprehenders did not appear to integrate information across sentences, and were less likely to recognise sentences that could have been inferred.

Oakhill, Hart, & Samols (2005), also found that less skilled comprehenders were less proficient at paragraph-level detection of anomalies than skilled comprehenders after controlling for decoding and vocabulary differences. In addition, a study by Yuill & Oakhill, (1988), found 7-8 year-old poor comprehenders “differed from good comprehenders, matched in age and decoding skill, primarily in their failure to make high-level inferences, despite adequate text recall” (Yuill & Oakhill, 1988, p. 33). However, in a study that used questions that tapped literal information, less-skilled comprehenders performed at a comparable level to their peers (Cain & Oakhill, 1999).

2.5.3.5 Poor comprehenders and knowledge availability
A study by Cain, Oakhill, & Barnes (2001), investigated the relationship between the ability to generate inferences when knowledge was available, and reading comprehension. The design of Cain et al’s (2001), study was such that all children were able to learn the knowledge base from which the inferences could be generated with relative ease. The less skilled comprehenders in the study generated significantly fewer inferences than the skilled comprehenders, despite being skilled in vocabulary knowledge. Cain et al., (2001), argue that “Knowledge availability is therefore not a sufficient condition for inferencing” (p. 857). Lack of knowledge as a primary source of poor comprehenders’ inference-making difficulties therefore, can be ruled out of
the equation, argue Cain et al (2001, p. 857). Cain et al (2001), note that for the less skilled comprehenders in this study a common source of difficulty in generating inferences “was a failure to retrieve the relevant textual premise” (p. 857). The authors noted that “Recall of the incorrect premise suggests that the less skilled comprehenders experienced difficulty in selecting the relevant information on which the inference should be based” (Cain et al. 2001), p. 857.

2.5.3.6 Poor comprehenders and type of inferences encountered

A further line of inquiry in relation to poor comprehenders and the difficulty they face in generating inferences, relates to the type of inferences encountered (Nation, 2007). Support for this claim comes from studies by Cain & Oakhill (1999), and Cain, Oakhill, Barnes, & Bryant (2001). These studies compared poor comprehenders ability to generate both cohesive and elaborate inferences, whilst controlling for individual differences in general knowledge. While cohesive inferences are necessary for the establishment of links between ideas in a text, elaborative inferences, while not considered essential for cohesiveness, are considered to enrich readers’ understanding of the text (Nation, 2007). Results of the two studies, by Cain, et al., (2001), and Cain & Oakhill (1999), indicate that poor comprehenders have difficulty with the generation of both cohesive and elaborate inferences.

2.5.3.7 Poor comprehenders and ability to make inferences spontaneously

Results from a number of studies suggest however, that it is not because less-skilled comprehenders are incapable of making inferences (Block, Gambrell, & Pressley, 2002; Cain, Oakhill, Barnes & Bryant, 2001; Cain & Oakhill, 2014; Casteel, 1993), but rather, that some fail to do so spontaneously (Cain, Oakhill, Barnes, & Bryant, 2001; Cain & Oakhill, 2014; Carr, Dewitz, & Patberg, 1989).

Further evidence in support of this claim comes from studies by Paris & Lindauer (1976), Oakhill (1984), and Cain & Oakhill (1999). The study by Paris & Lindauer involved seven and eleven year old children reading sentences that either implied or explicitly stated an instrument of action, such as:

“The workman dug a hole in the ground (with a shovel).”

Sentences were later cued with either the implicit or explicit instruments from the sentences. Whilst the eleven-year-olds successfully used both cues to recall the sentences, implicit retrieval cues were more difficult for the seven-year-olds, who
failed to comprehend the inferences spontaneously. However, when the seven-year-olds were encouraged to imitate the actions of the sentences (thus processing the inferences), both implicit and explicit cues were retrieved equally well. Results of the study suggest that unless specifically directed to, young children often fail to apply inferential strategies and thoroughly process text.

A similar study by Cain & Oakhill (1999), replicating Oakhill’s (1984) study, encouraged and prompted children to search the text for information required to generate an inference, and answer comprehension questions. Cain & Oakhill (1999) note that the results of this study, indicating an increase in the performance of the less-skilled participants, suggests a failure on their part to draw inferences spontaneously, rather than an inability to make inferences.

2.5.3.8 Poor comprehenders and ability to draw inferences at the appropriate time

Not only do some less skilled comprehenders fail to make inferences spontaneously, they also differ from skilled comprehenders in their ability to know when to draw inferences (Yuill & Oakhill, 1991). Yuill & Oakhill (1991), suggest that less skilled comprehenders may leave it too late and forget some of what they have read. However, Cain & Oakhill (1999) proposed that the reason 7-8 year old less-skilled comprehenders performed poorly on gap filling questions was due more to poor timing. In other words, their failure to understand when to use relevant knowledge when reading. On the other hand, as noted by Cain, Oakhill, Barnes & Bryant (2001), skilled comprehenders may generate more inferences because they regularly monitor their comprehension, and make inferences when and where necessary to fill in missing details. On the basis of these findings, Cain et al., (2001), suggest that while poor comprehenders are capable of integrating information from the text at a local level, they have difficulty in producing a cohesive, integrated model of the text as a whole.

The current section provided an overview of how inferences have been defined in the literature and why the skill of inferencing is important for successful reading comprehension. This overview was then followed by an examination of the role played by inference generation in reading comprehension for children. The characteristics of successful and less-successful comprehenders in relation to inference generation was then examined. The following section looks at how children come to approximate the adult model of inference making.
2.5.4 Progress to an adult model of inference making

As noted by Perfetti, Landi & Oakhill (2007), once children develop the skills necessary for effective reading comprehension, they start to emulate the adult model of inference generation. The adult model note Perfetti et al., (2007), is complex because readers generate only some of the plausible inferences within a text. Perfetti et al., (2007), propose that two broad principles seem to be at play in this adult model:

1. Inference generation is costly to processing resources

2. The reader strives to develop some degree of coherence in the mental model

(Perfett et al., 2007, p.231)

In this adult model argues Perfetti et al (2007), inferences such as mapping a pronoun onto a antecedent for example, which the reader makes without much cost to resources, are more likely to be made than inferences that are ‘resource demanding’ (Perfetti et al., 2007, p. 231). For example ‘inferring that an action described abstractly in the text was performed in a certain way- “going to school” elaborated as taking a bus to school’ (Perfetti et al., 2007, p. 231). It also means that within the adult model, inferences that support coherence are more routinely made than those that merely elaborate.

However, in attempting to explain the variability in children’s tendencies to make inferences, Perfetti (et al., 2007), note that explanations are problematic as the role of lower level comprehension processes and knowledge need to be factored into the equation. For example, difficulties attributed to vocabulary knowledge, deficients in general knowledge, and processing limitations which negatively effects the generation of inferences and integrating text information with prior knowledge (Yuill & Oakhill, 1991), need to be taken into consideration.

As noted by Carr, Brown, Vavrus, & Evans, (1990), in recognising that many skills may contribute to a child’s reading comprehension, a number of researchers have administered a battery of perceptual, cognitive, and linguistic tasks to determine the relative amounts of variance uniquely associated with a number of these component process. Component skills identified in the literature include word level ability, prior knowledge, and working memory. Although it has been demonstrated that good
comprehenders use specific strategies and skills (Block, Gambrell, & Pressley, 2002), Hannon & Daneman (2001), claim that our knowledge of the unique contributions made by different skills and processes to inferential reading comprehension development is limited. This observation by Hannon & Daneman (2001), has important implications for research.

2.6 Concluding Remarks
Reading is a very complex, interactive process, and becoming a competent reader requires a number of important skills to be mastered. These skills include understanding the purposes of reading, both explicit and implicit, activating relevant background knowledge, allocating attention on the major content of the text, critical evaluation of content and internal consistency, ensuring compatibility with prior knowledge and common sense, monitoring of ongoing activities to ensure comprehension is occurring by engaging in activities such as periodic review and self-interrogation, and the processes involved in drawing and testing many kinds of inferences.

However, in acknowledging the important role these skills play in the process of reading comprehension, the message is very clear that reading is also a very strategic, and active process of constructing meaning, rather than simply a set of skills to be mastered. One of the actions that distinguish good comprehenders from poor comprehenders in making sense of print, is the ability to implement a range of strategies and skills such as inferencing, the focus of this study. However, our knowledge of the unique contributions these strategies and skills make to the development of inferential reading comprehension is somewhat limited. The present study investigates the relationship between a number of component skills and strategies, and inferential reading comprehension in both narrative and factual texts for students in grades 2-6.
Chapter 3  Learning to infer

The current chapter provides an examination of the literature in regard to developmental trends in the acquisition of inferential comprehension, describing studies of preschool and primary school-aged students and their ability to make inferences. This chapter sets out a developmental sequence of inference types in narrative text, suggesting that some types of inferences may be easier than other. The literature proposes that this developmental trend is influenced by whether the inference (1) draws on automatic versus controlled processes, and (2) retrieval, deletion or the the generation of knowledge. While there are numerous studies in the literature supporting a developmental sequence for inferring in narrative text, little research is available on developmental aspects of inferential reading comprehension in factual text.

This chapter also examines what research has to say about associated areas of knowledge such as prior knowledge, word level knowledge, text structure, and working memory, and their relationship with inferential reading comprehension. Finally, the current chapter examines questions arising from the literature review, which include the relationship between paraphrasing and interrogative ability and inferential reading comprehension.

3.1  Developmental trends in learning to infer.

To examine the relative difficulty of one type of inference over another, consideration needs to be given to developmental trends in how children acquire the skill of learning to infer. It is possible that what may be difficult at age 5 for example, may not be so at 8 years of age. It has also been suggested that the skill of inferencing develops in line with the acquisition of world knowledge through both implicit and explicit learning experiences; even young children are capable of making these inferences, although the ability to do so is often constrained by lack of background knowledge or knowledge of textural features. (Kendou, 2015). While young children are capable of making inferences, they do not make them as consistently, and frequently as older children and adults (Casteel, 1993).
3.1.1 Developmental considerations

Developmental studies of inference making demonstrate that adults and children may differ quantitatively in how they infer when reading (Hansen, 1981). While studies have demonstrated that skilled, adult readers make inferences when and where necessary to maintain text coherence, the picture is less clear in young children (Cain & Oakhill, 1998). However researchers agree that these skills develop gradually and systematically over time as children mature and gain experience (Perfetti, Landi & Oakhill, 2007; van den Broek, 1989a; van den Broek, Kendeou, Kremer, Lynch, Butler, White, Lorch, 2005). As Perfetti, Landi & Oakhill (2007), point out, once children have acquired the skill of reading, their actions closely approximate the model of inference generation used by adults. However, they only make some of the plausible inferences in a narrative, due to the complexity of the adult model (Perfetti et al., 2013).

Hansen & Pearson (1983), point out that for children the process of inferring is a regular occurrence throughout their lives. For example they are constantly trying to figure out how things in the world around them work, and they do this by the process of inference- inferring likenesses and differences between things they already know and understand, and new, unfamiliar experiences.

Trabasso & Magliano (1996b), suggest that children as young as two and a half to three years of age use narrative to describe the causes and consequences of real-life experiences, and become sophisticated storytellers between the ages of 3 and 5. During this latter stage they infer goals and plans of characters, and use this knowledge to interpret, describe, narrate and explain sequences of experiences in an increasingly coherent way (Trabasso & Magliano, 1996; Trabasso & Stein, 1994). Trabasso & Stein (1994), argue that this early ability to use knowledge of story structure for comprehension purposes continues to improve with age.

While it has been proposed that children of kindergarten age demonstrate the ability to make inferences (van den Broek et al., 2005; Kendeou, 2015; Trabasso & Magliano, 1996), researchers such as Dreher (1981), suggest that children of this age are much less likely to do so spontaneously than older children. The spontaneous use of inferences they claim, does not occur until around grade three. As Casteel & Simpson (1991), suggest, despite the proficiency with which young children generate inferences, these skills still require further development as they grow older.
Results of a study of preschool children by van den Broek et al., (2005), using non-textural materials such as television narratives, suggests that the comprehension processes they use when trying to make sense of events and facts they encountered, are very similar to the reading processes used by adolescents and adults. Van den Broek claims that the basis of these processes for preschool children is the working out of how relationships work between events and facts, specifically of causal and referential relationships. A young child’s ability to be actively engaged in these meaningful relationships is predicative of successful reading comprehension as they mature, suggests van den Broek (2005).

While Barnes et al, (1996), suggest that children appear to use inferences spontaneously in normal daily activities such as analysing differences and similarities, Hansen (1981), notes that they fail to make them as spontaneously, and consistently when reading. Hansen’s observation is confirmed in studies by Paris & Lindauer (1976), Paris, Lindauer & Cox (1977), and Casteel & Simpson, (1991). who demonstrated that while young children were less likely to generate inferences than older children, this was not because they were incapable of this process, but rather that they required prompting or questioning to do so.

Casteel & Simpson (1991), examined the ability of second, fifth, eighth grade children, and college under-graduates, to make inferences when reading. Subjects read eight stories from which two types of inferences could be drawn: backward inferences critical to comprehension of stories, and forward inferences, not necessary for this skill. Subjects then answered questions to check that the appropriate inferences had been drawn. At all grade levels backward inferences were drawn more rapidly and reliably, compared to forward inferences. Results of the study suggest that children as young as second grade are able to draw inferences from text, particularly when drawing these inferences is required for coherence purposes.

While research indicates that during comprehension fluent readers regularly make inferences that bridge two ideas or propositions within a text to maintain coherence (Barnes, Dennis, & Haefele-Kalvaitis, 1996; Perfetti, Landi, & Oakhill, 2007), other studies have indicated that both elaborative and coherence inferencing improve as children age and mature (Ackerman, 1988; Zabrucky & Ratner, 1986; Schmidt & Paris, 1983). Other studies have demonstrated that as a consequence of young children’s
sensitivity to causal constraints in a text, children as young as 8 to 9 years old make more coherence inferences than the necessary elaborative inferences that elaborate on the text, in their search for meaning (Casteel, 1993).

A study by Barnes, Dennis, & Haefele-Kalvaitis (1996), involving 51 readers, aged between 6-15 years, provided participants with a common, fictional knowledge base to eliminate differences in existing background knowledge, as background knowledge has been shown to affect the drawing of elaborate inferences. Results of the research suggest that taking into consideration their importance in relation to understanding of the text, for all age groups coherence inferences were made more frequently than elaborate inferences. The researchers note that these results extend previous findings demonstrating that even six year old children demonstrate sensitivity to the causal constraints in a story, despite these inferences being more difficult for them than inferences that elaborate on a story.

Other studies indicate that the ability to infer develops between the ages of 6-12 years (Kail, Chi, Ingram, & Danner, 1977; Paris, Lindauer, & Cox, 1977; Paris, Cross, & Lipson, 1984), with the suggestion that children develop the ability to recognise referential inferences initially, followed by causal, and then thematic inferences (Van den Broek, 1997). Hansen (1981), and Hanson & Pearson (1983), note that children as young as second grade can improve on their inferencing abilities, with appropriate instructional support in integrating prior knowledge.

Stein & Glen (1982), argue that by the age of 6-7, children can produce an ideal, adult-like form of narrative which continues to become more refined throughout late childhood and early adolescence. According to van den Broek et al, (2005), this later stage is often characterized by an increase in the number of episodes in the narrative, as well as a more sophisticated approach to linking multiple episodes together in more complex ways. Young children, notes van den Broek (1997), tend to focus on specific events within a story, and forget about the goals that hold the events together.

Beach & Wendler (1987), suggest that older children are better than younger children at identifying important information in stories such as character’s feelings and goals. The study by Beach & Wendler compared the inferences made by students in years 8, & 11, as well as college students, related to character’s acts, goals, and perceptions. Beach & Wendler (1987), suggest that as readers develop from early adolescence to
young adults they move from a superficial understanding of characters surface feelings and behaviours, to a deeper understanding of their psychological beliefs and goals.

A study by Lehr (1988), examined the nature of children’s sense of theme in narratives. A total of sixty children across kindergarten, grade two and grade four listened to six stories being read- three realistic fiction and three folktale books, with two of the three books in each genre sharing a common theme. The children were then asked to identify books with similar themes and to state the themes. Results suggest that the ability to identify theme appears to develop early, with kindergarten children able to identify thematically matched books for 80% of the realistic fiction books, and 35% of the folktales. Lehr (1988), argues that the children’s ability to generate thematic statements were highly correlated with their exposure to literature, noting that children in the low exposure group provided responses that were too vague or too concrete. While kindergarten children in Lehr’s (1988), study were able to both grade children were able to analyse, as well as make generalisations about the stories.

Text-based factors, such as the distance between ideas in the text that need to be integrated have been suggested as having developmental implications, with studies by Barnes, Dennis & Haefele-Kalvaitis (1996), Cain, Oakhill & Lemmon, (2004), Cain, Oakhill & Elbro, (2003), finding that younger children and less-skilled comprehenders are more affected by the separation of ideas in texts than older children and more skilled comprehenders. Text-based factors were also examined in research by Wagner & Rohwer (1981), who found that younger children are more reliant on textural support than older children. However, results of their study indicated that when texts provided sufficient contextual support, preadolescents were as successful in generating inferences as that of late adolescents.

An additional finding which may impact on children’s ability to make inferences, includes the suggestion that performance on error-detection improves with age (Markman, 1981; Baker, 1984). This may be related to their developing information processing capabilities, as well as their levels of interest in particular tasks (de Sousa & Oakhill, 1996).

DeKemel (1998), links children’s development in narrative and inferencing abilities with Piaget’s stages of cognitive development. As children’s cognitive abilities increase over time, narratives become more elaborated in parallel with skill in generating
inferences. DeKemel maintains that there may be a relationship between the age at which children can produce fully developed narratives and adult-like inferences (6-7 years), and their transition from the pre-operational to the concrete operational stage (Piaget, 1954, cited in DeKemel, 1998). However, as van den Broek, et al., (2005), point out that what appear to be developmental differences may have more to do with increases in background knowledge and efficiency in processing than in developmental differences themselves.

A classic example of this situation notes van den Broek et al (2005), can be seen with very young children who make extremely complicated and abstract knowledge structures for areas in which they have developed a rich knowledge base. In support of this claim, van den Broek et al (2005), refer to a study of reading comprehension by Chi & Koeske (1983), demonstrating a four and a half year old child’s extensive memory of 40 different types of dinosaurs he had studied in dinosaur books. In this study the preschool child retained accurate descriptions of the attributes of each of the each forty dinosaurs, despite not having seen the books they were depicted in for over a year and a half.

On the one hand note van den Broek, et al., (2005), it is clear that children at an early age engage in very much the same inferential processes as do adults. In support of this claim van den Broek et al (2005), refer to a study by van den Broek, Lorch & Thurlow (1996), suggesting that when 4 and 6 year old children watch television programs they tend to recall events with fewer causal connections less well than they remember events with many causal connections. Furthermore, when these children are questioned relating to events in these programs, they consistently answered them by following the connections created in the network (van den Broek et., al., 2005).

Van den Broek et al., (2005), also refer to similar findings observed in a study by Trabasso & Nickels (1992), where six year olds listened to aurally presented stories. Referring to this study van den Broek et al., note that even 4 year old children make causal inferences and establish strong connections between the various parts of the events they experience in much the same way as successful readers do. Furthermore note Van den Broek et al (2005), referring to a study by Wenner & Bauer (1999), even children as young as 20 months are able to identify causal relations between arbitrarily ordered 3-step event sequences given appropriate materials and testing techniques,
however, developmental aspects are apparent in the ability to infer semantic relationships.

Van den Broek et al., (2005), provide a summary in Table 3.1, noting some of these developmental differences. As noted in this table, Van den Broek et al., suggest that while very young children are able to identify relations between concrete events, older children can do so between abstract events. Similarly, while young children are able to identify relations between external events, older children and adults routinely identify relations between internal events such as the feelings and goals of characters (van den Broek et al, 2005).

Finally, while young children tend to make inferences when attempting to identity relationships between discrete events, as they grow older they increasingly identify relations between groups of events. These developmental changes, notes van den Broek et al., (2005), not only reflect the experiences of children at different ages, but also the increasingly important role of working memory and the ability to focus and attend to the processes involved in comprehension.

However, van den Broek et al., (2005), argue that although very young children are capable of generating all of these types of inferences, in most cases they need the inferences to be simpler and more supported by the text itself or by their knowledge of the topic or context, than do older children. Van den Broek et al., (2005), clarify this position in stressing that when text materials are particularly challenging even experienced readers sometimes fail to make the types of inferences they normally would make.

<table>
<thead>
<tr>
<th>Relations between Concrete Events</th>
<th>Relations between Abstract Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relations between External Events</td>
<td>Relations involving Internal Events</td>
</tr>
</tbody>
</table>

Table 3.1: Examples of Developmental Trends in Inference Making in Narrative Comprehension (van den Broek et al, 2005)

Van den Broek et al., (2005), point out that these findings are consistent with those found in other areas in cognitive development, for example the study by Massey & Gelman (1988). In this study three and four year old children viewed photographs of unfamiliar objects, including mammalian animals, non-mammalian animals, statues with animal-forms and parts, wheeled vehicles, and multipart rigid objects, and decided whether each item could go up and down a hill by itself. While explanations
from both age groups varied, they consistently demonstrated the kind of information and criteria used to make inferences as a function of the type of item.

### 3.1.2 Proposed developmental sequence for narrative comprehension (van den Broek, et al., 2005)

In Table 3.2, van den Broek et al (2005), sets out a proposed developmental sequence for narrative comprehension, but cautions that definite ages for each step are not provided as types of inferences made at particular times are dependent on the relationship between both the child’s background knowledge and the level of complexity required in generating the inference. The authors argue that this understanding is in line with other theoretical accounts of cognitive-developmental sequence such as Paiget (1954), where suggested age ranges are illustrative rather than definitive.

As noted in Table 3.2, the first type of relation identified by children involves concrete, physical relations between events occurring close together in the narrative. The example provided by van den Broek et al., (2005), is that of John dropping a banana peel and Mary slipping on it. The second type of relation identified by children concerns relations between distant events. In the third type, children are able to identify causal relations involving characters’ goals, emotions, and desires, such as the joy experienced as a result of a new toy and how this may, in turn, lead to laughter. In the fourth type, children become more experienced and extend their cognitive skills, enabling them to increasingly recognise the relationships between groups of events, both those that are thematic in nature as well as those that are hierarchical in nature. For example, they recognise that narratives are made up of several episodes, based around a goal and connected by a theme. And finally they recognise that the theme running through the episodes translates into a plot or point of the story, for example the moral or lesson of the narrative (van den Broek et al, 2005).

<table>
<thead>
<tr>
<th>Developmental Order of Inference Making</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>
3.1.3 Developmental studies of inferential reading comprehension in expository texts

While a number of studies have investigated developmental aspects of inferential comprehension in narrative text, little research has been carried out in expository text. What little research there is available on developmental aspects of inferencing in this text type, has focussed mainly on elementary school students and adult readers (Englert & Hiebert, 1984; Millis & Graesser, 1994; Narvaez, van den Broek, & Ruiz, 1999).

The study by Englert & Hiebert (1984), focused on developmental aspects related to knowledge of expository text structure in elementary school aged children. Findings from this study indicate a positive relationship between grade level, reading ability and knowledge of discourse types and structures, such as factual texts. As noted by Englert & Herbert, this knowledge is incremental, increasing as students reach the upper elementary grades. The authors note that although some research suggests that second and third grade students are able to identify the main ideas in paragraphs, little is known in relation to how children’s awareness of text structures develops, and what we do know has mainly focussed on older readers.

3.2 The coherence of the text:

While it is well established that content or background knowledge is an important aspect of comprehension (Brando & Oakhill, 2005; Kintsch, 1994; Reutzel, Camperell, & Smith, 2002), the level of coherence of a text also plays an important part (Baker & Brown, 1984; Nahatame, 2017; Pardo, 2004, van den Broek et al., 2011). Baker & Brown (1984), suggest that the way in which text is written can either help or hinder comprehension. According to the RAND Reading Study Group: Snow, (2002), readers require a well-structured text that presents information in a clear and logical manner to support comprehension. The importance of well structured text is also noted by Kintsch (1994), who suggests that it is not just the complexity of the content that affects learning, but the way in which this content is expressed, also has an effect.

However, a number of researchers claim that although good writing can support understanding, there are limits to what can be achieved. Kintsch (1994), for example,
argues that good writing can make comprehension too easy for the reader, whereby minimizing what they need to do for themselves. Active participation in the comprehension process, notes Kintsch (1994), helps memory and learning. Further support of this claim, comes from a study by McNamara, Kintsch, Songer, and Kintsch (1996), who found that while readers with little domain knowledge of the text benefit from a more coherent text, the opposite is true for readers with a depth of knowledge of the text. The authors of the study argue that a minimally coherent text is most beneficial for high-knowledge readers as it forces them to engage in compensatory processing by inferring unstated relations in the text. Furthermore they claim their “study provides evidence that the rewards to be gained from active processing are primarily at the level of the situation model rather than at the superficial level of text base understanding” (1996, p. 1). Texts that provide optimal learning opportunities claims Kintsch (1994), are those which “overlap in content sufficiently, but not totally, with what readers already know” (p. 302).

The possibility that reading for different purposes may be associated with the level of coherence required of the text, has also been explored by van den Broek & Kremer (2000), who suggest that “how readers approach the comprehension process depends on their evaluation of the situational goals” (p. 15). For example less stringent standards of coherence may be used when reading for different purposes, such as entertainment compared to educational purposes (van den Broek & Kremer, 2000).

While it is widely accepted that text characteristics such as structure, vocabulary and topic, as well as reader characteristics such as reading skills, working memory and background knowledge, influence a reader’s comprehension of a text (Nahatame, 2017), a third major factor of reader characteristics has been suggested. This aspect refers to “the types and strengths of coherence the reader aims to maintain during reading, commonly referred to as standards of coherence.” (van den Broek, Risden, Trabasso, & Basche, 2001, p. 124). These standards assume a direct connection between the level of comprehension achieved and the standards the reader holds (van den Broek, Risden, & Husebye-Hartmann, 1995). In other words, readers with high standards would take a more critical overview of the coherence of a text than readers with low standards (Nahatame, 2017). Put simply, the standard with which a reader
examines the coherence of a text, directly affects their level of reading comprehension (van den Broek et al., 2005).

A number of studies in the literature have noted that reader characteristics, such as readers’ goals, can affect successful comprehension of text (van den Broek & Kremer, 2000; van den Broek, Lorch, Linderholm, & Gustafson, 2001). The effects of readers’ goals on inference generation was examined in a study by van den Broek, et al. (2001). The researchers observed that the generation of inferences varies according to reading situations, and explored possible reasons for this phenomena. While they acknowledge that inferential reading comprehension is affected by a number of aspects such as reading skill, comprehension ability, working memory capacity and background knowledge, they propose that readers’ purpose or goals for reading, can also effect the knowledge and skills they apply to the reading situation. Based on the results of their study, van den Broek et al., (2001), argue that “reading goals influence readers’ standards of coherence, which in turn influence the type of inferences that they draw” (p. 1081).

However, it has also been noted that both child and adult readers often find it difficult to accurately assess their level of comprehension (Glenberg, Wilkinson, & Epstein, 1982; Hacker, Dunlosky, & Graesser, 1998). Glenberg et al., (1982), claim that readers have a tendency to assume comprehension by measuring success on an understanding of the explicit, surface content of a text, rather than the deeper levels of understanding. This tendency is in contrast to the monitoring behaviour of expert readers, who are more skilled in the appraisal of their comprehension, and self-check as they progress in their reading. Glenberg et al., (1982), note that this situation has important implications for practice, as teachers may assume that deep comprehension has accured if understanding is based only on the perceptions of students.

The following section examines associated areas of knowledge involved in the generation of inferences—prior knowledge, word level knowledge, text structure, and working memory. Each of these areas of knowledge have been noted in the literature as playing an important role in the development of inferential reading comprehension.

3.3 Associated areas of knowledge
The present study proposes that the inferring mechanism involves various aspects:
• making links with the propositions already known to the reader (prior knowledge)
• accessing the reader’s vocabulary
• accessing knowledge of text structure (narrative and expository), and
• the ability to maintain the propositions assembled during reading in short term working memory.

Each of these aspects is examined in the following section.

3.3.1. Prior knowledge.
It is widely acknowledged that readers of all ages and abilities use their existing or prior knowledge to interpret and construct meaning of a given text (Armand, 2001; Block & Paris, 2008; Brandao & Oakhill, 2005; Pressley, 2000, 2006). However, what is typically referred to in the literature as general knowledge comes from many different areas of knowledge.

For example Resnick (1984), argues that prior knowledge is made up of three distinct sources of knowledge:

(a) specific knowledge about the topic;
(b) general world knowledge about social relationships and causal structures; and
(c) knowledge about the organisation of the text.

When readers have adequate prior knowledge they have little difficulty taking an active role in comprehension by generating inferences and integrating information across sentences for use in comprehension monitoring (Cain, Oakhill, Barnes, & Bryant, 2001; Pressley, 2002; Reutzel, Camperell, & Smith, 2002). As noted by Cain, Oakhill, Barnes, & Bryant, (2001), differences in general knowledge are potentially a source of difference in the generation of inferences.

To examine the possibility that knowledge of a domain increases understanding of a text in that domain, Chiesi, Spilich, & Voss, (1979), and Spilich, Vesonder, Chiesi, & Voss, (1979), examined the effects of prior knowledge on comprehension and memory in adults. Adults with both high knowledge and low knowledge about baseball read a text about a baseball match. The high knowledge adults not only recalled more of the text, but what they recalled was more significant. For example, they demonstrated
better recall of the order of events and integrated these events more successfully. Low knowledge adults tended to recall more peripheral information.

A study by Mar & Gormley (1982), demonstrated that prior knowledge of topics was a better predictor than general comprehension skill in generating inferences for second and fourth grade students respectively. Based on the results of their study, Marr & Gormley (1982), argue that relevant background knowledge of a passage is a more reliable indicator of fourth grade readers’ ability to draw inferences and elaborate on the text they have read, than is their general comprehension skill. They suggest that while prior knowledge as well as comprehension skill were predictive of overall performance in comprehension, the strongest predictor of the ability of students to make inferences, was their general knowledge of topics.

However, although readers’ background knowledge is crucial to comprehension (Armand, 2001; Brandao & Oakhill, 2005; Reutzel, Camperell, & Smith, 2002), it has been suggested that the relationship is not always a simple one, as demonstrated in results of the following studies.

### 3.3.1.1 Studies suggesting a more complex relationship between background knowledge and reading comprehension

A number of studies in the literature suggest that the relationship between background knowledge and inferential reading comprehension is not as straightforward as it would seem. The current section describes a number of these studies.

A study by van den Broek & Kremer (2000), demonstrated that a reader’s expertise in a particular subject area may make them appear to be more skilled in reading comprehension than they actually are. Based on the results of their study van den Broek & Kremer (2000), argue that text subject matter can greatly affect assessment of reader competencies. For example, when provided with text in their area of expertise, poor readers may seem more skilled than skilled readers. Conversely, highly skilled readers may see less proficient when presented with complex texts relating to a topic in which they have little prior experience (van den Broek & Kremer, 2000).

Results of a study by Barnes, Dennis, & Haefele-Kalvaitis (1996), in which a novel knowledge base was taught to 6-15 year old children, and inferences from a story presented to the students only drew on that knowledge base, demonstrated that despite the need for a knowledge base in successful inferencing, the age-related
differences in inference generation demonstrate that this is not sufficient, and that for successful inferencing to occur other skills must contribute.

A number of studies have also suggested that the way the way in which readers access their prior knowledge is not always as straightforward as it would seem. For example, it has been argued that readers’ levels of proficiency can also affect the way in which background knowledge is accessed. While good readers use their prior knowledge to make inferences necessary for successful comprehension of text (McKoon & Ratcliff, 1992; van den Broek & Kremer, 2000), the associations poor readers make to prior knowledge are often only remotely related to what they have read. For example results of a study by Zwaan & Brown (1996), suggest that proficient readers often access background knowledge in a more restrained and effective way than do less proficient readers.

In a study of 7 to 8 year old skilled comprehenders and less skilled comprehenders, Cain, Oakhill, Barnes & Bryant (2001), found a strong relationship between comprehension skill and inference-making ability. Despite the same knowledge base being equally available to all participants, a story made up of multi episodes, which was read to them, their ability to make two types of inferences, coherence inferences which were essential for successful comprehension of the text, and elaborate inferences, which although enhancing the text representation, were not crucial to their understanding.

The aspect of timing in the drawing of inferences has been implicated in a well-known study by Cain & Oakhill (1998). Cain & Oakhill, claim that the results of this study of approximately 60 children, indicate that deficits in general knowledge, or memory, were not the source of inference failure. Rather, they concluded that the source of the problem lay in not knowing when and how to relate their general knowledge to the text, in order to fill in the missing details necessary to make sense of what they were reading. In contrast, children in the study who were skilled in knowing when to relate their general knowledge to the text, and possessed the necessary strategies to do so, were more successful in generating the required inferences to make sense of what they were reading.

A study by Goldman & Saul (1990), noted a phenomenon observed in more successful readers. Based on results of their study, the researchers argue that this group of
skilled students ‘jump back’ to where they predict the relevant information to be, estimate their location relative to this information, then proceed in searching forward. These strategies demonstrated by the group of skilled comprehenders in their study, note Goldman & Saul (1990), are in contrast to those observed in a study by (van den Broek & Kremer, 2000), who suggest that poor readers use less efficient strategies such as reviewing all earlier text from the beginning, in a linear fashion.

However, some studies have suggested that predicting using prior knowledge can distort comprehension when the reader’s schema overrides the information in the text (McCormick, 1992; Magliano, Trabasso, & Graesser, 1999; Trabasso & Suh, 1993). For example in the study by McCormick (1992), of eighty 5th grade poor readers, the analysis of responses to inference questions indicated the difficulty for most of these readers lay in a lack of interaction between textural cues and prior knowledge.

McCormick (1992), made the observation that the difficulty for a large proportion of these poor readers lay either in their over reliance on prior knowledge, and, in some instances a total disregard for the information in the text, or an over dependence on text information, and failing to make inferences from the words in the text. Of further support for this claim, Anderson (1977), argues that unless children believe their existing knowledge to be an inadequate account of their everyday experiences, they are unlikely to make changes. Neuman (1990), refers to this pattern of over reliance on prior knowledge as assigning default value, while Dewitz & Dewitz, (2003), use the term ‘excessive elaboration’ to describe the phenomena.

The above phenomena may in part explain the results of a study indicating that deficits in drawing inferences cannot be wholly explained by differences in prior knowledge (Barnes & Dennis, 1996). In this study both average and poor comprehenders were taught a series of made up facts about an imaginary world so that they had the same knowledge base. The two groups did not differ in their literal comprehension, but the poor comprehenders were less able to draw both elaborate and necessary inferences from their knowledge base.

In respect to the tasks in the present study, a number of specific areas of prior knowledge was necessary for students to complete the comprehension, paraphrasing and self-questioning tasks. It is important to note that the level of knowledge required changed according to the age of the students competing the task, as well as the type of
text they were processing. For example the factual texts at the grade 5 & 6 level required background knowledge relating to relationships between humans and animals, as well as general knowledge about horses. The factual text at the grade 3 & 4 level required background knowledge about relationships between people, and some knowledge of the effects of stormy weather. The factual text at the grade 2 level required background knowledge related to following directions (step-by-step/sequential instructions in this case), on how to make a cut out monkey. The grade 2 text also required some knowledge of materials and tools, and an understanding of alternative formats, as the text was presented in a step-by-step procedural manner.

For the narrative tasks in the present study, the text at the grade 5-6 level required a depth of knowledge about human relationships, and empathy, and the factors that motivate people to take the actions they do. At the grade 3-4 level knowledge about human relationships, and human’s relationships with animals was required. For the text at the grade 2 level, knowledge about human relationships at a simpler level was required as well as knowledge relating to how plants grow.

For the comprehension tasks in the present study it is also important to take into account that the complexity of background knowledge necessary to infer both the settings and the relationships in the texts, increased at each of the levels- from the grade 2 text to the 3-4 text, and the 5-6 text. This is particularly evident in the factual texts.

The level of complexity relating to word knowledge and sentence structure in the present study also increased across the grade level tests, requiring a more sophisticated grasp of syntax. For all levels and text types prior knowledge of multi-choice format was also required to complete the comprehension tests.

For the questioning and paraphrasing tasks in the present study, students required knowledge of narrative story structure and the relationships between actions and consequences. In addition they required knowledge of human behaviour.

Despite research supporting background knowledge as a potential source of individual differences in inference generation (Cain, Oakhill, Barnes, & Bryant, 2001), this relationship is not pursued further in the present study. However, it needs to be acknowledged that existing knowledge is necessary for the comprehension,
paraphrasing and self-questioning tasks in the present study, and that this knowledge changes with age and text type.

The following section examines the relationship between the reader’s breadth of vocabulary network knowledge and inferential reading comprehension. A significant relationship between vocabulary knowledge and inferential reading comprehension has been described in the research literature.

3.3.2 Word level knowledge and comprehension
The current section examines studies of vocabulary knowledge and the important role this skill plays in the development of inferential reading comprehension. This is followed by a closer look at the efficiency of processing at word level, and the important role played by contextural knowledge in the generation of inferences. Studies of the relationship between vocabulary knowledge and inference generation for both adults and children are then presented. This is followed by studies examining the relationship between vocabulary, working memory and inference generation. Developmental studies of vocabulary knowledge and reading comprehension are then examined, followed by studies of good and poor comprehenders. The following section looks briefly at what research has to say about the existence of a causal relationship between vocabulary knowledge and comprehension. Finally, an examination of the important role played by both figurative language and other aspects of language, in reading comprehension.

3.3.2.1 The role of vocabulary knowledge and inferential reading comprehension
The present study suggests that a range and organization of verbal propositions available to the reader may also influence the quality of the inferential comprehension outcome. This would lead to the prediction that readers who have constructed a richer vocabulary network are more able to comprehend text at an inferential level. The extent of a reader’s vocabulary network may be related to Kintsch’s notion of automatic processing (Kintsch, 1993). According to this model, during reading readers either access existing meaning links or construct them as they read. The use of available vocabulary links is assumed to be less attention demanding than constructing these links. The present study examines the prediction that automatic processing is linked with a reader’s existing vocabulary knowledge.
A large body of research indicates a strong relationship between vocabulary and comprehension generally, and that the ability to automatically and fluently decode words is linked to higher levels of text comprehension, such as inferential reading comprehension (Block, Gambell, & Pressley, 2002; Cain, Oakhill & Lemmon, 2004; Cromley & Azevedo, 2007; Perfetti, Landi, & Oakhill, 2007). As noted by Paris & Hamilton, (2009), vocabulary is “an important, if not, historically, the most important component of comprehension” (p. 38). While Ruddell (1994), suggests that poor readers are often lacking in knowledge of the world relative to good readers, due in part to their poor vocabulary knowledge, Perfetti (1985), in putting the case more strongly, argues that the most frequent and pervasive reading problems are the result of difficulties in recognising and correctly identifying the meanings of individual words.

### 3.3.2.2 Efficiency of processing at word level

A central issue in this understanding is that the representation of the text constructed by the reader at any time is determined in part by the efficiency of the processing at each level. As noted by Adams (1990), that although skills and activities involved in word recognition are “useless in and of themselves” (p.3), unless these processes are working efficiently, successful reading comprehension is not possible. The extent to which the processing makes demands on attention is one aspect of this efficiency (Adams, 1990). Although readers can easily shift between levels of text processing, careful allocation of limited attentional resources is required when the text is difficult to process (Perfetti, 1985). As the reader’s active attention space is limited, it must be reserved for the process of discovering higher-order relationships that divulge the meaning of the text (Adams, 1990).

Perfetti et al (2007), suggest that ‘a bottleneck in comprehension’ (p. 240), is created by readers not knowing meanings of all the words encountered, and having to infer their meanings from the text they are reading. In emphasising the important role played by vocabulary, Perfetti et al. (2007), argue that the process of inferring the meanings of unknown words from text is only possible if the reader understands most of the words, and is able to achieve some approximation to the meaning of the text.

Adding further weight to this argument, Nagy & Scott (2000), and Hirsch (2003), suggest that successful comprehension depends on the reader knowing 90% to 95% of the words in a text. This amount of knowledge allows the reader to not only get the
main thrust of what is being said, but to correctly predict or infer what most of the unfamiliar words probably mean as well (Hirsch, 2003). As Hirsch (2003), observes, this process of inferring is how young children pick up oral language in the first place and continues to sustain their vocabulary development throughout their lives.

Beck & McKeown (1991), argue that word knowledge can be viewed as a “continuum from no knowledge; to a general sense, to narrow, context-bound knowledge; to having knowledge but not being able to access it quickly; to rich decontextualized knowledge of a word meaning” (p. 792). Rupley, Logan & Nichols (1998/1999), suggest that one simple form of word knowledge, definitional knowledge, may come from a variety of sources such as a dictionary, thesaurus, or glossary for example. However, as Rupley et al., (1998/1999), point out, definitions often fail to enable the reader to fully understand or infer how the meaning of an unknown word contributes to the text. In order to comprehend, the authors argue, the reader requires both some idea of the word’s meanings, as well as the manner in which they provide cohesiveness to the overall ideas in the text.

While it has been well established that good comprehenders tend to have good vocabularies (Anderson & Freebody, 1981; Cain, Oakhill & Lemmon, 2004; Hirsch, 2003; Stanovich, 1991), and that the extent of an individual’s vocabulary is a powerful predictor of reading comprehension, (Blachowicz & Fisher, 2006; Freebody & Anderson, 1983), it is important to note that this evidence does not suggest a causal relationship between the two (Pressley, 2002; Cain, et al., 2004). As Paris & Hamilton (2009), point out, “Although there is an obvious relationship between decoding abilities and reading comprehension, one does not guarantee the other” (p.33). In other words, although decoding is necessary for comprehension, it is not sufficient (Paris & Hamilton, 2009). A final word of caution regarding this relationship comes from Baumann, Kameenui, & Ash (2003), who note that “The evidence of a causal link between vocabulary and comprehension is historically long but empirically soft” (p. 758).

3.3.2.3 Contextual knowledge

Rupley et al., (1998/1999), suggest that another simple level of word knowledge, is contextual knowledge. While researchers such as Nagy, Anderson, & Herman (1987), and Sternberg & Powell (1983), propose that students use cues from the context in
which unknown words occur to independently infer their meanings, Rupley et al, (1998/1999), point out that inferring word meanings from context has its limitations. They note that sentences or short paragraphs often provide insufficient context to enable children to infer the meaning of a new word using their prior knowledge, and provide the following example to illustrate this point.

“Randy became very nervous as the doctor’s assistant approached him with the sphygmomanometer” (p. 337).

Rupley et al, (1998/1999), argue that although the reader is able to use the context of the sentence to gain some understanding of the general setting and emotional state experienced by Randy, the reader is unable to infer the meaning of the word sphygmomanometer unless they continue reading the following two sentences.

“She asked him to roll up his sleeve so that she could take his blood pressure. Wrapping the wide band tightly around his upper arm, she commented, “This new sphygmomanometer is so much more accurate in taking a patient’s blood pressure than the old one we used to have”. (p. 337).

Rupley et al., (1998/1999), suggest as illustrated in the example above, that while context often provides insufficient information to gain meaning from unknown words, good readers compensate for this lack of context knowledge by using their knowledge of language to infer the meaning of unknown words. Further support for this claim comes from a study by Dixon, LeFevre, & Twilley (1998), who argue that actions taken by good readers, such as making inferences when adequate context knowledge is not available, further illustrates the crucial role of language knowledge in enabling readers to make meaning from text. Dixon et al (1998), based this claim on the results of their study with undergraduate students, noting that among several predictors of reading comprehension, vocabulary was the best predictor of inferencing ability.

3.3.2.4 Vocabulary knowledge and inference: adult studies

Further support for the role of vocabulary knowledge in inference generation, comes from studies by Singer, Andrusiak, Reisdorf & Black, (1992), and Dixon, LeFevre & Twilley, (1988). These studies suggest that vocabulary knowledge for adults is associated with drawing both connective inferences (Singer, Andrusiak, Reisdorf & Black, 1992), and elaborative inferences (Dixon, LeFevre & Twilley, 1988). Further support for this claim comes from a study by Calvo, (2000), which suggests that high-
vocabulary adult readers are faster and more likely to make inferences than low vocabulary readers. Only the high vocabulary readers drew inferences when the stimuli involved reading continuous text, rather than discrete naming of target words. Although this was an online study, the results suggest that low vocabulary readers are unlikely to make inferences in natural reading conditions.

A later study by Calvo (2005), with undergraduate students, investigated the role of vocabulary and working memory span in elaborate inferences. Results of this study confirm the important role of vocabulary in comprehension, as inferences were only generated after accessing word meanings, combining meanings and encoding them into a situation model. As noted by (Calvo, 2005), readers possessing extensive vocabularies will find it easier to locate words in their memories to represent the inferences they are creating.

3.3.2.5 Vocabulary knowledge and inference: studies with children

The important role played by vocabulary in inferential reading comprehension for children has been demonstrated in numerous studies in the literature (Cain & Oakhill, 2014; Currie & Cain, 2015; Lynch, van der Broek, Kremer, White, & Lorch, 2008; Oakhill & Cain, 2012). As noted by Currie & Cain (2015), vocabulary plays an crucial and supportive role in the process of inferential reading comprehension. This role is demonstrated in the readers knowledge of the meanings of words necessary for successful inference generation, and through the contribution it makes to memory processes.

The consequences associated with failure to develop adequate vocabulary knowledge, and the consequences this has for reading comprehension has been acknowledge by researchers such as Block, Gambell, & Pressley (2002), who argue that poor vocabulary knowledge has a negative impact on oral language, and children’s comprehension. However, while supporting this claim by Block et al (2002), Adams (1995), makes the point that not only does reading comprehension depend on successful word recognition skills, but on these words being recognised relatively quickly and effortlessly. In stressing the important relationship between quick and effortless word recognition, and reading comprehension, Adams (1995), argues that success in reading comprehension in the early years of schooling depends on the development of these word recognition skills.
Further confirmation of the important role played by vocabulary knowledge in successful reading comprehension is noted by researchers such as Rupley, Logan & Nichols (1998/1999). In describing the important relationship between vocabulary and reading comprehension for children, they describe vocabulary as “the glue that holds stories, ideas, and content together...making comprehension accessible for children” (p. 339). Most importantly, they argue that possessing a broad and rich vocabulary, means children are better able to infer the meanings of unfamiliar words as they read. Adding further support for this claim made by Rupley et al (1998/1999), Cain (1996), argues that problems with decoding or vocabulary are the the most pervasive of all sources of comprehension failure.

3.3.2.6 Vocabulary, working memory and inference generation

A study by Currie & Cain (2015), examined the role played by vocabulary and working memory in inference generation in children aged 5-6 years and 8- 9 years. Students in the study were presented with short narratives before answering questions designed to test their understanding of both local and global inferences. Both local and global inferences are necessary for full understanding of the text. Results of the study indicate that although both working memory and vocabulary were correlated with global inference making at each of the age levels covered in the study (5- 6 years, and 8- 9 years), vocabulary had a mediating effect on these results. Currie et al (2015), conclude on the basis of these results, that vocabulary knowledge provides support for inference making through both the understanding of word meanings necessary for inference generation, and through the contribution it makes to memory processes.

3.3.2.7 Developmental studies, vocabulary knowledge and inferential reading comprehension

A study by Cain & Oakhill (2014), of eighty three 10 to 11 year olds, sought answers to the question of whether vocabulary knowledge is more closely associated with particular aspects of reading comprehension. The main focus of their study was to consider the relationship between both literal reading comprehension and inferential reading comprehension, and the richness of vocabulary knowledge. Results of the study indicated that while vocabulary generally was not a strong predictor of literal comprehension, depth of vocabulary knowledge was a strong predictor of inference making.
A study by Shefelbine (1990), examined how grade six students used their vocabulary knowledge, familiarity of concepts, and analytic reasoning to learn word meanings from natural passages in a basal reading textbook. Results of the study indicate that despite having less room for improvement due to their higher levels of vocabulary knowledge, students with higher levels still learned relatively more than students with lower levels of vocabulary. In attempting to explain these results, Shefelbine (1990), argues that students with the lower vocabulary knowledge were at a disadvantage because they knew fewer words and knew them less well. Shefelbine’s study concluded that both general vocabulary knowledge as well as vocabulary knowledge related to a particular passage being read, are important variables in successful learning from context.

As noted by Swanborn & de Glopper (1990), in their study of low and high readers, low ability readers defined relatively few words incidentally, while high ability readers defined up to 27 out of every 100 unknown words when reading text for comprehension. Results from these studies provide further confirmation of the importance of word knowledge in successful reading comprehension.

A number of studies suggest that age can affect the ability to infer the meaning of new words from context (Werner & Kaplan, 1952; Carnine, Kameenui, & Coyle, 1984). Werner & Kaplan (1952), were interested in how children acquired word meanings from context. Children in this study were presented with an imaginary word such as contavish, which Werner & Kaplan intended to mean hole. The children were then presented with six sentences containing that word. Based on the contextual cues they were given, subjects were asked to guess the meaning of 12 imaginary words. Results of this study indicate that while performance improves with age, processes underlying performance do not necessarily change in the same way. Werner & Kaplan (1952), note that while performance generally improves between the ages of 8 and 13, particularly significant changes occur around 10 to 11 years of age.

According to Nagy & Herman (1987), knowledge of word meanings increases dramatically between grades 1-12, with estimates in vocabulary growth of 3,000 words a year. Smith (1941), cited in Perfetti et al (2007), argues that the gap between high word knowledge children and low word knowledge children is correspondingly large. This gap is particularly concerning given the large number of unfamiliar words
that appear in school reading material (Nagy, Herman, & Anderson, 1985; Nagy & Herman, 1987), particularly in regard to expository reading material (Gardner, 2004). Gardner’s analysis of children’s reading materials demonstrated that expository texts contained a far greater degree of specialised vocabularies, and lexical density than narrative texts.

The relationship between word knowledge and comprehension, notes Cromley & Azevedo (2007), is evident not only in the primary school-aged students, but extends through to secondary students as well. A study by Cromley & Azevedo (2007), based on their model of reading comprehension, the direct and inferential mediation model (DIME), investigated the comprehension skills of 177 year 9 students. The model emphasizes the relationships between background knowledge, inference, reading comprehension strategies, vocabulary, and word reading, and addresses both the direct and mediated effects of these five predictors on comprehension. Vocabulary and background knowledge made the largest impact on comprehension followed by inference, word reading and strategies. Cromley & Azevedo, (2007), note that knowledge of word meanings is an important aspect of being able to generate inferences and understand texts.

### 3.3.2.8 Good and poor comprehenders and inferring words from context

A number of other studies have compared the ability of good and poor comprehenders to infer new word meanings from context (Cain, Oakhill, & Lemmon, 2004; Oakhill, Hartt, & Samols, 2005; Cain, Oakhill & Elbro, 2003; Swanborn & Glopper, 1999 ). The study by Cain, Oakhill & Lemmon, (2004), investigated the ability of 9 and 10 year old children with good and poor reading comprehension to use contextual information in stories to infer the meanings of novel vocabulary. Results of the study demonstrated that relative to their same-aged, skilled peers, children with weak reading comprehension skills were consistently weaker in inferring the meanings of novel vocabulary items in context. An important finding in this study was that for poor comprehenders trying to infer the meaning of a new word, the distance between the target word and contextual information necessary for inferring the target word, was crucial. As noted by Cain et al (2004), poor comprehenders need this contextual information in the immediate vicinity of the target word for the successful inference to occur.
3.3.2.9 Vocabulary knowledge and multiple meanings

In examining the relationship between vocabulary knowledge and reading comprehension it is important to note that approximately 50% of the English vocabulary is made up of words or combinations of words, which have multiple meanings (Durkin, Crowther, & Shire, 1986). For example words such as ‘coat’ have concrete referents, and can be used in both a literal sense, for example ‘the man put on his coat’, or alternatively, in a figurative sense, for example ‘the man put a coat of paint on the wall’, where the word ‘coat’ is used in a “domain other than that to which it would usually be applied” (Wigg & Secord, 1992, p.8). The use of words or expressions with a meaning different from the literal interpretation of the word or expression, is commonly referred to as ‘figurative language’ (Wiig & Secord, 1992). As noted by Cain, Oakhill, & Elbro (2003), language is made up of a vast amount of figurative language, such as idioms, and metaphors, for example.

Children’s understanding of figurative language continues to be an area of interest for researchers. It has been argued in the literature that this aspect of vocabulary knowledge is closely related to successful inferential comprehension (Cain, Towse, & Knight, 2009; Levorato, Roch, & Cacciari, 2006; Oakhill, Cain, & Nesi, 2016).

A number of studies have examined the important relationship between children’s reading comprehension and their understanding of figurative language (Cain, Oakhill & Lemmon, 2005; Cain, Towse, & Knight, 2009; Oakhill, Cain, & Nesi, 2016). The majority of these studies have examined children’s understanding of idioms, and suggest that poor comprehenders experience difficulty with this form of figurative language, which impedes their reading comprehension. Cacciari & Levorato (1989), describe an idiomatic expression as “a multiword lexical unit whose meaning is conventionalised and not necessarily deducible from the meanings of the component words” (p. 388). Furthermore, depending on the context, idioms can have both a literal and figurative meaning (Cain, Towse, & Knight (2009). To understand idioms, Levorato et al (2004), argue, children need to extend the comprehension strategy they are using beyond simple word-by-word processing, and “integrate figurative meaning into contextural information” (p.303).

As noted by Levorato and Cacciari, (1995), two main hypotheses have been proposed in the literature to explain the acquisition of idiomatic language. The first of these
hypotheses, the *Acquisition via Exposure Hypothesis* (Nippold & Martin, 1989; Prinz, 1983), postulates that idioms become part of a child’s repertoire by exposure to this form of language in everyday life. Levorato and Cacciari (1992, 1995), argue that if this were in fact the case, familiar idioms should be easier to understand than unfamiliar idioms. However, in their study of children aged 6.9 to 11.9 years, degree of familiarity of idioms was not positively related to the comprehension of idioms.

In response to this long running issue in the figurative language literature as to whether specific mechanisms must be assumed to explain the acquisition of idioms or whether they are acquired as part of children’s normal cognitive development (Levorato, Nesi, & Cacciari, 2004), Levorato & Cacciari (1992, 1995), developed a model for the development of figurative competence, referred to as their ‘Global Elaboration Model on figurative competence’, (*GEM*), (Levorato & Cacciari, 1992, 1995). Put simply, this model argues that the understanding of idioms and other forms of figurative language develops developmentally in the same way as other areas of language competence (Levorato & Cacciari, 1992, 1995). For example a child must use a variety of comprehension skills and strategies when encountering an idiomatic expression in a text, such as making inferences from context, both at word and sentence level, selecting specific word meanings from a range of possible word meanings, ignoring those that are inappropriate, and monitor their understanding of the text (Levorato & Cacciari 1992).

As noted by Levorato, Nesi & Cacciari (2004), the fact that in order to understand an idiomatic expression according to the *GEM* model, children need to be able to integrate each piece of information at the local level, to form a global representation of the text. This “ability to integrate figurative language into the global representation of a text or discourse can explain the stable facilitating effect that context has on children’s comprehension of idioms” (Levorato & Cacciari 1995, p. 263). Levorato et al (2004), suggest that this understanding fits nicely with Kintsch’s (1998), Construction-Integration model. According to this model, the ability to understand a text is predictive of a child’s understanding of idiomatic meanings (Levorato, Nesi, & Cacciari, 2004).

Levorato et al (2004), investigated this prediction in a study of idiom comprehension in Italian children in grades two and grade 4, using a multiple choice format. The sample
at each of the two grade levels included children with a range of comprehension levels- good, medium and poor comprehenders. Results of the study indicated that text comprehension was an accurate predictor of children’s understanding of idiomatic meaning, and that the cohorts of poor comprehenders interpreted text at a more literal level, thus missing the subtlety of idiomatic interpretation. The study also provided support for the ‘GEM’ (Levorato & Cacciari, 1992, 1995), with results supporting the claim that children’s comprehension of a text was a reliable predictor of idiom understanding, when the idioms were presented in context.

According to Cain, Towse, & Knight (2009), difficulty with figurative language applies not only to poor comprehenders generally, but also to young children who sometimes struggle with this aspect of language. In their developmental study, Cain et al., (2009), compared 7- 8 year olds and 9- 10 year olds use of inference from context, to that of 11- 12 year olds, and adults, in the understanding of idioms. Using a multiple choice task the researchers manipulated the type of idioms used - familiar or novel, as well as controlled or opaque. They were also presented with or without a supportive context in the story. Results of the study indicate that even the youngest children in the study were able to use inference in context to work out the meaning of the idioms presented. Cain et al., note however, that while their results provide overall support for Levorato & Cacciari’s (1992),‘global elaboration model’, there was an important difference in their data for the youngest children, the 7- 8 year olds who were able to use “semantic analysis to derive the meanings of transparent idioms as well as being sensitive to meaning in context” (p. 280).

A further consideration in relation to words with multiple meanings such as those classed as figurative language (Cain, Towse, & Knight, 2009), is the understanding that words may also be polysemous (Vicente, 2018). The study of polysemy has taken place predominantly in the area of psycholinguistics which has traditionally treated ‘lexical words in general terms only’ (Vicente, p. 947). Polysemous words are words which have multiple meanings that are not figurative, and can be used as a noun, verb, or adjective according to context. For example the word ‘cook’, used as a noun, may refer to a person who has prepared food, as in the cook prepared a sumptuous meal. Alternatively the word ‘cook’ can be verb, and used to describe a process, for example, ‘you need to cook the meat slowly to retain tenderness’.
In many other instances notes Vicente (2018), ‘words are not overtly context sensitive, and yet fail to express the same conceptual meaning in all occasions’ (p. 948). For example the word ‘mouth’, used in various contexts, such as ‘part of the mouth’, the ‘whole mouth’, ‘an aperture, such a the mouth of a cave’, or the ‘river mouth that opens into an ocean’, or ‘a person who speaks too much- a big mouth’ (Vicente, 2018 p. 948).

While the concept of polysemous words is an important area for consideration in the relationship between vocabulary, and inferential reading comprehension, it is not pursued further in the present study. However, it is recommended as an important area for consideration in future studies, especially in regard to the difficulties experienced by students for whom English is a second language.

The present study predicts that inferential reading comprehension is influenced by the reader’s breadth of vocabulary network knowledge. Speculation as to the particular process in which children make sense of figurative language is beyond the scope of this study. However, as noted by Yagiz & Izadpanah, (2013), and Narvaez (2002b), it is important to bear in mind that figurative language such as idioms, are very much part of particular cultures’ customs, norms and beliefs. While this consideration is an important one, all students in the present study were first language English speakers born in Australia, therefore understanding of idioms in the figurative language subtest used in the present study (The Test of Word Knowledge, Wiig & Secord, 1990, Figurative Usage Subtest), was not seen as an issue.

3.3.3 The coherence of the text:
While it is well established that content or background knowledge is an important aspect of comprehension (Brando & Oakhill, 2005; Kintsch, 1994; Reutzel, Camperell, & Smith, 2002), the level of coherence of a text also plays an important part (Baker & Brown, 1984; Nahatame, 2017; Pardo, 2004, van den Broek et al., 2011). Baker & Brown (1984), suggest that the way in which text is written can either help or hinder comprehension. According to the RAND Reading Study Group: Snow, (2002), readers require a well-structured text that presents information in a clear and logical manner to support comprehension. The importance of well structured text is also noted by Kintsch (1994), who suggests that it is not just the complexity of the content that affects learning, but the way in which this content is expressed, also has an effect.
However, a number of researchers claim that although good writing can support understanding, there are limits to what can be achieved. Kintsch (1994), for example, argues that good writing can make comprehension too easy for the reader, whereby minimizing what they need to do for themselves. Active participation in the comprehension process, notes Kintsch (1994), helps memory and learning. Further support of this claim, comes from a study by McNamara, Kintsch, Songer, and Kintsch (1996), who found that while readers with little domain knowledge of the text benefit from a more coherent text, the opposite is true for readers with a depth of knowledge of the text. The authors of the study argue that a minimally coherent text is most beneficial for high-knowledge readers as it forces them to engage in compensatory processing by inferring unstated relations in the text. Furthermore they claim their “study provides evidence that the rewards to be gained from active processing are primarily at the level of the situation model rather than at the superficial level of text base understanding” (McNamara et al., 1996, p. 1). Texts that provide optimal learning opportunities claims Kintsch (1994), are those which “overlap in content sufficiently, but not totally, with what readers already know” (p. 302).

While it is widely accepted that text characteristics such as structure, vocabulary and topic, as well as reader characteristics such as reading skills, working memory and background knowledge, influence a reader’s comprehension of a text (Nahatame, 2017), a third major factor of reader characteristics has been suggested. This aspect refers to “the types and strengths of coherence the reader aims to maintain during reading, commonly referred to as standards of coherence.” (van den Broek et al., 2011, p. 124). These standards assume a direct connection between the level of comprehension achieved and the standards the reader holds (van den Broek, Risden, & Husebye-Hartmann, 1995). In other words, readers with high standards would take a more critical overview of the coherence of a text than readers with low standards. Van den Broek et al., (2001), observed that the generation of inferences varies according to reading situations, and explored possible reasons for this phenomena. While they acknowledge that inferential reading comprehension is affected by a number of aspects such as reading skill, comprehension ability, working memory capacity and background knowledge, they propose that readers’ purpose or goals for reading, can also effect the knowledge and skills they apply to the reading situation.
Based on the results of their study van den Broek et al., (2001), argue that “reading goals influence readers’ standards of coherence, which in turn influence the type of inferences that they draw” (p. 1081). For example while a reader with low standards for coherence would generate the minimum inferences required for basic understanding of the text, a reader with high standards of coherence would generate inferences beyond those required for minimal understanding of the text, for example inferences required for deep comprehension (van den Broek, Risden, & Husebye-Hartmann, 1995). Put simply, the standard with which a reader examines the coherence of a text, directly affects their level of reading comprehension (van den Broek et al., 2005). In other words, a reader with a low standard of coherence would make only the minimal inferences required to make sense of what they are reading, while a reader striving for a high level of coherence would make a more coherent mental representation of the text.

3.4 Text types: Narrative and expository texts

While there has been considerable research in the literature in relation to developmental trends in the acquisition of inferential reading comprehension, the types and frequency of inferences and the sources of information that are necessary to elicit them, and the range of cognitive processes that are involved in their generation, the focus for the majority of these studies have used the narrative text as a stimulus (Lehman-Blake & Tomkins, 2001; Virtue, Haberman, Clancy, Parrish, & Beeman, 2006). This contrasts starkly with inference making in expository texts, where according to Baretta, Tomitch, MacNair, Lim, & Waldie, (2009), little research has taken place. The following section examines both narrative and expository texts, and looks at what research has to say about the relative difficulty in drawing inferences in both of these text types. The present study predicts that inferential reading comprehension will be influenced by the structure of the text, and that drawing inferences in expository text will be more difficult than drawing inferences in narrative text.

In attempting to comprehend text, readers construct situation models, or mental models which are created from information in the text as well as the readers’ background knowledge (Kintsch, 1998; Graesser, Louwerse, Mc Namara, Olney, Gai, & Mitchell, 2007). Graesser et al (2007), note that in narrative text the situation model is a “microworld of actions and events” (p. 289). This microworld contains characters
pursuing goals, and overcoming obstacles to these goals, conflicts and resolutions between characters, as well as the emotional responses of the characters to events and conflicts. Graesser et al (2007), suggest that depending on the amount of time and motivation the reader devotes to the text, the mental microworlds developed can contain detailed and vivid descriptions of the settings, actions, and objects used by the characters.

In addition, notes Graesser et al (2007), these microworlds may also include references to mental states of characters such as what they believe, know, perceive, and want. While adults find the construction of situation models easy for narrative texts as the microworlds created are closely related to everyday experiences, the construction of a situation model for expository text is much more difficult (Graesser et al, 2007; Kucan & Beck, 1996). In illustrating the difficulty readers may have in the construction of a situation model for an expository text on a scientific mechanism, for example, Graesser et al (2007) suggest that “Ideally, the reader would be able to construct a mental model of the components, causal chains, and processes that capture a scientific mechanism” (p. 289). However, Graesser et al., make the observation that this task is a difficult one, when the reader possesses little knowledge of the world with which to make sense of the text, necessary for the creation of a mental model.

Not only do expository texts typically involve unfamiliar content in complex logical relationships (Stein & Trabasso, 1981), researchers have identified a variety of formats or structures used by authors in expository texts. For example, Meyer (1975), and Meyer & Freedle (1980), cited in Englert & Hiebert (1984, p. 65), have described a classification system used by authors of expository texts which include covariance (cause –effect), attribution (description), sequence (collection), comparison (adversative), and response (problem-solution). According to Meyer (1975), and Meyer & Freedle (1980), cited in Englert & Hiebert (1984), authors typically ‘signal’ the relationships of these structures using a number of semantic and syntactic techniques. For example when using a sequence structure authors typically use temporal indicators such as ‘first’, ‘second’, ‘then’, and ‘finally’, in contrast to indicators such as ‘in contrast to’, ‘ similarly’, used in a comparison structure.

While texts are rarely written strictly according to any of these formats (Armbruster et al., 1991), Mayer (1984), suggests that authors do rely on them when developing
passages or segments in books, and expert readers are aware of them as they read expository text, and use them for ‘building internal connections’ (p. 32).

As noted by Snow (2002), in the RAND Report, mental models in expository texts have been examined by various researchers. Detailed analysis has then been made of these mental models according to content.

Snow lists some of the common types of referential content from the RAND Report (2002), as follows:

- **Class inclusion**: One concept is a subtype or subclass of another concept. For example, a Pentium is a computer (is a device).

- **Spatial layout**: Spatial relations exist among regions and entities in regions. For example, a pin is in a cylinder (is in a lock). A spring surrounds a rod.

- **Compositional structure**: Components have subparts and subcomponents. For example, a computer has (as parts) a monitor, a keyboard, a central processing unit, and memory.

- **Procedures and plans**: A sequence of steps or actions in a procedure accomplishes a goal. For example steps taken in removing the hard drive in a computer.

- **Causal chains and networks**: An event is caused by a sequence of events and enabling states. For example the sequence of events that lead to a polluted lake.

- **Agents**: These are organised sets, such as people, organisations, and countries. For example organisational charts.

- **Others**: These include property descriptions, quantitative specifications, and rules.

Snow (2002), notes that while some of the aspects of the mental model are those described or conceptualised by the parts or features in a particular text, the reader has to infer other details or components of the text as part of the comprehension process. Snow lists and defines different classes of inferences (Table 3.3), that are relevant in many instances to expository texts. She notes that while the list is not exhaustive, it
does cover inferences investigated frequently by researchers in discourse psychology and discourse processing. Snow (2002), suggests that some inferences are more difficult than others, noting that while predictive inferences are usually difficult to make, bridging and anaphoric inferences are much easier. Snow also makes the observation that while goal and explanation inferences are commonly made by good readers, poor readers often make elaborative inferences that have little to do with the text. Snow (2002), provides a description of classes of inferences that are relevant to expository text in the following Table.

Table 3.3: Classes of inferences that are relevant to expository texts (Snow, 2002).

The following section examines studies demonstrating children’s comprehension of both narrative and factual text.

### 3.4.1 Children’s comprehension of narrative and expository text

As part of everyday school life students are exposed to a variety of text types or genres with particular purpose, and linguistic features to meet that purpose (Duke & Tower, 2004). Some important observations have been made in recent research in relation to text types. The suggestion has been made that reading comprehension strategies used by readers may differ according to the type of text being read (Duke & Martin, 2008). It has also been suggested that regardless of the level of exposure to, or instruction in a particular text type, whatever has been learnt in this process does not necessarily
transfer to knowledge of an alternative text type (Duke, 2008). The two most common text structures students experience at school are narrative and expository (Kent (1984).

Hall et al., (2005), note, that despite the two major types of texts, narrative and expository sharing some overlap, each serves a unique purpose, and possesses a different structural pattern. These structural patterns relate to the way in which ideas are organised in the text, as well as the particular relationships which are created from those ideas in order to provide meaning for the reader (Meyer & Rice, 1984). While both narrative and expository text have hierarchical structures (Meyer & Poon, 2001), narratives tend to have a single structural pattern with the setting, characters, problem, solution, and outcome both highlighting the structure framework in which actions and episodes happen, as well as where they are placed (Hall et all, 2005).

Expository texts on the other hand contain multiple structures such as descriptions, sequences or procedures, as well as structures relating to concepts such as causation, problem/solution, and compare/contrast (Meyer & Freedle, 1984). In order to read and understand these texts fully, students need to understand the different types of textural organisation and structures on which they are based. (Gersten, Fuchs, Williams, & Baker, 2001). Difficulties arising from a lack of knowledge of text structures and organisation have been linked to differences in reading achievement (Gersten, Fuchs, Williams, & Baker, 2001).

Comprehension of both narrative and expository texts has been shown to rely on the same general cognitive processes and structures (van den Broek, Evenson, Virtue, Gaddy, Sung, & Tzeng, 2002). These include working memory capacity, long-term and episodic memory, maintenance of coherence during reading, along with available information sources and activation processes to do so, and the creation of a memory representation of the text over the course of reading (van den Broek et al., 2002). However, the specific processes involved are likely to differ according to the text type, either narrative or expository (van den Broek et al., 2002). For example when individuals read literary texts they focus more on the surface structure of the text than they would if reading newspaper articles (Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007; Zwaan, 1994).
Graesser et al., (1994), suggest that while the same inferencing mechanisms and knowledge about the world used to make sense of everyday experiences are also likely to be used in the understanding of narratives, expository texts on the other hand are created more consciously to “inform the reader about new concepts, generic truths and technical material” (Graesser et al., 1994, p. 372). Graesser et al., propose that inferences occur automatically in narratives because of their close correspondence to everyday life. “Both narrative texts and everyday experiences involve people performing actions in pursuit of goals, the occurrence of obstacles to goals, and emotional reactions to events” (p.372). Our understanding of these actions, goals, events and emotions note Graesser et al (1994), are “deeply embedded in our perceptual and social experience” (p. 372).

While the generation of inferences in narratives has been investigated extensively, little has been carried out with expository text (van den Broek et al.,1993; Baretta et al., 2009). According Schneider & Pressley (1997), narratives have been a focus because they comprise a form of language commonly experienced in everyday life, both in social interaction and recreational and educational media, and are produced and understood according to particular to particular structural and organisational principles. For example narrative texts posses a causal-temporal structure that is more familiar to the reader than the logical structure of expository text (Cote, Goldman, & Saul, 1988; Graesser, Singer & Trabasso, 1984). These structural and organisational components, referred to as story grammas or story schemata, typically include elements such as characters, settings, problems, plans, responses, attempts, consequences, and resolutions (DeKemel, 1998). Graesser, et al., (1994), argue that because we know a great deal about people’s actions, motives, goals and attempts to solve daily problems, we know a lot about narratives.

Paris et al (2005), suggest that the development of children’s narrative comprehension skills develop through early socialisation experiences long before they begin to read. From their earliest experience with language children are surrounded by narratives, with the telling of stories about family and other personal stories by parents in the presence of their children (Dickenson & Snow, 1987).

Stein & Glenn (1979), argue that many primary school students already possess an internal representation of ‘story’, and can comprehend and retell basic story elements
with ease. Williams (2008), claims that young children, even before they come to school can identify the basic elements of a story, for example the setting, main characters, major actions and reactions of the characters, and story resolution, although their comprehension of narrative does not ordinarily reach the more advanced level of theme until they are older (Williams, Brown, Silverstein, & de Cani, 1994).

This claim is backed up by research, for example Mandler & Johnson (1977), suggest that even preschoolers use story structure as an organising framework in understanding narrative. In their study Mandler & Johnson (1997), presented preschoolers with two types of narratives- a scrambled form and a traditional form. The preschoolers remembered less of the story when it was presented in scrambled form than when it was presented in traditional form. These results claim the researchers, suggest that the scrambled form may have denied the children the opportunity to draw on their knowledge of story structure.

Kispal (2008), notes that familiarity with narrative text structure forms part of the background knowledge readers bring to the text to enable reasonable inferences to be made. As suggested by Gillam, Fargo, & Robertson (2009), in narrative text structure characters perform actions in order to solve problems. These actions are “causally linked to feelings, motivations, and goals directed to solving these problems” (p. 83).

However, a very different picture emerges for expository text (Goldman, 1997; Stein & Policastro, 1984; Chambliss, 1995), with many students lacking exposure to such texts and their underlying organisation, prior to schooling (Ogle & Blachowicz, 2002; Williams, Hall & Lauer, 2004). The fact that expository text is distinctly different to narrative text in terms of structure (Duke, 2000; Williams, Hall & Lauer, 2004), can be challenging for many children (Hidi & Hildyard, 1983; McCutchen & Perfetti, 1982), as they are increasingly confronted with material such as texts about history, science, geography, social sciences, and other disciplines. The dense nature of these texts means students must perform fairly complex cognitive tasks to extract, summarise, and synthesise the content (Lapp, Flood, & Ranck-Buhr, 1995; Lorch, 2015). Expository texts, notes Gardner (2004), also contain a far greater density of specialised vocabularies and lexical density than narrative text, adding a further layer of difficulty for students.
Even relatively good readers can experience difficulty with expository text (Williams, Taylor, & decani, 1984; Lorch, 2015). Reasons for this difficulty include the nature of the material, which is usually unfamiliar, and the fact that ideas presented often represent complex, abstract logical relationships (Stein & Trabasso, 1981), unlike the simple and familiar sequence of events found in most narratives (Williams, Hall, Lauer, Stafford, DeSisto, & deCani, 2005). Williams, Hall, & Lauer (2004), note that when we consider the information contained in a text, we think mainly about information that is related to content. While most textual information is content information that readers use to construct meaningful mental representations of the text, and comprehend it, some textural information concerns structure, not content.

For example, as noted by Gillam, Fargo, & St Clair Robertson (2009), features and attributes of constructs in descriptive factual texts are often signalled by words such as “for example”, and “such as “, while information in sequential, factual texts are signalled using numerical or chronological notation, such as “first”, and “previously”. Factual texts that feature comparisons, are often cued through the use of words such as “however”, and “on the other hand” (Gillam, et al, 2009). Moreover, as argued by Snow (2002), students often settle for superficial knowledge in factual texts, such as concentrating on lists of facts, or simple definitions, for example, and neglect the more effortful comprehension strategies such as “deep, coherent explanations” (p. 110), to enable important inferences to be made.

Structural information in texts has been shown to be important as it helps readers organise the content, which in turn supports the process of constructing a mental representation, that is, the meaning of the text (Williams et al., 2004). Importantly, it has been demonstrated that text structure may affect the types of inferences children make. For example, Liang & Kamhi (2002), argue that during the comprehension of narratives, successful comprehenders make more explanatory or causal inferences than associative or predictive inferences or paraphrases.

As noted by Gillam et al., (2009), some comprehension strategies are more suited to one type of text structure such as narrative, than an alternative text structure such as expository. For example, while using strategies such as ‘listening for known words’, generating ‘predictive inferences’, and ‘ongoing monitoring to ensure these predictions are correct’ (Gillam et al, 2009), are effective strategies for comprehension
of narrative text, they may not be as effective for the comprehension of expository text, due in part to the lack of causal structure in many expository texts (Gillam et al., 2009).

A further consideration suggested by Bereiter & Scardamalia, (1987, cited in Gersten et al., 2001), as to why expository texts can be more challenging than narrative texts, relates to the length of passages in expository text read without “prompts from a conversational partner” (Bereiter & Scardamalia, 1987, cited in Gersten et al., 2001, p. 294). This is in contrast to narrative text, where dialogue is commonly found throughout the text, as well children’s oral language experiences.

Lorch & Lorch (1996), argue that students need an increased awareness of text structures as they progress through their school years as the emphasis shifts from reading a storyline to reading for information (Akhondi, Malayeri, & Samad, 2011; Williams, 2005). This shift in emphasis from narrative to expository is noticeable by the third and fourth grades, with students reading longer and denser passages of information (Gillet, Temple, & Crawford, 2004; RAND Reading Study Group: Snow, 2002). As the focus moves from narrative to expository text, students need an awareness of structures such as description, sequence, listing, comparison, cause-effect, and problem-solution (Meyer & Poon, 2001; Meyer & Rice 1984). Other authors for example Anderson & Armbruster (1984), have similar lists students need to be aware of including text structures such as ‘explanation of concepts’, ‘definition’, and ‘example’.

An observation in the literature noted by researchers such as Duke (2000), Duke, Bennett, Armistead, & Roberts (2002), Williams, Hall, & Lauer (2004), is that most early childhood educators overemphasize narrative texts and neglect expository texts, with students at secondary school level unprepared for the challenge of increasing comprehension demands. This lack of exposure to expository texts in primary schools, argues Williams, Hall & Lauer, (2004), causes great difficulty for students in secondary schools as most of the materials they are exposed to are expository texts. As noted by Katims & Harris (1997), “The ability to glean meaning from expository passages is arguably one of the most important skills for success in our secondary schools” (p. 122).
Furthermore, it has been suggested that the overemphasis on narrative texts in the primary grades, has contributed to the decline in reading achievement after the third grade (Chall, Jacobs, & Baldwin, 1990; Hirsch, 2003). This decline is often referred to in the literature as the ‘fourth-grade slump’ (Chall et al., 1990; Hirsch, 2003).

Lorch (2015), claims that while we know a lot about inferencing, this knowledge is restricted to a very “constrained domain” (p. 358), that of narratives. In contrast, inferencing in exposition texts such as science texts for example, “becomes more effortful and possibly less successful at resolving gaps and inconsistencies in readers’ understandings”(p. 358). Lorch makes the observation that “with narrative, we are in a world of inferencing in the service of comprehension; with exposition, we enter the world of inferencing in the service of learning” (p. 358).

While primary school children have been shown to be sensitive to narrative text structure (Englert & Thomas, 1987; Lorch, 2015; Williams, Hall, & Lauer, 2004; Williams, Taylor, & decani, 1984), little research has been carried out in expository text with primary school aged children (Baretta et al, 2009). As noted by Gillam, Fargo, & Robertson (2009), the majority of studies cited in the literature have focused on adults, for example the study by Braten & Stromso, (2003), or older adolescents, in the study by Kucan & Beck (2003). The present study examines inferential reading comprehension for students in grades 2 to 6 when reading both narrative and expository texts.

An additional factor that needs to be taken into consideration in the examination of inference generation, is the important role of working memory in maintaining the propositions assembled during the reading process (Carr, Brown, Vavrus & Evans, 1990; Palincsar & Brown, 1984; Perfetti, Marron, & Foltz, 1996). The following section examines the role of working memory in the generation of inferences, and is based on the Capacity Constrained Model of working memory (Just & Carpenter, 1992). This model stresses the importance of cognitive capacity in constructing the foundation of textural representations. Support for Just & Carpenter’s model comes from studies that demonstrate reading time slows as working memory reaches its capacity (Schneider & Pressley, 1997; Cain, Oakhill & Bryant, 2004; Daneman & Green, 1986 ). When demands of text comprehension exceeds limitations of working memory, comprehension performance deteriorates, and readers with high working memory
spans enjoy advantages in comprehension (Brainerd, & Pressley, 1985). The following section examines the role of working memory in reading comprehension generally, and inference making specifically.

3.5 Working memory

Gathercole and Alloway (2007), note that the term working memory is a term commonly used to describe the ability to both hold and mentally manipulate information in our minds over short periods of time. They suggest that working memory is often conceived as a “mental workspace used to store important information in the course of our mental activities” (Gathercole and Alloway, 2007, p. 4).

Text comprehension involves a large amount of processing (Kintsch & Rawson, 2007). These processes include linguistic-level processes, and semantic processes used to form the text base, as well as the processes used to form the situation model, such as retrieval and integration of knowledge. It has been demonstrated that these processes place a heavy demand on working memory resources (Cain, Oakhill & Bryant, 2004; Gathercole, Pickering, Ambridge, & Wearing, 2004; Kintsch & Rawson, 2007; Nation, 2007).

As noted by Kintsch & Rawson (2007), all models of comprehension are based on the assumption that all information processed must take place in “a finite capacity working memory” (p. 224). In describing this finite capacity, Cain, Oakhill, & Bryant (2004), suggest that working memory is a resource that is directly related to the processes involved in successful construction of text representation. This resource not only acts as a “buffer for the most recently read propositions in a text, enabling their integration to establish coherence” (Cain et al., 2004, p. 32), but also acts as the holding space for information retrieved from long-term memory, to enable the integration with “currently active text” (p. 32). However, within this resource framework, note Cain et al., (2004), the proposal is made that comprehension processes such as integration and inference generation are affected by inaccurate or slow, word-by-word reading.

Results of studies have consistently indicated a strong relationship between working memory and comprehension (Alloway, 2007; Gathercole, Pickering, Ambridge, &
Wearing, 2004; Oakhill, Cain & Bryant, 2004; Oakhill Hartt, & Samols, 2005), with
studies of adults and children with reading comprehension difficulties, demonstrating
a lower level on working memory tasks than adults and children without these
difficulties (Just & Carpenter, 1992; Oakhill, 1993; Swanson & Berninger, 1995).
As noted by Daneman & Hannon (2001), having less capacity to both process and store
verbal information simultaneously in working memory puts individuals at a
disadvantage “when it comes to integrating successively encountered ideas in a text as they have to keep the earlier read relevant information still active in working memory” (p, 209).
On the basis of the important role played by working memory, Cain et al (2004), argue
that it should be regarded as one of the several contributing factors that influence
comprehension ability and development. In emphasising this important role, they
refer to working memory as “the work space where integration and inference take
place”(p. 33). The vital role played by working memory in the generation of
inferences has been demonstrated in numerous studies in the literature (Cain, Oakhill,
& Bryant, 2004; Gathercole, Pickering, Ambridge, & Wearing, 2004; Oakhill, Hart &
Samols, 2005).

3.5.1 Working memory and poor comprehenders
A number of studies have investigated the role of working memory in poor
comprehenders and found a positive relationship between working memory and
reading comprehension (Oakhill, Cain & Bryant, 2004; Oakhill, Hartt, & Samols, 2005;
Seigneuric & Ehrlich, 2005). Based on the results of these studies, the researchers
argue that the difference between good and poor comprehenders is poor working
memory and lack of skilled strategies, rather than a deficient in decoding, syntactic
skills or lack of prior knowledge. As noted by LaBerge & Samuels, (1974), automatic
text processing requires relatively less short term capacity than slow decoding. When
more capacity is required for decoding, less is available for comprehension (LaBerge &
Samuels, 1974). Automatic decoding frees up the short term memory capacity for
comprehending the word, the overall meaning of the sentence, paragraph and text
(Pressley, 2006; Adams 1995).
A study by Yuill, Oakhill & Parkin (1989), demonstrated that less able 7-8 year old
comprehenders are poorer at repairing comprehension failures, particularly when the
load on working memory is high. They differ from skilled comprehenders in their ability to store information while performing concurrent processing rather than in their ability to store information per se. Yuill & Oakhill (1991), suggest that what often happens for less skilled comprehenders is that they are less likely to know when to make inferences, rather than in their ability to do so. In other words they may delay making the necessary inferences until it is too late, and by the time they realise the inferences needs to be made, they may have forgotten some of what they have read.

Swanson & Berninger (1995), also investigated the role of working memory in skilled and less skilled readers’ comprehension. Ninety one students in their study were divided into two groups. One group were low in word recognition and comprehension, and the other group were low only in comprehension. Results indicate that the group who were low in both comprehension and word recognition, the less skilled group, had working memory deficits that contribute to comprehension difficulties, independent of the issues they experience in phonological coding (Swanson & Berninger, 1995).

3.5.2 Developmental studies of working memory
The strong relationship between developmental aspects of working memory and comprehension is noted in the literature. For example Paris & Hamilton (2009), refer to a 3 year longitudinal study of 56 seven-year-olds, by Seigneuric & Ehrlich (2005). This group of seven-year-olds, were tested at each year level as they progressed through the school, in first, second and third grade. Testing was conducted in phonological ability, vocabulary, reading comprehension, and working memory. At each grade level, at each of the three time points, vocabulary was found to be a consistent predictor of reading comprehension. In contrast, third grade was the only time point when working memory predicted comprehension. Results of this study provide strong evidence for a developmental aspect to working memory, suggesting that as children mature working memory may become a more reliable predictor of comprehension.

Paris & Hamilton (2009), note that children demonstrate weaker performance in working memory processing than adults until they reach adolescence, suggesting an incremental increase with age. However, they also note an alternative hypothesis put forward by Case (1995), that the total processing space remains constant over time with any observed differences due to differences in operating and storage space. Paris
and Hamilton (2009), note that little research has fully explored the implications of these differing views.

A number of additional studies have examined developmental aspects of working memory (Alloway, Gathercole, & Pickering, 2006; Alloway & Gathercole, 2005; Gathercole, Alloway, & Willis, 2006). The study by Gathercole et al (2004), of over 700 children ranging in age from 4 to 15 years, used a consistent span procedure for all three tasks used across all age groups to measure working memory- a digit recall task, a word recall task, and a nonword recall task. Gathercole et al (2004), argue that a major strength of the span procedure is that the same test structure is able to be used consistently over a wide age range, with comparable sensitivity at each of the age groups. Results of the study indicate that the “basic modular structure of working memory is present from 6 years of age and possibly earlier” (p. 177). However each of the components undergo “sizable expansion in functional capacity through the early and middle years” (Gathercole et al, 2004, p. 177).

Further studies in the literature provide support for developmental aspects of working memory. (Hulme, Thomson, Muir, & Lawrence, 1984; Isaacs & Vargha-Khadem, 1989; Siegler, 1994). These studies have noted a gradual and steady increase in working memory in students from kindergarten through to secondary school. Alloway (2007), suggests that “given the high degree of variability in both outcome measures and the populations sampled in these studies, the findings have been remarkably consistent; measures of working memory are highly predictive of the attainment levels of individuals” (p. 7). On the basis of these results, Alloway (2007), argues that high working memory scores in children of all ages are consistently correlated with successful skills in reading, and this strong relationship between continues into adulthood.

A study by Currie & Cain (2015), set out to determine if the unique variance in inference generation was predicted by working memory and vocabulary, or conversely, whether the relationship between working memory and inference generation was ‘mediated by vocabulary’ (p. 61). In the study by Currie & Cain, 130 children equally spread across the age groups 5-6 years, 7-8 years, and 9-10 years, answered questions designed to elicit both local and global coherence inferences after listening to short stories. While both types of inference demonstrated developmental increases in
Analysis of variance (ANOVA) results, multiple regression analyses indicated that vocabulary was the major contributor to inference generation. Vocabulary was the only predictor of unique variance in the 6-8 year olds for local coherence inferences. For the 9-10 year old group performance was not associated with any of the variables. In relation to global coherence inferences, at each age group, the only ‘unique predictor’ (p. 57), was vocabulary. The authors of the study note that vocabulary plays a supporting role in inference making through both the understanding of word meanings necessary for the process of inferencing, and through the contribution it makes to memory processes.

3.5.3 Working memory and executive functioning:
An important consideration in relation to working memory however, is that this construct is arguably part of a much broader range of executive functions. These distinct functions include inhibition, where dominant action tendencies are suppressed in favour of more goal-appropriate behaviour, shifting, which refers to the ability to disengagement of an irrelevant task or strategy to a more relevant task or strategy, and updating, which refers to encoding and evaluation of information in relation to the relevance of a task at hand, and when necessary, revising of the information held in memory (Bull, Andrews Espy, & Wiebe, 2008). It is important to note here that individual students may exhibit one or a number of these functions, which could impact on the results of the present study.

Difficulties with executive functions can be seen for example in children demonstrating low scores on measures of working memory such as the backward digit span used in the present study, or the listening test. These children have been found to be frequently behind the expected level of curriculum achievement at school (Archibald et al., 2011), typically exhibit difficulty with both reading and maths, following instructions, and focussing on more than one task at a time (Gathercole et al., 2006). Classroom teachers typically make the observation that students with poor working memory can be inattentive and exhibit short attention spans (Gathercole et al., 2008; Archibald et al., 2011). Teachers have also made the observation that students with low working memory exhibit difficulties in other areas of executive functions, such as monitoring their work, planning and organisation skills, and the inhibition of impulsive
responses (Gathercole et al., 2008a), assessments of action planning and visual selective attention (St Claire-Thompson, 2011).

3.5.4 Measures used to determine working memory capacity

Both simple and more complex measures have been used by researchers to determine the effectiveness of storage capacity and working memory (Alloway, 2007; de Jong & de Jong, 1996). Daneman & Carpenter (1980), developed both a simple span test, and a complex span test for this purpose. In reference to these span tests, de Jong & de Jong (1996), note that the simple test, the digit or word span test, has been used to ‘measure the storage component of working memory, because information only has to be produced’ (p. 1007), and involves the presentation of a series of words or digits, which need to be repeated in the order presented. The more complex of Daneman & Carpenter’s test, the reading span test, was designed “to measure the ability to store and process information simultaneously” (de Jong & de Jong, 1996).

The present study proposes that the inferring mechanism involves various aspects, one of which is the ability to maintain the propositions assembled during reading in short term memory. The present study draws on a combination of Kintsch’s construction-integration model (Kintsch, 1998), and Just and Carpenter’s capacity-constrained model (Just & Carpenter, 1992), to examine the generation of inferences in reading comprehension in children from grades 2 – 6. Just & Carpenter (1992), argue that the limited capacity of working memory is confirmed in studies that show that: (1) reading time slows as working memory reaches its upper limits; (2) readers with high working memory spans are at an advantage in comprehension as components of comprehension are demanding on working memory; (3) when the demands of text comprehension exceed limitations of working memory, comprehension performance deteriorates.

The present study uses 2 tests from the Automated Working Memory Assessment (AWMA, Alloway, 2007)- A digit recall test, a measure of short term memory storage, and a backwards digit recall test, a measure of working memory capacity involving storage and processing. These tests are based on the work of Daneman & Carpenter (1980). The digit span tests, rather than the more complex reading span test were chosen, as Baddeley (1993), questions whether the heavy storage demands of the
more complex reading span test are necessary for effective measurement of working memory.

While acknowledging the crucial role played by working memory, Cain, Oakhill, & Bryant, (2004), suggest that neither good working memory nor good verbal skills are sufficient for inference making and comprehension monitoring. Cain et al., conclude that further research is needed to identify the comprehension component skills that need to be taught.

### 3.6 Perspective-taking/theory of mind

Three of the questions students in grade 2-6 are required to answer as part of the multi-choice comprehension test in the present study, involve cognitive and affective perspective-taking. This process involves the understanding of other minds or the feelings of others (Dunn et al; 1991), or ‘the ability to recognise another person’s point of view’(Healey & Grossman, 2018, p. 491). In other words, perspective-taking requires the making of inferences in relation to how other people think, feel, and what motivates their actions.

Students in the present study were asked to answer six multi-choice questions based on two texts which involved making an inference. For example in order to answer three questions based on a narrative text and three questions based on an expository text they were required to make an inference about a character’s emotions and feelings, an inference about a person’s character traits, and an inference about a character’s motives for taking a particular action. Dunn et al., note that although there is considerable disagreement as to the earliest stage when these abilities are manifest in children, it is generally agreed that between the ages of 3 and 5 children’s ‘ability to reflect on other minds verbal intelligence, and their understanding of the psychological bases of human action change markedly in nature’ (Dunn et al, 1991, p. 1352). The authors claim that we do not know as yet whether these differences are due to individual differences such as verbal intelligence, or to participation in ‘discussions of why people behave as they do, or the quality of their family relationships’ (p.1352). This issue has not been further examined further in the literature in relation to developmental aspects of older primary school-aged children.
Although the students in the present study range from grade 2, to grade 6, it will be interesting to note whether there are any developmental patterns across the grade levels in the results to the multiple-choice questions requiring perspective taking. Although the concept of perspective-taking in considering and interpreting results of the present study is an interesting one, it is not pursued further than making some general observations in the results of the present study.

3.7 The role of imagery in inferential reading comprehension

A number of studies have examined the role of imagery in generating inferences. Fincher-Kiefer & D’Agostino (2004), looked at the role of visuospatial resources in generating predictive and bridging inferences. Butcher, (2006), examined the use of texts with diagrams, and argues that graphic depictions promote mental model development with inference generation. Pike, Barnes & Barron (2010), examined the role of illustrations in children’s inferential comprehension, with a particular focus on the generation of bridging inferences. Butcher & Davis (2015), suggest that learning with visual representations rather than text alone, increases inference generation, and leads to a more successful construction of mental models and deeper comprehension.

Results of a study with college students by Butcher & Davis (2015), demonstrated that the addition of diagrams to a text had a direct positive effect on the number of inferences the students produced, compared to students who only saw the text alone. However, the authors note that studies examining the relationship between imagery and inference generation has provided converging results. Butcher & Davis (2015), note therefore, that the possibility that the processing of diagrammatic representations is positively related to the generation of more inferences, requires further investigation.

Researchers such as Pike, Barnes, & Barron (2010), argue that while illustrations in children’s books provide important information for readers, research examining the relationship between illustrations and comprehension has mostly focussed on literal comprehension of facts. The study of 11 year old students by Pike et al (2010), however, focussed on the relationship between illustrations and bridging inferences. Results of this study indicated that illustrations had both a facilitating and interference effect, depending on the nature of the information depicted. The authors note that
this relationship needs to be explored further in order to understand more fully the
effect of illustrations on students’ inference generation. The relationship between the
effect of illustrations and inferential reading comprehension is not pursued in the
present study.

3.8 Questions arising from the literature review

The focus of the current study is on developmental trends in inferential
comprehension by primary school students, and on factors that influence this
important skill. One unanswered question relates to the relative ease of various types
of inference for these students. The present study examines the acquisition of a wide
range of inferential comprehension skills in both narrative and factual text. The
foregoing review indicates that the influence on inferential comprehension of readers’
vocabulary knowledge, knowledge of text structure, narrative and factual, and ability
to retain propositions in short term working memory, have not been investigated in
earlier examinations for students across the age range 8 – 12 years, for both narrative
and factual text.

The following section examines a number of questions which arise from the preceding
literature review.

These include:

1. The means by which readers link the literal representation of a text with their
   existing knowledge to form the situation representation, that is, the basis for
   inferential comprehension. Paraphrasing is one means readers use to link literal
   representations with their existing knowledge (Munro, 2002).

2. The role of interrogative linguistic forms in generating inferences. As noted by
   Munro (2002), “Students need to learn how to ask questions of topics they are
   learning, to identify the questions answered by a text and match the questions in
   their head with the text questions” (p.7). This strategy promotes deeper
   comprehension and encourages students to become active readers.

Kintsch’s (1993), classification system for inferences in discourse comprehension
proposes that readers make various types of inferences by manipulating the text
information in particular ways that are determined by the reader’s existing knowledge
(Munro, 2003). A possible aspect of the inferring mechanism is the use of
paraphrasing as a mediating process. This would lead to the prediction that readers who can paraphrase text more easily are also able to comprehend text at an inferential level. It is also possible that paraphrasing has a greater influence on inference under the controlled condition than under the matching automatic process condition. Inferences that require readers to search for bridging knowledge or to make logical inferences may be more susceptible to variations in paraphrasing than associative elaborations or transitive inferences in a familiar domain (Munro, 2003).

The present study examines the possibility that paraphrasing is one component of the mechanism that readers use to comprehend text at an inferential level. The present study examines the relationship between inferential reading comprehension and paraphrasing ability under the controlled condition for drawing inferences, which involves cognitive activity on the part of the reader (Munro, 2006).

The following section examines the skill of paraphrasing and its relationship to the comprehension of text at an inferential level in both narrative and factual text. The present study hypothesizes that a significant relationship exists between the readers’ ability to paraphrase a text, and inferential reading comprehension.

3.8.1 Paraphrasing

While researchers such as Anderson & Armbuster (1984), note that paraphrasing has traditionally been considered a student study skill, a number of researchers have emphasised its value in the promotion of reading comprehension (Fisk & Hurst, 2003; Gajria, Jitendra, Sood, & Sacks, 2007; Gillam, Fargo & Robertson, 2009).

In emphasising the important role of paraphrasing in reading comprehension, Snow (2002), argues that amongst a number of studies that have been implemented in upper school grades, the skill of paraphrasing has been shown to aid recall of the text, and deepen comprehension. As suggested by Harris & Sipay (1990), the ability to express what someone else has said using your own words, is a reliable indicator of whether these ideas have been fully understood. Likewise, Shugarman & Hurst (1986), argue that the skill of paraphrasing helps students to express ideas in their own words, and by doing so, deepens their understanding of what they have read. Fisk & Hurst (2003), suggest that “One of the reasons paraphrasing works so well is because it integrates all modes of communication—reading, writing, listening, and speaking—which leads to a deeper understanding of the text” (p. 182). However, as noted by
Kletzien (2009), while the paraphrasing strategy has been noted as a strategy used by skilled readers, it has received little attention in the research literature. Kletzien suggests that many other comprehension skills and strategies such as visualization, questioning and using prior knowledge have been the focus in classrooms programs and research.

The value of paraphrasing, argues Kletzien (2009), is that it supports readers in making the necessary connections with their existing knowledge. In the process of making these links readers access words and phrases that are already part of their existing knowledge base. In addition, the paraphrasing strategy supports the reader in establishing retrieval cues that provide the necessary links between their prior knowledge and the information in the text being read. These skills, argues Kletzien, are crucial for successful comprehension of texts.

Kletzien (2009), also makes clear the important distinction between the more commonly used retelling strategy used in many classroom comprehension programs, and the paraphrasing strategy. She notes that while the retelling strategy encourages readers to use the words straight from the text, the emphasis in paraphrasing is on encouraging readers to use their own words and phrasing in expressing the content of the text. Kletzien (2009), argues that while readers must actively engage in the content of the text while paraphrasing, in the retell strategy engaging in the content of the text is not necessary. However the most important aspect of the paraphrasing strategy notes Kletzien, is that it makes clear to students that the purpose of reading is to understand text.

Further support for the relationship between paraphrasing and reading comprehension comes from a study by Gillam, Fargo & Robertson (2009), who used a ‘Think-Aloud’ strategy with fourth grade students with and without language impairments. The ‘Think-Aloud’ strategy is a tool used to explore ‘comprehension processes in an authentic, integrative context’ (Paris & Stahl, 2005, p. 39, cited in Gillam, Fargo, & St. Claire-Robertson, 2009). During this process participants are asked to report their thoughts (referred to as ‘verbal protocols’, in the literature), during tasks, and talk about how they came to decisions and particular solutions. Gillam et al., (2009), note that these protocols typically consist of series of factual comments, for example paraphrases, or inferences made by the participants that can be analysed.
Results of the study suggest that better comprehenders produced better paraphrases than the less skilled comprehenders. However, Gillam et al (2009), noted that the results from their study were more strongly related to expository text than narrative text. They postulated that “the general structure of narrative text may lend itself to the generation of inferences and expository text to the generation of paraphrases” (p. 90).

Munro (2006), argues that one of the key strategies used by effective readers is the paraphrasing strategy. In using this strategy readers say the ideas expressed in a passage in their own words as they read. They may also ‘build an image of what a sentence is saying in a particular context’ (p. 1). This strategy supports them in making links between the text and what they know, to support their comprehension and retain what they are reading.

In noting the important contribution the paraphrasing strategy plays in developing a deep understanding of texts, Munro (2006), argues that it helps readers to:

- understand the texts they read
- link the new ideas with what they know
- engage with the text
- understand grammatically or conceptually complex sentences by unpacking them
- link the new concepts, often in unfamiliar relationships and to talk about the new ideas
- talk about the ideas in the topic area
- build and reinforce new vocabulary
- retain the related ideas in short term memory.
- reiterate what they have read in their own words

Fisk & Hurst (2003), suggest that paraphrasing helps students in text comprehension by reinforcing skills such as “identifying the main ideas, finding supporting details, and identifying the author’s voice” (p. 182). Using the paraphrasing strategy for comprehension purposes, note the authors, provides the opportunity to integrate the
three aspects of communication—reading, writing, and speaking. This integrating process, argue the researchers, produces a deeper, more comprehensive understanding of the text.

The purpose of teaching paraphrasing, argue Fisk & Hurst (2003), is to help students express the main ideas of a piece of text in their own words. A good paraphrase “will convey the meaning of the original document using the students’ own vocabulary and phrasing” (Fisk & Hurst, p. 183). Fisk & Hurst (2003), taught middle school students to paraphrase using a simple four step strategy: (a) initial reading of text followed by discussion, (b) second reading of text accompanied by note-taking, (c) written paraphrasing, and (d) sharing the written paraphrase. This strategy, notes the authors, enables students to have a thorough understanding of whatever text they have read. Importantly, Fisk & Hurst (2003), argue that teaching students the paraphrasing strategy strengthens their understanding of both narrative and expository text.

A number of studies have indicated that paraphrasing can also be a helpful comprehension strategy for students with learning disabilities (Bakken, Mastropieri & Scruggs, 1997; Ellis & Graves, 1990; Katims & Harris, 1997, Schumaker & Dreshler, 1992). In a study by Katims & Harris (1997), 207 middle school students with and without learning disabilities, were taught a paraphrasing strategy called RAP (Schumaker, Denton, & Deshler, 1984). The program was delivered simultaneously for all students with no adjustments made in intensity for those with a learning disability. Expository text was used as the researchers noted that the ability to gain meaning from expository texts is a crucial skill for success in middle and secondary school.

The strategy (RAP), contained three steps:

1. Read a paragraph,
2. Ask yourself questions about the main ideas and details, and
3. Put the main ideas and details into your own words using complete sentences.

Results of the study indicate that the paraphrasing strategy improved reading comprehension scores for both students with learning disabilities, and those without learning disabilities. On the basis of these results Katims & Harris (1997), report that the paraphrasing strategy has been shown to be a significant factor in raising the reading comprehension skills of all students, both those with learning disabilities and
those without learning disabilities. In addition, the researchers note that experience with the paraphrasing strategy produced better reading comprehension performance in the experimental group at the end of testing, than the regular comprehension curriculum for the control group.

A study by Shugarman & Hurst (1986), used the strategy of paraphrase writing across the curriculum to improve the students’ reading and writing skills in the process of learning new content. The researchers note that to produce an accurate and clear statement in their own words of what the author was saying in these tasks, required a strong commitment on behalf of the students. Shugarman & Hurst (1986), observed that as a result of much practise in this process, students were able to produce a clear and precise statement of what the author was saying. They argue that the process of deliberate consideration of what the author is trying to say, improves student’s understanding of the text at a deeper level.

The present study examines the relationship between the paraphrasing strategy and the ability to infer in both narrative and factual texts, and uses Munro’s (2005), ‘Paraphrasing Task’ to examine this relationship. While studies on paraphrasing noted in the literature with the exception of the study by Gillam, Fargo, & Robertson (2009), were limited to upper primary and secondary students, the present study examines the relationship between the ability to paraphrase, and inferential comprehension of both narrative and factual texts for students in grades 2-6.

The following section examines the reader’s ability to formulate questions, and the relationship between this skill and inferential reading comprehension. The present study predicts that a significant relationship exists between inferential reading comprehension and the readers’ ability to identify questions answered by a written text.

3.8.2 Interrogative ability

As suggested by Munro (2003), a possible aspect of the inferring mechanism is the role of interrogative linguistic forms in generating inferences. The interrogative form is one that readers can potentially generate for a sentence proposition. It is indicated in the reader’s ability to identify questions answered by a sentence. Munro (2003), argues that this self-questioning ability may be expected to assist readers in linking relevant propositions in verbal semantic memory. This would lead to the prediction that
readers who are more able to generate questions are more able to comprehend text at an inferential level (Munro, 2003).

In further highlighting the possibility that interrogative ability may have an important part to play in inferential reading comprehension, Graesser, Singer, & Trabasso (1994), argue that successful comprehension of text involves the reader in asking important questions such as those that tap plausible gaps in their knowledge, as well as discrepancies in the text. In asking themselves these types of questions, notes Graesser et al., the reader is able to construct answers that are both relevant and instructive, and in so doing support the comprehension process. As Taboada & Guthrie (2006), point out, that in creating their own questions students are required to assess their current knowledge, and on the basis of this information make decisions about what actions they will take to fill any obvious gaps.

King (1994), emphasises that the important processes involved in students generating their own questions as they read texts are extremely rigorous, and require much cognitive effort on the part of the reader. This active processing, notes King, involves the reader in both searching and identifying main ideas from the text, and thinking about the relationships between these ideas, as well as how they link to prior knowledge. In further confirmation of the important role played by student self-questioning, Bransford, Stein, Vye, Franks, Auble, Mezynski & Pefetto (1982), suggest that this strategy is a distinguishing feature of effective readers. Effective readers they note, implement a variety of strategies in their search for meaning in text. Generating questions as they proceed through text is one of these strategies.

Teaching students to generate their own questions, has been identified by the National Reading Panel (Langenburg, 2000), as one of seven categories of text comprehension strategies which they claim have a sound scientific basis for improving comprehension outcomes. As noted by Pressley & Afflerbach (1995), the ability to generate their own questions about a text being read is one of the key characteristics that differentiates skilled readers from less skilled readers. However, according to Dole, Duffy, Ruehler, & Pearson, (1991), while teacher constructed questioning has been used consistently in classroom reading programs over many years, the practice of students developing their own questions is a strategy that is seldom used.
A number of studies have demonstrated that teaching students to generate their own questions improves comprehension of text (Haller, Child, & Walberg, 1988; Keene, 2002; Taboada & Guthrie, 2006; Rosenshine, Meister & Chapman, 1996).

In examining the role of individual differences in students generating their own questions Wong (1985), suggests that what differentiates skilled from less-skilled comprehenders, is the ability of skilled readers to spontaneously engage in question generation in the process of reading. However, notes Wong (1985), both weak and average readers need support in learning this important skill.

Further confirmation of the important role of self-questioning in reading comprehension, comes from a study by Keene (2002), examining the actions taken by proficient readers as they attempt to understand texts. Results of this study with upper school students found that skilled readers generate questions spontaneously at different time points as they read. Proficient readers, notes Kenne (2002), generate questions before reading, during reading, and after reading.

In further support for the role of questioning, Haller, Child, & Walberg (1988), report in their synthesis of 20 studies with a total student population of 1,553, that the most effective metacognitive skills amongst those studied were ‘awareness of textural inconsistency and the use of self-questioning as both a monitoring and a regulating strategy were most effective’ (p. 5). As noted by the authors these results were most significant for students in seventh and eighth grades, followed by students in second and third grades. As noted by Haller et al., the term metacognition is used in the literature to refer to mental activities “such as awareness, monitoring and regulating functions to aid faltering understanding” (p.6). They note however, that the essence of metacognition is still being debated within the literature.

Palincsar & Brown (1984), implemented a reciprocal teaching approach to develop questioning skills in their students, leading to improvement in standardized comprehension scores. The approach taken was reciprocal in nature, with a teacher modelling appropriate comprehension strategies, such as asking questions and providing paraphrases, with the student gradually taking over this role. By the end of the sessions, students were independently creating questions focusing on main ideas in the text rather than unclear, more random questions.
Additional support for the role of student questioning in the development of reading comprehension, comes from a study by Singer & Dolan (1982), based on the use of story-grammar questions such as ‘Who were the main characters in the story?’ Junior High School students were taught to generate their own questions based on a set of ‘who’, ‘what’, ‘why’, ‘when’, questions. Singer & Dolan (1982), claimed the results of the study provide support for the notion that students developing their own questions rather than relying on questions developed by their teachers, led to improved comprehension results.

A study by Taboada & Guthrie (2006), investigated the relationship of student-generated questions and prior knowledge with reading comprehension. The researchers developed a questioning hierarchy to “describe the extent to which student generated questions seek different levels of conceptual understanding” (p.1). The questions posed by grade 3 & 4 students were related to their background knowledge, as well as their general level of reading comprehension. Results of the study note Taboada & Guthrie (2006), indicate that student ability to create questions was positively related to their comprehension scores, after taking into account the contribution of prior knowledge. Furthermore note the authors of the study, results indicated a positive relationship between high and low level questions, and high and low level understanding of “conceptual knowledge gained from text” (p.1). Taboada & Guthrie suggest that these results demonstrate a positive relationship between reading comprehension and self questioning ability.

In their extensive review of intervention studies teaching students to generate their own questions as a way of improving their comprehension, Rosenshine, Meister, & Chapman, (1996), note that students are more actively engaged in reading when they create and answer their own questions rather than answering questions created by the teacher. Rosenshine et al., (1996), suggest that as a result of this intervention comprehension results improved. However, they also note that comprehension results improved in the more traditional comprehension methods of teachers designing the questions.

A study by Davey & McBride (1986), explored the effects of training sixth grade students in question generation. The study consisted of five sessions during which the students were asked to generate “good think-type questions” (p. 256), as they read
expository passages. The experimental group outperformed the control group on all measures for question generation, in both literal and inferential comprehension. As noted by the researchers, due to the cognitive effort involved in this process, creating successful higher-order questions may have a negative effect on the accuracy of responses made to questions developed after reading the text, due to the active nature and cognitive effort of the process. Davey & McBride (1986), also suggest that training students in self-questioning strategies provides them with a deeper understanding of both the strengths and weaknesses of their comprehension abilities.

Findings from a study by Cohen (1983), of 60 third grade students trained to generate questions at a literal level of comprehension in relation to short stories, demonstrated significant gains in answering and generating questions in criterion and standardised reading comprehension tests, when compared to students who did not learn to generate story-based questions. On the basis of these results Cohen (1983), suggests that training students to create story-based questions as they read can begin as early as primary school. They claim that this training in the generation of questions may improve their comprehension of stories. However, Cohen (1983), suggests that further studies would be required to investigate the effect of training to generate questions in the higher levels of comprehension.

A study by Nolte & Singer (1985), demonstrated that fifth and sixth grade students who learned to ask themselves questions about key points in a story significantly improved their performance on tests about story content. Nolte & Singer trained the students in asking appropriate questions as they read, before the students implemented the strategy independently. Results of the study indicate that students in the experimental group who took an active approach to reading comprehension by asking themselves questions, performed better than those in the control group.

The present study uses ‘The Questioning Task’ (Munro, 2005), to examine the reader’s ability to formulate questions for sentence propositions. As noted by Munro (2003), the ability to form questions may assist readers in linking relevant propositions in verbal semantic memory, which would lead to the prediction that readers who are more able to generate questions are more able to comprehend text at an inferential level (Munro, 2003).
3.9 Concluding Remarks

A number of observations regarding designs and methodologies used in the studies cited in this chapter can be made. Firstly, in relation to the predominance of studies of primary school aged students examining the knowledge and skills necessary for inference making were in narrative text. Very few studies have examined this age group in relation to these skills in expository text. Moreover there was a lack of studies in the literature that examined inferencing in these two text types with the same cohort of students. This means that drawing conclusions from the studies available as to the difficulty of one text type over the other, is not possible.

Secondly, the majority of studies examining inference with primary school aged students focussed on particular grade levels, usually at the upper grade level, or across two or three grade levels at the most. This is particularly noticeable in relation to studies in expository text. No studies were sighted in the literature comparing inferential comprehension in both narrative and factual texts across the age group examined in the present study. This observation applied also to the component skills examined in this study, for example studies in the literature focussed mainly on one, or at the most three grade levels, mainly focussing on the relationship between inferencing skills and one component skill, for example working memory, or vocabulary knowledge.

Likewise with the relationship between paraphrasing and questioning, and inferential reading comprehension, studies in the literature mainly examined the relationship with inferencing ability in upper primary and secondary aged students.

The strength of the present study lies in the breadth of examination of the knowledge and skills necessary for the development of inferential reading comprehension in both narrative and expository text across the primary school grades 2-6.
Chapter 4  The Present Study

While an extensive body of research over the past two decades has shown that successful reading comprehension involves the reader using a variety of strategies to make meaning, the strategies involved in the generation of inferences have been demonstrated to be more significant than others (Garnham & Oakhill, 1996; van den Broek, 1994). For example studies have demonstrated that many children with reading difficulties have been shown to have problems with inferential reading comprehension (Cain & Oakhill, 2006; Cain, Oakhill, Barnes & Bryant, 2001; Garnham & Oakhill, 1996). While studies have demonstrated that primary school aged children are sensitive to text structure (Englert & Thomas, 1987; Williams, Hall, & Lauer, 2004), the majority of research in the literature has examined inferential reading comprehension in narrative text structure in children at or above the grade four level.

A number of studies in the literature suggest that inferential comprehension is acquired developmentally (Casteel & Simpson, 1991; Thompson & Myers, 1985; van den Broek et al., 2005). While a developmental sequence in narrative text has been proposed by van den Broek et al., (2005), suggesting that some inferential skills are easier than others at particular age levels, little research is available on developmental aspects of inferential reading comprehension in expository text.

While studies in the literature have also identified the crucial role of various psycholinguistic and cognitive factors, such as the role of vocabulary network knowledge (Cain, Oakhill, & Lemmon, 2005), and short term working memory (Just & Carpenter, 1992), in the development of inferential reading comprehension, the majority of these studies have focussed on various individual primary and secondary grade levels, and predominantly in relation to narrative text.

Other variables have been noted in the literature which may contribute to the ease in which students make inferences, such as the skill of developing their own questions (Taboada & Guthrie, 2006), and the skill of paraphrasing (Gilliam, Fargo & Robertson, 2009). As noted by Kletzien (2009), although these studies have identified paraphrasing as a strategy used by successful readers, it has not had the same amount of attention in the research as other strategies. For example the only study in the literature examining the relationship between reading comprehension and paraphrasing with primary school children was the study of grade 4 students by Gillam,
et al., (2009). This study examined the relationship between paraphrasing and reading comprehension generally, but did not focus on either narrative or factual text explicitly.

Likewise, the only study in the literature examining the skill of self-questioning and inferential reading comprehension with primary school aged students, was a study of grade 3 & 4 students by Taboada & Guthrie (2006), examining the relationship between self-questioning and both literal and inferential comprehension of expository text. Other studies in the literature investigated grade 3 student’s self-questioning and comprehension skills at a literal level, (Cohen, 1983), and with students in grade 5 & 6, investigating self-questioning and comprehension generally (Nolte & Singer, 1985).

**The present study examines the following research questions:**

1. Is inferential reading comprehension more difficult than explicit reading comprehension?
   - Will this pattern be evident across each of the grade levels 2-6?

2. Is inferential reading comprehension influenced by the structure of the text?
   - Is drawing inference in narrative text easier than drawing inference in factual text?
   - Will this pattern be evident across each grade level 2-6?

3. Is inferential reading comprehension acquired developmentally?
   - Are some inferential skills easier to apply than others at each year level?

4. Is inferential comprehension influenced by the reader’s breadth of vocabulary network knowledge?
   - Is this influence evident across each of the grade levels 2-6?

5. Is inferential reading comprehension influenced by the reader’s working memory?
   - Is this influence evident across each of the grade levels 2-6?

6. Is there evidence of a significant relationship between inferential reading comprehension and the readers’ ability to identify questions answered by a written text?
-Is this relationship evident across each of the grade levels 2-6?

7. Is there evidence of a significant relationship between inferential reading comprehension and the readers’ ability to paraphrase a written text?

-Is this relationship evident across each of the grade levels 2-6?

Throughout the remainder of the present study the term ‘factual’ text, is used rather than the term ‘expository text’, used in the research literature. This decision was made taking into consideration the term that was most familiar to the students in the present study. It is noted that the school where the study was conducted used the term ‘factual text’ consistently in instructional contexts across all grade levels, and in all school-wide planning documentation.

The current chapter identifies the parameters for the study and provides justification for the empirical decisions made in the following areas:

4.1 The focus of the present study

Difficulty with drawing inferences has been implicated in studies of skilled and less-skilled readers (Cain & Oakhill, 2004; Cain, Oakhill, Barnes & Bryant, 2001; Oakhill & Cain, 2004). While skilled readers go beyond what is stated explicitly on the page and create an integrated mental representation of the text, less-skilled readers tend to process text in a more passive way, generating a more superficial, literal understanding of the text (Bowyer-Crane & Snowling, 2005; Cain & Oakhill, 1998, Cain Oakhill, Barnes & Bryant, 2001).

In emphasising the crucial role played by inference in successful reading comprehension, researchers such as Cain & Oakhill (1999), argue that unless these difficulties with inferential processing are addressed for these children, they can have a major impact on reading comprehension throughout their lives. The focus of the present study is on inferential reading comprehension. The present study proposes that inferential reading comprehension will be more difficult than explicit reading comprehension across the grade levels 2-6 (students in the present study across these grade levels have an average age of between 8.0 years and 12.3 years).

While primary school children have been shown to be sensitive to narrative text structure (Williams, Hall & Lauer, 2004; Lorch, 2015), little research has been carried out in factual text with primary school aged children (Baretta et al., 2009). As noted by
Gillam, Fargo, & Robertson (2009), the majority of studies cited in the literature have focussed on adults or older adolescents (Kucan & Beck, 2003). The present study investigates inferential reading comprehension of both narrative and factual texts across the grade levels 2-6.

Studies have also demonstrated the role of a number of psycholinguistic and cognitive factors in the development of inferential reading comprehension such as the role of vocabulary network knowledge (Cain, Oakhill & Lemmon, 2005), and working memory (Just & Carpenter, 1992; Kintsch & van Dijk, 1978). Although studies in the literature have investigated these factors at various grade levels, mainly in relation to narrative text, the present study examines these factors in relation to both narrative and factual text, and at each of the grade levels 2-6. As part of the examination of vocabulary network knowledge, the present study also examines the relationship between figurative language and inferential reading comprehension. Although figurative language has been shown to be an important aspect of vocabulary development (Cain, Oakhill, & Lemmon, 2004; Cain, Oakhill & Elbro, 2003), its relationship to inferential reading comprehension of both narrative and factual texts in students from grade 2-6, has not been previously examined.

While a positive relationship has been suggested between interrogative ability, the ability to construct questions which can be answered by a text, and inferential reading comprehension (Taboada & Guthrie, 2006), few studies in the literature have been carried out with primary school students. The present study examined the relationship between the skill of self-questioning and inferential comprehension of both narrative and factual texts across the grade levels 2-6.

While a positive relationship has also been proposed between paraphrasing ability and reading comprehension generally, only one study in the literature, a study by Gillam, Fargo & Robertson (2009), examined this skill with primary school students. The study by Gillam et al., used a ‘Think-Aloud’ strategy to examine the relationship between paraphrasing and reading comprehension generally, by grade 4 students. The present study examines the relationship between paraphrasing ability and inferential reading comprehension of both narrative and factual text for students in grade 2-6.
4.2 Model of text comprehension used in the present study
The present study draws on a combination of Kintsch’s construction-integration model (Kintsch, 1998), and Just and Carpenter’s capacity-constrained model (Just & Carpenter, 1992). This model emphasizes the influence of prior knowledge and cognitive capacity on formation of text comprehension. It views reading as a goal-orientated, information processing activity in which readers identify various types of text information: word meanings, sentence propositions, conceptual relationships, the topic or theme of the text and the writer’s disposition to the topic.

4.3 Definition of inferential reading comprehension used in this study
The present study is based on the understanding that inferential reading comprehension is a constructive, cognitive process involving the reader going beyond what is stated explicitly in a text, linking ideas not linked directly in the text (Munro, 2004). This process is one in which the reader uses information from the text, or from both the text and their own background knowledge, to draw a conclusion that has not been stated explicitly within the text (McNamara & Kendeou (2011).

4.4 Model of inference classification used in the present study
The present study is based on Kintsch’s (1993) classification system for the generation of inferences in reading comprehension. Kintsch’s system has been chosen for the present study at it classifies inferences not only in terms of the activity required, but also indicates the increasing complexity of cognitive processes necessary for the generation of particular inferences (proceeding from right to left: Table 4.1). All five inference types used in the present study have been classified according to this system, as controlled processes, as they involve cognitive activity on the part of the reader. Reasons for the choice of the five inference types examined in the present study are discussed in section 5, of this chapter. This classification system is referred to in the present study as the Elaborated Classification System for inferences in reading comprehension (adapted from Kintsch, 1993).
The present study uses the Elaborated Classification System (Table 4.1, adapted from Kintsch, 1993), for the generation of inferences in discourse comprehension, and focuses on five types of inference- inferring motive/goal, inferring cause/effect, inferring conventions of text, inferring feeling/emotions, and inferring character traits. These inference types were used as the present study were based on inferential questions from the ICAS (ICAS material is owned by UNSW Global Pty Limited), English test papers (2007, 2008, 2009), for grades 3 to 6 (test papers A, B, C & D), from the University of New South Wales. The ICAS tests, the selection of inference types chosen from these tests, as well as the process for classifying them according to the
Elaborated Classification System (adapted from Kintsch, 1993), for controlled
processes, are described in detail in the following sections.

4.5  Selection of texts for comprehension tasks (Hypotheses 1-3)

The acquisition of inferential reading comprehension was examined in the present
study by analysing the order of difficulty of a range of inferential tasks in both
narrative and factual texts, across the grade levels 2-6. This order of difficulty was
assessed using a set of comprehension tasks, based on both narrative and factual
texts, from the suite of comprehension tests developed from the 2007- 2009,
*International Competitions and Assessments for Schools, University of New South
Wales* (UNSW), English Tests for grades 3- 6. These Tests, commonly referred to as
ICAS tests, are developed by Educational Assessment Australia (EAA), and owned by
UNSW Global Pty Limited, a not-for-profit education provider and a wholly owned
telestate of the University of New South Wales. They are organised in booklet form,
and contain a range of texts, both narrative and factual, accompanied by a set of
multiple-choice questions. These questions, include those requiring inferential
processes to be used to provide correct answers, as well as those where the answers
are stated explicitly in the text. The only comprehension test in the present study not
based on ICAS English tests (2007- 2009), was the grade 5/6 test based on an
alternative factual text. The reason for this change is explained in section 6.1.1.

Documentation on The University of New South Wales (UNSW Global, Educational
Assessment Australia), website, notes that the framework for describing skills assessed
in their English tests, including those used as the basis for the present study (English
papers 2007, 2008, & 2009), was Bloom’s Taxonomy, using the skill words *Locate,*
*Identify, Interpret, Infer,* and *Synthesise.* UNSW has since (as of 2017), developed three
new skill descriptors—*Identify, Understand & Explain, Analyse and Evaluate.* Under
these new descriptors, *inference* comes under *Analyse and Evaluate.* It is interesting to
note that the UNSW have more recently included ‘*paraphrasing*’ as one of the skills in
their *Understand & Explain* descriptor.

4.5.1  Reasons for using the ICAS test materials

The school where the present study was conducted had purchased the English ICAS
tests (2007- 2009), for all students at each year level 3-6, and used the results provided
by ICAS, for tracking student performance. Once purchased, the test booklets remain the property of the school, and separate answer sheets, provided by ICAS for each individual test, are sent back to the University of New South Wales for marking. This meant that the school where the research for the present study was completed had class sets of ICAS English test booklets (2007-2009), at each grade level 3-6, which could be used by the school for its own purposes. None of the students in the present study, at any of the levels, grades 2-6, had previously seen, or used, the particular ICAS English test papers, (2007, 2008, 2009), used as a basis for the present study.

The English ICAS tests (2007-2009), used as the basis for examining inferential reading comprehension in the present study, are set out booklet form. Each of the tests within each booklet contains a text and a set of multiple-choice questions for students to answer. However, as separate answer sheets are provided by ICAS, no answers to the multiple-choice questions had been indicated in the test booklets used in the present study, by students who had used them for previous test purposes. Care was taken to ensure that any booklet with even the slightest mark on the multi-choice answer page accompanying each text was not used in the present study. Only five booklets across the year levels 3-6, were deemed unsuitable for use in this regard, and were not used in the present study.

Students in the present study at each level grade 2-6, completed two comprehension tests, one based on a narrative text, and the other based on a factual text. Each of the two tests, at each grade level 2-6, contained five questions requiring an inference to be drawn, and five questions where the answer was stated explicitly in the text. Inferential and explicit questions were ordered randomly throughout the test. These tests were on separate sheets of paper from the ICAS booklets. The ICAS English test materials (2007-2009), were used for this purpose, with the exception of the grade 5-6 test based on a factual test. An alternative factual text was used for this purpose. The reason for the use of an alternative factual test at the grade 5-6 level is explained in the following section.

4.5.2 Selection of tests for students in grades 2-6

Two tests, one based on a narrative text, and the other based on a factual text were selected from the grade 3 & 4 suite of ICAS English tests (2007-2009), (ICAS material is owned by UNSW Global Pty Limited), for students in grades 3 & 4. Two different tests,
one based on a narrative text, and the other test based on a factual text, were selected for students in grade 5 & 6, from the suite of grade 5 & 6, ICAS English tests (2007-2009). The reason students at different grade levels completed the same tests was to enable comparative data to be generated across the two levels, grades 3 & 4, and grades 5 & 6. The Flesch-Kincaid Readability Measure (see Section 6.1.4), was then applied to the texts on which each of these four tests were based, to ensure they were suitable for each of the grade levels completing the tests (Table 4.3). A group of three literacy specialist teachers from the same Region as the school where the present study took place, were then consulted as to the suitability of the four texts, the narrative and factual texts for grade 3 & 4 students, and the narrative and factual texts for students in grades 5 & 6 (Summary of this consultation process in Appendix A).

The only text considered unsuitable as a result of this consultation process, was the grade 5 & 6 factual text. The literacy specialists consulted considered this text too difficult for the grade 5 students and too easy for the grade 6 students. As the process of consultation continued without finding a suitable factual text from the ICAS English test materials (2007-2009), an alternative text and set of comprehension questions, (Literal and Inferential Comprehension Tasks, Unpublished manuscript, University of Melbourne, Munro, 2012), was chosen for this purpose. Munro’s (2012), task is based on an extract ‘Phar Lap the Champion’ from the book ‘Legendary Animals’ (Chase & Krantz, 1995, p. 29). Permission has been provided for use of the text (Appendix C), and the accompanying photograph of Phar Lap used in the present study to accompany Munro’s (2012), test questions. The photograph of Phar Lap is now in the public domain (details in Appendix C). Munro’s (2012), task was considered by the same literacy specialists consulted previously, to be a suitable replacement for the grade 5 & 6 factual text in the present study. (Appendix A, provides a summary of this consultation process).

As the University of New South Wales does not publish English test papers at the grade 2 level, the grade 2 students in the present study were assessed using a separate narrative and factual text chosen from the suite of grade 3, ICAS English tests, (2007-2009). In the selection of these texts consideration was given to the appropriate Readability level of the texts on which the questions were based, using the Flesh-Kincaid Readability Measure (Section 4.6), as well as the results of a Pilot Study.
The purpose of the Pilot Study was to explore the efficiency of tasks and data gathering protocols in relation to the use of the ICAS English tests for students at the grade 2 level, using grade 3, English ICAS tests. These considerations were examined by comparing the results of 5 multiple choice questions where an inference was required to answer the question correctly, and 5 multiple choice questions where the answer was stated explicitly in the text, from the grade 3, ICAS English test based on the narrative text ‘Queenie the Bantam’ (ICAS, 2005). The Flesh-Kincaid Readability Measure was used to confirm the suitability of the text ‘Queenie the Bantam’, for the grade 2 Pilot Study. This was the only test carried out as part of the Pilot Study. No testing was completed based on a factual text. The test questions and multiple choice answers were taken directly from the ICAS test, with no changes made. The text used for the Pilot Study (Queenie the Bantam), was not used as part of the Present Study.

The Pilot Study was carried out with a group of 25 grade 2 students, from the school in which the present study was carried out. All students in the cohort were considered to be at the expected level of reading ability for their age group according to baseline data from PATR (Progressive Achievement Test in Reading, ACER, 2008). Results of the Pilot Study indicated a high percentage of students were able to make the necessary inferences to answer the inferential questions correctly (Mean Percentage Score across the cohort of 75.5 for correct answers to the 5 multichoice inferential questions, and 79.0 for the explicit questions). Results indicated that students in grade 2, who were reading at the expected level according to PATR, were able to cope with the multichoice format as well as the readability level of the text on which the questions were based. More detailed information regarding these results are included in the Appendices. (Appendix A: 1. Selection of Tests).

4.6 Readability Measure

The Flesch-Kincaid Grade Level Readability Test (Kincaid, Fishburne, Rogers, & Chissom, 1975) (Table 4.2), was used to ensure readability levels were appropriate for each of the grade levels completing the comprehension tests in the present study. The Flesch-Kincaid Readability Formula rates text on a U.S school grade level, is used extensively in the field of education, and is bundled with common word processing programs such as Microsoft Office Word. The formula translates the 0-100 score to a U.S grade level for equivalent Australian grade levels. For example a score of 5 means
that a fifth grade student is able to understand the text. It is important to note that
the text ‘Kensuke’, used in the present study for the Grade 5 & 6 narrative test, was
originally used in 2008 by ICAS as part of the grade 5, English test. However, after
applying the Flesch-Kincaid Readability formula to the text, it was considered suitable
for grades 5 & 6 in the present study (‘Kensuke’ ICAS text- Flesch-Kincaid Readability
level- grade level 5.8). See Table 4.2 for a comparison of approximate ages and grade
levels in American and Australian schools.

<table>
<thead>
<tr>
<th>America</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elementary School</strong></td>
<td><strong>Approx. age of students</strong></td>
</tr>
<tr>
<td>Preschool</td>
<td>4-5 years</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>5-6 years</td>
</tr>
<tr>
<td>1st Grade</td>
<td>6-7 years</td>
</tr>
<tr>
<td>2nd Grade</td>
<td>7-8 years</td>
</tr>
<tr>
<td>3rd Grade</td>
<td>8-9 years</td>
</tr>
<tr>
<td>4th Grade</td>
<td>9-10 years</td>
</tr>
<tr>
<td>5th Grade</td>
<td>10-11 years</td>
</tr>
<tr>
<td><strong>Middle School</strong></td>
<td></td>
</tr>
<tr>
<td>6th Grade</td>
<td>11-12 years</td>
</tr>
</tbody>
</table>

Table 4.2: Comparison of approximate ages and grade levels in American and Australian Schools.

The formula for the Flesch-Kincaid Grade Level score is:

\[(.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59\]

Where:

\[\text{ASL} = \text{average sentence length (the number of words divided by the number of sentences)}\]

\[\text{ASW} = \text{average number of syllables per word (the number of syllables divided by the number of words)}\]

Table 4.3. sets out the year of the ICAS English test papers used for the present study,
the titles of the texts used from the ICAS test papers, and details of the additional
factual text used at the grade 5 & 6 level.
<table>
<thead>
<tr>
<th>Title of text used.</th>
<th>Text Type</th>
<th>Flesch-Kincaid Grade Level</th>
<th>Source of text</th>
<th>Test Paper and Year</th>
<th>Grade levels completing tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kensuke</td>
<td>Narrative</td>
<td>5.8</td>
<td>ICAS (University of New South Wales) Educational Assessment Australia. International Competitions and Assessment for Schools. English. Test paper A</td>
<td>ICAS Grade 6 English 2008</td>
<td>✓</td>
</tr>
<tr>
<td>The Potato People</td>
<td>Narrative</td>
<td>2.4</td>
<td>ICAS (University of New South Wales) Educational Assessment Australia. International</td>
<td>ICAS Grade 3 English 2007</td>
<td>✓</td>
</tr>
</tbody>
</table>
### Table 4.3: Comprehension texts completed by students at grade levels 2 to 6.

#### 4.7 Choice of inference types

Once suitable texts, a narrative and a factual text were chosen for grade 2 tests, grade 3-4, tests, and grade 5-6, tests, the next issue for consideration was determining a common set of inference types from the ICAS test questions accompanying each of the selected ICAS texts.

To enable comparisons to be made across grade levels 2, 3-4, and 5-6, in the present study, some slight changes had to be made in the way some inferences were described in the ICAS materials. For example, a broader description such as ‘inferring a motive/goal’ is used in the present study in place of the description used in the ICAS documentation, such as ‘infer the reason/motive for a character’s action’ (Table 4.2).

All of the changes made to the ICAS descriptions for each of the inference types chosen for the present study, were examined by the same group of 3 literacy specialist teachers from schools in the same Region as the school where the present study was conducted, who had been consulted previously. This process of consultation was undertaken to ensure meaning was not lost in creating more general descriptions of the inferences used in the present study, from those used in the ICAS testing materials (Summary of consultation process in Appendix A).

To meet this criteria, five broad inference types common to all ICAS comprehension tests (2007-2009), were chosen for the present study, the grade 2 narrative and factual tests, the grade 3/4 narrative and factual tests, and the grade 5/6 narrative and factual tests, were selected. The five inference types are listed below. Each of the inference types is described in the broad terms used in the present study.
• inferring motive/goal
• inferring cause/effect
• inferring feeling/emotions
• inferring character traits
• inferring conventions of text

Examples of descriptions used for inferences in the ICAS materials, and the corresponding descriptions used in the present study as a result of the consultancy process, can be seen in Table 4.4.

<table>
<thead>
<tr>
<th>ICAS inferences types (examples noted in their documentation) for questions in comprehension tests</th>
<th>Descriptions of five inference types used in Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infer a character trait</td>
<td>Infer a character trait (same description as ICAS)</td>
</tr>
<tr>
<td>Infer a motive/reason for a character’s action</td>
<td>Infer motive/goal (similar description as ICAS)</td>
</tr>
<tr>
<td>Infer a character’s feelings or emotions</td>
<td>Infer feeling/emotions (same description as ICAS)</td>
</tr>
<tr>
<td>Infer a reason for a character’s action</td>
<td>Infer cause/effect (decision made to change to this broad term as result of the consultancy process).</td>
</tr>
<tr>
<td>Infer the consequences of an action</td>
<td>The present study grouped all of the ICAS examples under the broad term ‘Infer reasons for using conventions of text’ (This decision was made as a result of the consultancy process)</td>
</tr>
</tbody>
</table>

Table 4.4: Descriptions of inference types in ICAS materials, and in present study
4.7.1 Selection of questions for each of the inference types

To enable comparisons to be made of the five inference types across the grade level tests, a number of new inferential questions were developed by Munro (2010), to ensure an equal number of inferential questions, and to maintain consistency in the types of inferential questions included. All tests, both those based on a narrative text and those based on a factual text, at each of the grade levels, contained ten questions. Five of the questions required an inference to be generated, and answers to the remaining five questions were stated explicitly in the text.

All new inferential questions developed by Munro (2012), for the present study, were examined by a group of three literacy specialists from schools in the same Region as the school where the present study was conducted, to ensure they were assessing the type of inferential comprehension they were meant to be assessing, and were at an appropriate grade level (summary of consultation process in Appendix A). All questions for all of the tests, both those taken directly from the suite of ICAS English tests (2007-2009), as well as the new questions created by Munro (2010), for the present study, are noted in Appendix B.

New questions created for the tests based on the ICAS texts (grades 2-6) (See Appendix B)

Grade 2 factual test based on text ‘Monkey Chain’ (ICAS, 2008)
- Three new inferential questions were created

Grade 2 narrative test based on text ‘The Potato People’ (ICAS, 2007)
- Three new inferential questions were created

Grade 3/4 factual test based on text ‘Jungle Boy’ (ICAS, 2008)
- Four new inferential questions were created

Grade 3/4 narrative test based on text ‘That Magnetic Dog’ (ICAS, 2008)
- Two new inferential questions were created

Grade 5/6 narrative test based on text ‘Kensuke’ (ICAS, 2008)
- Five new questions were created

Grade 5/6 factual test based on text ‘Phar Lap The Champion (Chase & Krantz, 1995)."
• Five new inferential questions were created

The five inferential questions for the grade 5-6 factual text were created by Munro (2012), based on the extract ‘Phar Lap the Champion’ from the book ‘Legendary Animals’ (Chase & Krantz, 1995). These questions were examined by a group of 3 literacy specialist teachers who had been consulted previously, to ensure that the questions were assessing the type of inferential comprehension they were meant to be assessing, and were suitable for this age group. A summary of this consultation process can be found in Appendix A. The five inferential question types created by Munro (2012), used for the grade 5-6, factual test in the present study, were consistent with the five inferential question types used in the tests in the present study, across the other levels – the two grade 2 tests based on a narrative and a factual text, the two grade 3-4, tests, based on a narrative and a factual text, and the grade 5-6 text based on a narrative text.

4.7.2 Selection of multi-choice answers for the inference questions

As noted in section 4.7.1 above a number of new questions were developed (Munro, 2012), which necessitated the creation of accompanying multiple-choice answers. In designing the multi-choice answers, the concept of ‘distractor items’ was an important consideration. As noted by Gregory (2011), one of the major difficulties in the design of multi-choice questions, is the creation of the incorrect answer options or ‘distractors’. Distractors that are obviously incorrect can compromise the purpose of testing (Dickenson, 2013).

In designing the distractor items for the present study the following considerations were taken into account:

- poor choice of distractor items can make the the multiple-choice questions easier or harder than intended
- ensuring that the purpose of the question is clear; putting all the relevant information in the stem makes options easier to read and understand
- eliminate excessive working in the stem as this confuses students
- making sure there is only one best answer- avoiding creating two or more options that are correct, but where one is ‘more’ correct than the others (the
distractors should be incorrect answers to the questions posed in the stem); making the distractors appealing and plausible

- Limiting the number of alternatives to four or five at most.

(Dickenson, 2013)

When creating these items for the present study much consideration was given to making sure each of the items was plausible. Consideration was also given to ensuring distractors were consistent in type, content and style across grade levels, question type and text type.

On ICAS website the issue of distractors is mentioned in the design of their tests, noting their importance in the design of multiple choice questions. However there is no information in relation to which of the multichoice answers were the distractors in the ICAS tests used for the present study. Due to this lack of this information, it was not meaningful to further analyse the student responses to the multiple choice questions in the comprehension tests in relation to the effectiveness or not of the distractor items, as only the responses to the questions created by Munro (2012), would be able to be analysed. However, the recommendation has been included in the ‘Recommendation for the Future’ chapter (chapter 9), for this consideration to be taken into account in future studies.

The same consultancy process with the literacy specialist teachers was then undertaken with the new multi-choice answers for each of the new inferential questions at each of the grade level tests, grade 2, grade 3-4, and grade 5-6. (See Appendix A)

4.7.3 Selection of explicit questions

Once all inferential questions had been chosen for each of the tests, the narrative and factual questions for the grade 2 test, the grade 3-4 test, and the grade 5 & 6 tests, questions where the answer is stated explicitly in the text, referred to in this study as explicit questions, were chosen. Although a number of explicit questions were used from the ICAS tests at the different levels, new questions were required to make up an equal amount of literal questions to match the five inferential questions chosen for each of the tests. The additional explicit questions required were created by Munro,
(2012). The same consultation process used for examining the inferential questions was put in place for examining the explicit questions.

4.7.4 Selection of multi-choice answers for the explicit questions
The same consideration in relation to distractor items was taken in creating the multiple-choice answers for the explicit questions, as was taken in creating the multiple-choice questions for the explicit questions (see 4.7.2).

The same consultancy process was undertaken for the creation of new multi-choice answers for each of the new explicit questions at each of the grade level tests, grade 2, grade 3-4, and grade 5-6. (See Appendix A)

4.8 Selection of tasks: (Hypotheses 4-6)
The present study examines the role of vocabulary knowledge, short term working memory, the ability to identify questions answered by a written text, and the ability to paraphrase a text in relation to inferential reading comprehension of narrative and factual texts by primary school aged students in grades 2-6.

4.9 Vocabulary Task (Hypothesis 4)
The present study predicts that inferential reading comprehension will be influenced by the reader’s breadth of vocabulary network knowledge (Cain & Oakhill, 2014; Currie & Cain, 2015; Oakhill & Cain, 2012; Lynch, van der Broek, Kremer, White, & Lorch, 2008). The present study examines the relationship between the reader’s breadth of vocabulary network knowledge and inferential reading comprehension of both narrative and factual text, using The Test of Word Knowledge (TOWK), (Wiig & Secord, 1992). Three subtests from level 2, of this test were used in the present study in order to cover both Expressive and Receptive vocabulary. Figurative language is assessed in the Receptive vocabulary subtest of the TOWK Test. As approximately 50% of the English vocabulary is made up of words or combinations of words, which have multiple meanings (Durkin, Crowther, & Shire, 1986), commonly referred to in the literature as figurative language (Wiig & Secord, 1992), this subtest was seen as an important component of the vocabulary task for the present study.
4.10 Working Memory Task (Hypothesis 5)

The present study proposes that the inferring mechanism involves various aspects, one of which is the ability to maintain the propositions assembled during reading, in the reader’s working memory.

Working memory plays a vital role in the generation of inferences (Cain, Oakhill, & Bryant, 2004; Just & Carpenter, 1992; Kintsch & van Dijk, 1978). The present study hypothesises that inferential reading comprehension will be influenced by the reader’s working memory. The Automated Working Memory Assessment (AWMA) (Alloway, 2007), a PC-based program which is standardised for children aged 4 to 22 years was used to examine this hypothesis, using both the Digit Recall test (Verbal short-term memory), and the Backward Digit Recall test (Verbal working memory). This program is designed for easy administration for classroom teachers and other professionals. The scores are calculated automatically by the computer program, and the child’s performance is automatically summarised at the end of testing.

4.11 Paraphrasing task (Hypothesis 6)

A possible aspect of the inferring mechanism is the use of paraphrasing as a mediating process (Munro, 2005). Paraphrasing is one means readers use to link literal representations with their existing knowledge (Munro, 2005; Kletzien, 2009). This would lead to the prediction that readers who can paraphrase text more easily are also able to comprehend at an inferential level (Munro, 2005; Graesser, Singer & Trabasso, 1994). While studies on paraphrasing noted in the literature, with the exception of the study by Gillam, Fargo, & Robertson (2009), were limited to upper primary and secondary students only, the present study examines the relationship between the ability to paraphrase and inferential comprehension of narrative and factual texts for students in grades 2-6. The Paraphrasing Task (Munro, 2005), was used in the present study to examine this relationship between inferential comprehension and the reader’s ability to paraphrase a text.

The reliability of the paraphrasing task was examined using internal consistency and test-retest reliability procedures with average students in years 2-7. The correlations using internal consistency ranged from $r = 0.67$ to $r = 0.82$, and using test-retest reliability procedures ranged from $r = 0.73$ to $r = 0.85$ (Munro, 2003, 2002a). The validity of the paraphrasing task was examined by investigating its association with
independent reading comprehension for average students in years 2-7. The correlations ranged from $r = 0.62$ to $r = 0.79$ (Munro, 2003, 2002a).

The paraphrasing task is made up of 16 sentences which tell the story of two people going for a ride on a bike. For each of the sentences students are required to change as many of the words in the sentence as possible, while still retaining the original meaning. A copy of the instructions for Group Administration of the task, Guidelines for scoring the sentences in the task, and the Student Worksheet for recording the sentences, are included in Appendix C.

4.12 Questioning task (Hypothesis 7)

As noted by Munro (2005), a second possible aspect of the inferring mechanism is the role of interrogative linguistic forms in generating inferences. The interrogative form is the reader’s ability to identify the questions answered by a sentence. This self-questioning ability may be expected to assist readers to link relevant propositions in verbal semantic memory. This would lead to the prediction that readers who are more able to generate questions are more able to comprehend text at an inferential level (Munro, 2005). The Questioning Task (Munro, 2005), was used in the present study to examine this relationship.

The reliability of the questioning task was examined using internal consistency and test-retest reliability procedures with average students in years 2-7. The correlations using internal consistency ranged from $r = 0.63$ to $r = 0.86$, and using test-retest reliability procedures ranged from $r = 0.71$ to $r = 0.83$ (Munro, 2003, 2002b). The validity of the questioning task was examined by investigating its association with independent comprehension for average students in years 2-7. The correlations ranged from $r = 0.64$ to $r = 0.78$ (Munro, 2003, 2002b).

The questioning task is made up of 16 sentences that tell the story of two children going for a bike ride. The students are required to match each sentence with a question that is answered by the sentence. The task has been standardized with students from grades 2 to 10. A copy of the task with instructions for group administration is included in Appendix C. Directions for scoring the Questioning Task are also included in Appendix C.
The Questioning Task (Munro, 2005), is based on a narrative story structure. Comparing student questioning in both narrative and factual text is beyond the scope of this study. The current study does not attempt to classify the types of questions created by students in ‘The Questioning Task’. For example classifying questions generated by students as to whether they were ‘why’, ‘what’, ‘who’, ‘when’, ‘where’, questions, is beyond the scope of this study. Rather, questions generated by the students in this study were scored according to whether answers to their questions could be found in the sentences provided, and whether the response given by the student was a question, rather than a statement. The scoring system for this task (Munro, 2005), is explained more fully in the Methodology Section.
Chapter 5  Methodology

The present study examines the mechanism of inferencing during reading comprehension by primary school students in grades 2-6. The present study examines trends in inferential comprehension of narrative and factual texts, as well as the influence of a number of psycholinguistic and cognitive factors on developmental trends in the acquisition of inferential reading comprehension. These factors include vocabulary knowledge, short term working memory, text interrogative ability, and paraphrasing ability. The design of the study is provided in Table 5.1.

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Design of analysis</th>
<th>Statistical Procedures</th>
</tr>
</thead>
</table>
| Is inferential reading comprehension more difficult than explicit reading comprehension?  
  - Will this pattern be evident across the grade levels 2-6? | Grade 2 inferential x grade 2 explicit  
Grade 3 inferential x grade 3 explicit  
Grade 4 inferential x grade 4 explicit  
Grade 5 inferential x grade 5 explicit  
Grade 6 inferential x grade 6 explicit | -General Linear Modelling with repeated measures  
-Analysis of variance (ANOVA) with repeated measures  
Trends analysed using SPSSX 6.1 for Macintosh computer |
| Is inferential reading comprehension influenced by the structure of the text?  
  - Will this pattern be evident across the grade levels 2-6? | Grade 2 inferential x grade 2 narrative  
Grade 2 inferential x grade 2 factual  
Grade 3 inferential x grade 3 narrative  
Grade 3 inferential x grade 3 factual  
Grade 4 inferential x grade 4 narrative  
Grade 4 inferential x grade 4 factual  
Grade 5 inferential x grade 5 narrative  
Grade 5 inferential x grade 5 factual  
Grade 6 inferential x grade 6 narrative  
Grade 6 inferential x grade 6 factual | -General Linear Modelling with repeated measures  
-Analysis of variance (ANOVA) with repeated measures  
Trends analysed using SPSSX 6.1 for Macintosh computer |
| Is inferential reading comprehension acquired developmentally?  
  - If so, does this apply to both narrative & factual text? | Grade 2 inferential x grade 2 narrative  
Grade 2 inferential x grade 2 factual  
Grade 3 inferential x grade 3 narrative  
Grade 3 inferential x grade 3 factual  
Grade 4 inferential x grade 4 narrative  
Grade 4 inferential x grade 4 factual  
Grade 5 inferential x grade 5 narrative  
Grade 5 inferential x grade 5 factual  
Grade 6 inferential x grade 6 narrative  
Grade 6 inferential x grade 6 factual | -General Linear Modelling with repeated measures  
-Analysis of variance (ANOVA) with repeated measures  
Trends analysed using SPSSX 6.1 for Macintosh computer |
| Is inferential reading comprehension influenced by the reader’s breadth of vocabulary network knowledge?  
  - Is this influence evident at each grade level 2-6? | Grade 2 inferential x vocab knowledge  
Grade 3 inferential x vocab knowledge  
Grade 4 inferential x vocab knowledge  
Grade 5 inferential x vocab knowledge  
Grade 6 inferential x vocab knowledge | -Pearson Correlation (two tailed)  
Trends analysed using SPSSX 6.1 for Macintosh computer |
Is inferential reading comprehension influenced by the reader’s working memory?  
- Is this influence evident at each grade level 2-6?

| Grade 2 inferential x working memory | Grade 3 inferential x working memory | Grade 4 inferential x working memory | Grade 5 inferential x working memory | Grade 6 inferential x working memory | Pearson Correlation (two tailed) | Trends analysed using SPSSX 6.1 for Macintosh computer |

Is there evidence of a significant relationship between inferential reading comprehension and the reader’s ability to identify questions answered by a written text?  
- Is this relationship evident across each of the grade levels 2-6?

| Grade 2 inferential x questioning task | Grade 3 inferential x questioning task | Grade 4 inferential x questioning task | Grade 5 inferential x questioning task | Grade 6 inferential x questioning task | Pearson Correlation (two tailed) | Trends analysed using SPSSX 6.1 for Macintosh computer |

Is there evidence of a significant relationship between inferential reading comprehension and the reader’s ability to paraphrase a written text?  
- Is this relationship evident across each of the grade levels 2-6?

| Grade 2 inferential x paraphrasing task | Grade 3 inferential x paraphrasing task | Grade 4 inferential x paraphrasing task | Grade 5 inferential x paraphrasing task | Grade 6 inferential x paraphrasing task | Pearson Correlation (two tailed) |

Table 5.1: Study Design

5.1 Ethics

An application to the University of Melbourne Human Research Ethics Committee for an Expedited Review of A Low-Risk Project involving Humans was lodged for the present study. Once the application was granted for the project, the Principal from the school in which the research was to be carried out was provided with the Information for Primary Principals (Appendix C), and signed the Principal Consent form (Appendix C).

Parents of students in grades 2-6, were provided with a Plain Language Statement (Appendix C), informing them of the purpose of the research, and the tasks students would be asked to perform. Details were also provided in this statement as to the approximate amount of time these tasks would take. This document also explained that their child’s participation was voluntary, and they were able to withdraw from the study at any time, as well as withdraw any unprocessed data supplied. This document also informed parents that all tasks students completed and the scores obtained from these tasks will be handled in the strictest confidence. Parents were also informed in this document that the scores achieved on the tasks would not be used in any assessments by their child’s teacher or the school, and that their child would not be identified under any circumstances during the course of the study or in any written material following it. Parents were also informed that all data would be destroyed after the minimum period of five years. Parents were also provided in this document.
with contact details for the Human Research Ethics Officer for the institution where the study was being completed.

Pupils were also fully informed about the purposes of the research, and the level of involvement required if they decided to be part of the study. They were also informed of their right to withdraw from the study at any time, and also withdraw their data at any time.

5.2 Participants

The present study, a social research study of students in a natural setting - a State Government Primary school, involved a total sample of one hundred and fifty students. This sample was made up of thirty students from each grade level - grade two, grade three, grade four, grade five, and grade six. Thirty students at each grade level 2-6, was assumed to be a satisfactory number given that the total sample of the study was 150 students. Although statistically, 30+ participants is a viable sample (Pallant, 2016), evidence from larger groups at each grade level would need to be carried out to generalise the findings of the present study.

The rationale for choosing 30 students at each grade level was based on decisions related to the predicted length of time it would take to administer the suite of tests. Two of the six tasks in the present study, the working memory task and the vocabulary task required administration on an individual basis, and were predicted to take approximately 30 minutes each to administer. Together with the time taken for individual students to be collected from their individual classrooms and returned at the conclusion of the testing session, it was predicted that each of the students in the study (150 students), would miss approximately twenty minutes of their class time to complete the working memory task, and twenty minutes to complete the vocabulary task. The two comprehension tasks, the narrative and the factual task were predicted to take approximately thirty minutes per task, with students at each grade level leaving their individual classrooms and sitting the tests with their classmates from the same level in another classroom. The two comprehension tasks, the narrative and the factual tasks were completed on different days. A similar organisation and amount of time was required for the questioning and paraphrasing tasks, which were administered on different days at each grade level. Given this timeframe, a decision to create a sample
of 30 students at each grade level was made in consultation with the school, in order to minimise disruption to classroom programs.

### 5.2.1 Age of students in the study

Students in the grade two sample ranged in age from (7.11 years - 8.8 years)

Students in the grade three sample ranged in age from (9.0 years - 9.11 years)

Students in the grade four sample ranged in age from (10.0 years - 10.9 years)

Students in the grade five sample ranged in age from (10.11 years - 11.6 yrs)

Students in the grade six sample ranged in age from (11.11 years - 12.7 years).

Table 5.2 indicates the average age of students in the study at each of the grade levels 2-6.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Total number of students</th>
<th>Average age of students at each grade level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>30</td>
<td>8.0 years</td>
</tr>
<tr>
<td>Grade 3</td>
<td>30</td>
<td>9.4 years</td>
</tr>
<tr>
<td>Grade 4</td>
<td>30</td>
<td>10.5 years</td>
</tr>
<tr>
<td>Grade 5</td>
<td>30</td>
<td>11.2 years</td>
</tr>
<tr>
<td>Grade 6</td>
<td>30</td>
<td>12.3 years</td>
</tr>
</tbody>
</table>

Table 5.2: Average age of students at each grade level 2-6.

### 5.3 Selection process

All students from grade 2-6 who attended the State Government Primary School where the study was conducted were invited to be part of the present study (see copy of Consent Form, and Plain Language Statement in Appendix C). As noted in this letter parents were informed that they were able to withdraw their child from the study at any time. However, all students who were part of the study initially, remained in the study through the testing period.

Once permission forms were returned, a total of between 60 and 79 students at each grade level, only students achieving at or above the ‘Expected level’ for their year level in Reading according to baseline data from PATR (Progressive Achievement Test in Reading, ACER, 2010), were considered for the study. This consideration was seen as important in order to rule out the possibility of any underlying language difficulties affecting the results of the present study.
The PATR Reading Test reflects comprehension skills described in the Australian National Curriculum for English (2010), and is designed to provide objective, norm-referenced information to teachers about their students’ skills and understandings in these key areas. These areas include the ability of students to retrieve directly stated information, interpret both explicit and implied information, reflect on texts, and assess word knowledge through synonyms. The PATR Reading Test includes multiple-choice questions that match the general ability of students in the target year level, with percentile ranks and stanines providing a picture of how students’ results compare with results of students in the norm reference sample in the same year level across Australia. All students in grades 2-6 at the school where the research for the present study took place, sit the PATR, as part of a suite of standardised tests completed by students from grades 2-6, at the beginning and end of each school year.

A small number of students at each level were excluded on the basis of their PATR Reading results being below the ‘Expected Level’ for their grade level. Selection criteria also required that students not exhibit evidence of sensory or speech impairment that could affect their task performance.

Permission forms were then sorted into male and female students at each grade level. Thirty students were then randomly selected at each grade level 2-6. While an effort was made to include equal numbers of male and female students at each grade level, this was not possible at all levels, due to the difference in numbers of females and males, and the number of permission forms from families of female and male students.

The students in the sample across each of the grade levels 2-6 ranged in age from 7.11 years, to 12.7 years, and were from predominately middle to upper middle-class families. All students in the sample were born in Australia, and were fluent English speakers with English as their first language.

The sample randomly selected for the study at the grade 2 level included 16 males and 14 females, with an average age of 8.0 years. The grade 3 sample was made up of an equal number of male and female students, with an average age of 9.4 years. At the grade 4 level, the sample was made up of 14 males and 16 females, with an average age of 10.5 years. The grade 5 sample was made up of 16 males and 14 females, with
an average age of 11.2 years. At the grade 6 level the sample included an equal number of male and female students, with an average age of 12.3 years.

All parents who had expressed an interest in their child participating in the study received a letter from the researcher thanking them for their interest. This letter also informed parents whether their child had been selected for the study.

5.4 **Timeframe**

All tasks were completed over a period of approximately four months. The comprehension, questioning and paraphrasing tasks which were administered on a grade level basis at each grade level 2-6, were carried out during morning sessions. The tasks requiring administration on a one-to-one basis, the working memory task and the vocabulary task, were administered in afternoon sessions with the older students in grades 4, 5 & 6, and the younger students in grade 2 & 3, in morning sessions.

Administration of the comprehension tests at each grade level 2-6, was completed over a period of approximately 3 weeks, with students completing the test based on a narrative text in session one, and the test based on a factual text in session two. The questioning and paraphrasing tasks were completed over a period of approximately 3 weeks. The two tasks administered on a one-to-one basis, the working memory task and the vocabulary task, were completed over a period of approximately 6 weeks.

5.5 **Statistical Procedures**

A description of the statistical procedures for each task used to investigate each of the seven hypotheses in the present study is as follows:

To compare the comparative ease of explicit comprehension over inferential comprehension for each of the two text types narrative and factual, at each grade level 2-6, Means for both the explicit and inferential comprehension were compared using general linear modelling with repeated measures and paired sample statistics (N=30 for each text), 2-tailed t-test, df = 29).

To investigate the effect of text type, narrative and factual, on inferential and explicit reading comprehension at each grade level 2-6, Means for inferential comprehension of the two text types were compared using general linear modelling with repeated
measures comparing the two text types and grade trends for both explicit and inferential comprehension.

To investigate the relative ease of each of the five types of inference used in the study—inferring feelings/emotions, inferring cause/effect, inferring motive/goal, inferring character traits, and inferring conventions of text, in both narrative and factual text at each grade level, 2-6, Means for each inference type were compared using general linear modelling with repeated measures at each grade level 2-6, for both narrative and factual text.

To investigate the relationship between four psycholinguistic and cognitive factors and developmental trends in both inferential and explicit reading comprehension for both narrative and factual texts at each grade level 2-6, a Pearson Correlation (2 tailed), test was used. The four cognitive factors investigated were vocabulary knowledge, short term and working memory, paraphrasing ability and text interrogative ability.

Skewness and Kurtosis values were checked to determine the relative normality of the data. Effect sizes were calculated to indicate the strength of the associations in the findings. Effect sizes were evaluated using the guidelines proposed by Cohen (1988, cited in Pallant, 2016). While there are differing views as to how to interpret effect size, the most commonly accepted opinion is that of Cohen (1992), where 0.2 is indicative of a small size effect, 0.5 a medium effect, and 0.8 a large effect size (Cohen, 1998, cited in Pallant, 2016). The following table was used to interpret the effect size statistics.

<table>
<thead>
<tr>
<th>Size</th>
<th>% of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>.01.2</td>
</tr>
<tr>
<td>Medium</td>
<td>.065</td>
</tr>
<tr>
<td>Large</td>
<td>.138.8</td>
</tr>
</tbody>
</table>

Table 5.3: Effect sizes for group comparisons (Cohen, 1992 cited in Pallant, 2016).

The testing for all tasks in this study was carried out by the researcher. The comprehension tests were carried out at each individual grade level 2-6, with the 30 students participating in the study at each level. The same process was used by the
researcher for the questioning and the paraphrasing tasks. The remaining tasks, the vocabulary task, and the working memory task were carried out on an individual basis by the researcher, with each of the 30 students at each grade level. The researcher marked all the comprehension tests at each of the grade levels 2-6, as well as the questioning and paraphrasing tasks.

5.6 Comprehension tests

All students in grades 2-6, in the present study completed 2 multiple-choice tasks- one task based on a narrative text, and the other task based on a factual text. For each task, students at each grade level 2-6, answered 10 multi-choice questions based on the text. Five of the multiple-choice questions required an inference to be generated, while answers to the remaining five questions were stated explicitly in the text. The grade 2 students completed two tests, one based on a narrative text, and the other based on a factual text. Students in grade 3 & 4 also completed two tests, one based on a narrative text, and the other based on a factual text. Likewise, students in grade 5 & 6 completed the same two tests, one based on a narrative text and the other based on a factual text. The reason for the grade 3 & 4 students completing the same two tests, and the grade 5 & 6 students completing the same tests was to enable results to be compared across the two grade levels.

All tests with the exception of the grade 6 test based on a factual text, were chosen from the suite of ICAS tests (2007-2009), held by the school where the research for the present study took place, on the appropriateness of the readability level of the texts. These readability levels were based on the Flesch-Kincaid Grade Level Readability Formula, and the consistency in the type of inferential questions included in each of the tests. As the school where the research was conducted had purchased the (2007-2009), ICAS tests for all students at grade levels 3-6, and had kept class sets of the test booklets containing text extracts and matching multiple choice tests at each grade level, these materials were used as the basis for the present study. As the school had purchased these materials, which have been consistently acknowledged as ICAS materials at all points of reference in this research, no copyright issues have been identified. However this issue was also confirmed via email. (See Appendix C for email confirmation from ICAS in relation to copyright issues).
The complete suite of comprehension tests used for the present study based on the ICAS test materials (2007-2009), at each of the levels, the grade 2 narrative and factual tests, the grade 3-4 narrative and factual tests, and the grade 5-6 narrative test, as well as the grade 5-6 factual test based on an alternative text and questions (Chase & Krantz, 1995, & Munro, 2012), all included a text, a graphic, (either an illustration, or a photograph), and a set of multichoice questions. The only difference in layout of the tests was the grade 2 factual test, which instructed readers, in a step by step process, how to make a paper cut-out. The possible implications this difference in design and layout had for comparing results in inferential reading comprehension in factual tests across the grade levels, are discussed in the Results and Discussions sections of the present study. Appendix B. provides copies of all test questions for both the narrative and factual tests at each of the levels, grade 2, grade 3-4, and grade 5-6. All questions, and/or multiple choice answers are labelled according to whether they are from ICAS tests, or were created by Munro (2012). Photos or illustrations accompanying each of the tests, or in the case of the grade 2 factual text, the step-by-step graphics and instructions are also provided in Appendix B.

As a further measure of ensuring appropriateness of the selected ICAS tests and test questions, a process of consultation was held with a group of literacy specialist teachers from schools in the same Region as the school where the present study was conducted. This process is described in the Present Study chapter, as well as in Appendix C. As mentioned in the Present Study chapter, a suitable factual text from the suite of ICAS tests (2007-2009), was not found for the grade 5 & 6 test. An alternative text ‘Phar Lap the Champion’, (Chase & Krantz, 1995), was used for this purpose. A set of 10 questions based on this text (Munro, 2012), five requiring an inference to be made, and 5 where the answers are stated explicitly in the text, was used for the present study. A copy of this text and accompanying questions is also found in Appendix B.

### 5.6.1 Administration of comprehension tests
All comprehension tests were held in a quiet room free from distractions, and administered by the researcher of the present study. These tests were carried out at each of the grade levels 2-6. The researcher ensured all students were comfortable and able to hear the instructions from the researcher who administered the tests. Two
sittings were required for the completion of the comprehension tests. Students completed the test based on a narrative text at a separate sitting a number of days apart to the one they completed based on a factual text.

All students in grades 4-6 were familiar with multi-choice test formats, as they had completed ICAS tests at previous grade levels. However, whole class revision of this strategy was still provided for approximately 5 minutes via the classroom interactive whiteboard to ensure everyone understood this process. As students in grade 2 & 3, had not completed ICAS tests previously, a longer introductory session was provided before the testing commenced. Examples of questions with multi-choice answers were provided on the interactive whiteboard to ensure that they were familiar with the format and the strategy. Approximately 10 minutes was spent in this practice session at the grade 2, and 3 levels.

All the comprehension tests, with the exception of the grade 5-6 test based on a factual were published in booklet form, with separate tests on individual pages. For the purposes of the tests for the present study, students only required the photo or graphic accompanying the particular test they were completing. The ICAS test booklets therefore had been folded over to the required page by the researcher with the question sheet at the back, and the accompanying graphic/photo at the front, and placed in a clear plastic pocket. Students were informed that they would be given separate question sheets on which to complete their tests.

However, as an added precaution, all test booklets had been checked to ensure students in previous years who had used the booklets to complete tests, had not indicated answers by placing any type of mark on the multi-choice question page. No marks were found on the papers during this checking process, as ICAS tests have a separate answer sheet which is sent away for marking when tests are used by schools for external assessment purposes. The grade 5 & 6 factual test was printed on 2 sheets of A4 paper stapled together with the graphic/photo on the top of the first sheet. Students were informed at each testing session, that they were to raise their hand if they wanted to ask a question.

For each comprehension test in the present study, the test based on a narrative text and the test based on a factual text, included five questions requiring an inference to be made, while for the remaining five questions the answer was stated explicitly in the
Students at each level, grade 2, 3, 4, 5 & 6, sat the factual and narrative based tests on 2 different occasions. The tests were carried out in normal test conditions, in a quiet environment, free from distractions. The title of the texts used at each grade level 2-6, for the reading comprehension tasks, the year of the ICAS test papers, the text type, and the difficulty of the text based on the Flesch-Kincaid Grade Level Readability Test, are described in 6.1.2 in The Present Study.

All questions used in the comprehension tests in the present study from each of the ICAS English tests (2007-2009), both questions requiring an inference to be made and those where the answer was stated explicitly in the text, including those developed by Munro (2010), and the inferential questions for the grade 6 factual test (Munro, 2012), are to be found in Appendix A.

5.6.2 Analysis

The comprehension results were analysed at each grade level as follows:

1. To analyse the comparative ease of explicit reading comprehension over inferential reading comprehension the following statistical procedures were used:
   (a) General Linear modelling with repeated measures
   (b) T-test for repeated measures
   (c) Analysis of variance (ANOVA), with repeated measures

2. To analyse the effect of text type, narrative and factual, on inferential reading comprehension the following statistical procedures were used:
   (a) General Linear modelling with repeated measures
   (b) T-test for repeated measures
   (c) Analysis of variance (ANOVA), with repeated measures

3. To analyse the effect of developmental considerations on the acquisition of inferential reading comprehension the following statistical procedures were used:
   (a) General Linear modelling with repeated measures
   (b) T-test for repeated measures
(c) Analysis of variance (ANOVA), with repeated measures

Trends in these three areas above were analysed using SPSSX 6.1 for Macintosh computer.

5.7 Vocabulary Task

The present study examines the relationship between the reader’s breadth of vocabulary network knowledge and inferential reading comprehension of both narrative and factual text for primary school students in grades 2-6. The Test of Word Knowledge (TOWK), (Wiig & Secord, 1992), was used for this purpose. TOWK is standardized for ages 5 through to 17 and provides norm-referenced information for this age range. The TOWK is made up of two levels, covering:

- Level 1: Referential and Relational Aspects (for ages 5-8), and,
- Level 2: Relational and Metalinguistic Aspects (for ages 8-17).

Each level of the TOWK is made up of a number of subtests.

As the students in the present study were all aged between 8-12 years of age, Level 2 of this test was used. The following three subtests from level 2, covering both expressive and receptive usage, were used in the present study.

(1) Expressive vocabulary subtest
(2) Receptive vocabulary (Synonyms), subtest
(3) Receptive vocabulary (Figurative Usage), subtest

Wiig & Secord (1992), use the following criteria to meet the needs of a test with the broad age range of 5-17 years.

1. Each subtest must cover developmental milestones and linguistic transitions across the targeted age range.
2. The vocabulary used within the subtests must span the targeted age range
3. The vocabulary and figurative expressions used in the items must be relevant to current communication styles, but must not include regionalism or current slang.
Expressive vocabulary task

**Purpose:** This subtest is used to assess a student’s ability to name pictures that represent nouns verbs (referential word knowledge/production).

**Ages:** Students 8-17 years of age take this subtest as part of the Level 1 Core Battery.

**Subtest design and Content:** For each item, a carrier phrase and an illustration is used to elicit a noun or verb response. The student’s task is to provide one word that best describes the illustration. Nouns and verbs are represented in a two-to-one ratio.

Receptive vocabulary: Synonyms task

**Purpose:** This subtest is used to assess students’ knowledge of synonyms (relational word knowledge).

**Ages:** Students 8-17 years of age take this subtest as part of the Level 2 Core Battery.

**Subtest design and content:** In each item a stimulus word is presented with three (or four) choices. One of the choices is the target word (synonym). Foils are antonyms of the target, members of the same semantic class, or words related by association. The student’s task is to select the synonym of the stimulus word.

Receptive vocabulary: Figurative Usage task

**Purpose:** This subtest is used to assess a student’s ability to match figurative expressions with their meanings (semantic fields- reflected meaning knowledge).

**Ages:** Students 8-17 years of age take this subtest as part of the Level 2 Core Battery.

**Subtest design and content:** Each item is presented in one or two multiple-choice formats. In the first format, the student’s task is to choose one of four figurative expressions presented to match a meaning given in the stimulus question. In the second format, the student’s task is to choose one of the four meanings to match a given figurative expression. The latter format was used
for the present study. A copy of the scoring sheet for this task can be found in
Appendix C.

5.7.1 Administration of Subtests
All testing for the above three subtests was administered by the researcher of the present study, on a one-to-one basis, in a quiet space free from any distractions. For all subtests, the researcher presented the printed stimulus from the Stimulus Manual to the student while reading it aloud. This method of presentation is used to avoid taxing the student’s auditory memory and preventing reading ability from negatively affecting test scores.

Each subtest contains an inventory of words assembled according to the reading grade level that represents the appropriate linguistic age level, as well as the appropriate interest level. The vocabulary items in the Expressive vocabulary tasks, and the Receptive vocabulary tasks (Synonyms and Figurative Usage), have been controlled for parts of speech. The earliest items introduced in the synonyms test have three response choices in a multiple choice format. As the difficulty of the items increases, four choices are given. By limiting the number of choices given to younger students, there is less risk of readers missing an item due to strain on auditory memory.

Scoring of all tests for the vocabulary tasks was made according to the Norms Tables set out in the Examiner’s Manual (Wiig & Secord, 1992).

5.7.2 Analysis
The vocabulary results were analysed at each grade level as follows:

(1) To analyse the relationship between Expressive Vocabulary and inferential reading comprehension the following statistical procedure was used:
   (a) Pearson Correlation (2 tailed)

(2) To analyse the relationship between Receptive Vocabulary (Synonyms), and inferential reading comprehension the following statistical procedure was used:
   (b) Pearson Correlation (2 tailed)

(3) To analyse the relationship between Receptive vocabulary (Figurative Usage) and inferential reading comprehension the following statistical procedure was used:
   (c) Pearson Correlation (2 tailed)
5.8 Working Memory Tasks

The influence of short term and working memory on inferential reading comprehension was assessed using the computer-based assessment program, Automated Working Memory Assessment (AWMA) (Alloway, 2007). This program, which is standardised for children aged 4 to 22 years, is designed for easy administration for classroom teachers and other professionals. The scores are calculated automatically by the computer program, and the child’s performance is automatically summarised at the end of testing.

The AWMA assessment program includes the following tests:

- Verbal short-term memory (Digit Recall, Word Recall, Nonword Recall)
- Verbal working memory (Listening Recall, Counting Recall, Backwards Digit Recall)
- Visuo-spatial short term memory (Dot Matrix, Mazes Memory, Block Recall)
- Visuo-spatial working memory (Odd One Out, Mister X, Spatial Recall)

Participants in the present study completed two tests from the AWMA program:

1. The Digit Recall test (from the suite of tests for testing verbal short-term memory storage)
2. The Backwards Digit Recall test (from the suite of tests for testing verbal working memory, which involves both storage and processing).

Both tests are based on the work of Daneman & Carpenter, (1980), who developed the digit and word span tests.

5.8.1 Administration of tasks:

The testing took place on a 1:1 basis, in a quiet environment. The researcher of the present study who administered this task, was seated in front of a laptop computer, with the student seated in close approximation, but in a position where they were unable to see the computer screen. The administration time for each test was approximately 5 to 7 minutes for each student. Each of the two tests in the program began with practice trials to enable students to feel at ease with the content and
format of the test. For the practice trials the computer program provides feedback following the student’s response. However, the administrator is not permitted to provide information about the accuracy of student responses during the actual tests. Permitted responses included statements such as ‘well done’, or ‘very good’. The scorebook used by the examiner throughout the session, was placed in a position where the student was unable to see the correct responses.

**Digit Recall test:**

The participant hears a sequence of digits and attempts to recall each sequence in the correct order.

**Backwards Digit Recall test:**

The participant hears a sequence of digits and attempts to recall each sequence in backwards order.

The AWMA program (Alloway, 2007), automatically creates a report for each participant with standard scores, composite scores and percentiles. Standardised scores were used to rate the performance of participants in this study. Average performance is indicated by a standard score of 100. Standard scores in the range of 70 and 85 are classified as being below the average range of performance and those in the range of 115 and 130 above the average level of performance (Alloway, 2007).

For the purpose of scoring the two AWMA tasks for the present study, participants were allocated a score from 1 to 5 (far right hand column of Table 5.4), by the researcher according to the classification of Standard Scores in the AWMA Assessment manual (Table 5.4). This method of scoring was considered by Munro (2007), to be an accurate and reliable way to score these results.

<table>
<thead>
<tr>
<th>Category (Classification of scores from AWMA Assessment manual page 45)</th>
<th>Standard Scores (AWMA Assessment manual page 45)</th>
<th>Score assigned by researcher (based on discussion with Supervisor, John Munro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely low standard score</td>
<td>&lt; 70</td>
<td>1</td>
</tr>
<tr>
<td>Below average standard score</td>
<td>70- 85</td>
<td>2</td>
</tr>
<tr>
<td>Average standard score</td>
<td>85- 115</td>
<td>3</td>
</tr>
</tbody>
</table>
Above average standard score | 115-130 | 4  
 Extremely high standard score | >130 | 5  

Table 5.4: Scoring system used for the AWA tasks

5.8.2 Analysis
The short term and working memory results were analysed at each grade level as follows:

1) To analyse the relationship between the reader’s short term memory (Digit Recall Task) and inferential reading comprehension the following statistical procedures were used:
   (a) Pearson Correlation (2 tailed)

2) To analyse the relationship between the reader’s working memory (Backwards Digit Recall Task) and inferential reading comprehension the following statistical procedures were used:
   (a) Pearson Correlation (2 tailed)

Trends in this area were analysed using SPXX 6.1 for Macintosh computer.

5.9 Questioning Task
The ability to identify questions answered by a text was assessed using the Questioning Strategy Task (Munro, 2005). This task is made up of 16 sentences that relate to a Questioning Task: Group Administration (Munro, 2005, p. 1-4), (Appendix C).

This task is made up of 16 sentences that relate to a story of two children going for a bike ride. For each sentence the student is required to write a question that is answered by the sentence. The task consists of 16 sentences which increase in complexity.

This task was completed with each of the cohorts, the grade 2 students, the grade 3 students, the grade 4 students, the grade 5 students, and the grade 6 students, completing the test, grade by grade on individual occasions. Each testing session for each grade level was held in a separate classroom free from interruptions.

Administration of task
5.9.1 Administration of task

For this task the researcher explained to the students that they were going to be reading sentences and writing questions. The researcher emphasised to the students that this was not a spelling test, and if they were not sure how to spell a word they were to just write down the way they think it is spelt. It was emphasised by the researcher that for this task it does not matter if you write down words incorrectly.

The students were provided with the *Group Administration* sheet (*Appendix C*), and were asked to look at the first sentence while the researcher read the sentence. The researcher asked the students to read the sentence to themselves while it was being read. The researcher then explained that they are going to try making up a question which is answered by the sentence they was just read. The researcher models this strategy first by providing some examples of questions where the answer is in the sentence. The researcher shows the students where to write their questions on the *Group Administration* sheet. Students were then asked to write down a question for the second sentence on this sheet, under the ‘Your Try’, section. The researcher then asked students to share their questions, and as each student did so, asked the group if the answer to the question just shared can be found in the sentence. The process is followed for the four sentences provided in the *Group Administration* sheet, with the researcher providing corrective feedback at each point. The researcher again emphasised to the students that correct spelling was not the purpose of this task, and that they were not required to be able to spell a word in order to use the word.

<table>
<thead>
<tr>
<th>Questioning Task: Key to scoring</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Created a question that is answered in the text</td>
<td>1</td>
</tr>
<tr>
<td>Created a question that is not answered in the text</td>
<td>0</td>
</tr>
<tr>
<td>Created a statement rather than a question</td>
<td>0</td>
</tr>
<tr>
<td>Fragment/isolated words/no response</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 5.5: Scoring for the Questioning Task (Munro, 2005).*

5.9.2 Analysis

The results for the Questioning Task were analysed at each grade level as follows:

(1) To analyse the relationship between the Questioning Task and inferential reading comprehension the following statistical procedure was used:

(a) Pearson Correlation (2 tailed)

Trends in this area were analysed using SPXX 6.1 for Macintosh computer
5.10 Paraphrasing Task

The ability to paraphrase a text was assessed using the *Paraphrasing Strategy Task* (Munro, 2005). This task is made up of 16 sentences that relate to a story of two children going for a bike ride. This task was designed to be administered on a whole class basis, and for purposes of the present study this was completed with each of the cohorts, the grade 2 students, the grade 3 students, the grade 4 students, the grade 5 students, and the grade 6 students, completing the test, grade by grade on individual occasions. Each testing session for each grade level was held in a separate classroom free from interruptions, and was administered by the researcher of the present study. Participants read sentences from a story about two children going for a bike ride and then generate a literal representation of each sentence read by substituting as many as possible of the words and phrases in the sentences. Each student was assigned a score from 0 to 2 for their responses to each of the 16 sentences (Table 5.6). A total score out of a possible score of 32 was then assigned to each participant. Scoring this task was completed according to a List of keywords/phrases for each of the 16 sentences, developed by Munro (2005), (Appendix C). Instructions for administering this task (*Paraphrasing task: Group Administration, Munro, 2005, p. 1-4*), in Appendix C.

5.10.1 Administration of task

The paraphrasing task was administered on a grade by grade basis. At each grade level students were provided with the the *Paraphrasing task: Group Administration* sheet (Appendix C), and the researcher explained that the task they were to complete involved reading and writing sentences. Students were instructed that this activity was not a spelling test, and if they were unsure of the spelling of a word they wanted to use, they were able to write the word the way they think it might be spelt.

Students were then instructed to look at the first sentence on the sheet, and read it to themselves while the researcher read it aloud. The researcher then explained that the task involved saying the same sentence in another way by changing as many words as possible while keeping the meaning of the sentence the same. The researcher explained that they may not be able to change every word in the sentence. The students were then asked to complete the first sentence on the sheet provided (Appendix C), using their own words.
Students were then asked to share their responses with the class and corrective feedback was given by the researcher. The students were then asked to use the same strategy with the second, third and fourth sentences on the sheet. Discussion and feedback was provided by the researcher at each stage of this introductory session. The students then completed the *Paraphrasing Student Work Sheet* (Appendix C).

Scoring this task was completed according to a list of keywords/phrases, for each of the 16 sentences, developed by Munro (2005), *Guidelines for Scoring Sentences* (Appendix C), and Scoring Key, Table 5.6.

<table>
<thead>
<tr>
<th>Paraphrasing Task: Key to scoring</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed 50% or more key words/phrases and retained meaning</td>
<td>2</td>
</tr>
<tr>
<td>Changed 50% or more key words/phrases but did not retain meaning (although this is not a probable outcome, it is possible for students to change 50% of the words, but change the meaning).</td>
<td>0</td>
</tr>
<tr>
<td>Changed less than 50% key words/phrases but retained meaning</td>
<td>1</td>
</tr>
<tr>
<td>Changed less than 50% of key words/phrases but did not retain meaning</td>
<td>0</td>
</tr>
<tr>
<td>No response</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 5.6: Scoring Key for Paraphrasing Task (Munro, 2005)

**5.10.2 Analysis**

The results for the Paraphrasing Task were analysed at each grade level as follows:

(1) To analyse the relationship between the Paraphrasing Task and inferential reading comprehension the following statistical procedure was used:

(a) Pearson Correlation (2 tailed)

Trends in this area were analysed using SPXX 6.1 for Macintosh computer.
Chapter 6  Results

The present study examines the mechanism of inferencing during reading by primary school students in grades 2-6. It examines the influence of various psycholinguistic and cognitive factors on developmental trends in the acquisition of this ability.

The present study examines the following:

(1) The comparative ease of explicit comprehension over inferential comprehension for students in grade 2-6;

(2) The influence of text type, both narrative and factual, on inferential reading comprehension for students in grades 2-6;

(3) Developmental considerations on the acquisition of inferential comprehension in both narrative and factual texts for students in grades 2-6;

(4) The influence of vocabulary knowledge on inferential reading comprehension in both narrative and factual text for students in grade 2-6;

(5) The influence of the reader’s short term working memory on inferential reading comprehension of narrative and factual text for students in grades 2-6.

(6) The relationship between the reader’s ability to identify questions answered by a written text and inferential reading comprehension of narrative and factual texts for students in grades 2-6.

(7) The relationship between the reader’s ability to paraphrase a text and inferential reading comprehension of narrative and factual text for students in grade 2-6.

For the purpose of the present study, inferential reading comprehension is understood to be a constructive, cognitive process involving the reader going beyond what is stated explicitly in a text, linking ideas not linked directly in the text (Munro, 2003).

Five different types of inferences were examined in the present study:

1. Inferring character’s feelings/emotions

2. Inferring cause/ effect

3. Inferring reasons for using conventions of text

4. Inferring character trait
5. Inferring motive/ goal

The following section examines the comparative ease of explicit comprehension over inferential comprehension in both narrative and factual text at each grade level 2-6.

### 6.1 Comparative ease of explicit comprehension over inferential comprehension in both narrative and factual text at each grade level 2-6.

The present section examines the comparative ease of explicit comprehension over inferential comprehension for each type of text narrative and factual, at each grade level 2-6. Means for explicit and inferential comprehension were compared using general linear modelling with repeated measures and paired samples statistics (N=30 for each text), 2-tailed t-test, df = 29). The means for each type of comprehension for each type of text at each grade level are shown in Table 6.1.

The present study speculates that one type of comprehension, inferential comprehension, will be more difficult than explicit comprehension across grade levels 2-6.

<table>
<thead>
<tr>
<th>Text type</th>
<th>Inferential comprehension</th>
<th>Explicit comprehension</th>
<th>T value for F ratio</th>
<th>*</th>
<th>**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>sd</td>
<td>mean</td>
<td>sd</td>
<td></td>
</tr>
<tr>
<td><strong>Grade 2 (N = 30)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>narrative</td>
<td>3.50</td>
<td>.86</td>
<td>4.40</td>
<td>.72</td>
<td>5.13**</td>
</tr>
<tr>
<td>factual</td>
<td>2.83</td>
<td>1.11</td>
<td>4.53</td>
<td>.68</td>
<td>6.35**</td>
</tr>
<tr>
<td><strong>Grade 3 (N = 30)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>narrative</td>
<td>2.50</td>
<td>1.17</td>
<td>4.33</td>
<td>.66</td>
<td>7.95**</td>
</tr>
<tr>
<td>factual</td>
<td>3.37</td>
<td>1.12</td>
<td>3.30</td>
<td>1.02</td>
<td>2.07</td>
</tr>
<tr>
<td><strong>Grade 4 (N = 30)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>narrative</td>
<td>2.87</td>
<td>1.07</td>
<td>4.50</td>
<td>.73</td>
<td>6.17**</td>
</tr>
<tr>
<td>factual</td>
<td>3.20</td>
<td>.99</td>
<td>3.90</td>
<td>.54</td>
<td>3.03**</td>
</tr>
<tr>
<td><strong>Grade 5 (N = 30)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>narrative</td>
<td>2.63</td>
<td>.99</td>
<td>3.93</td>
<td>1.081</td>
<td>4.85**</td>
</tr>
<tr>
<td>factual</td>
<td>3.32</td>
<td>1.25</td>
<td>3.80</td>
<td>.961</td>
<td>2.10*</td>
</tr>
<tr>
<td><strong>Grade 6 (N = 30)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>narrative</td>
<td>3.60</td>
<td>1.27</td>
<td>4.47</td>
<td>.77</td>
<td>2.90**</td>
</tr>
<tr>
<td>factual</td>
<td>3.50</td>
<td>1.00</td>
<td>4.33</td>
<td>.84</td>
<td>3.54**</td>
</tr>
</tbody>
</table>

Table 6.1: The means for each type of comprehension for each type of text at each grade level
Figure 6.1: Mean scores for inferential and explicit comprehension in narrative text for each grade level 2-6. Standard Error of Measurement at each level indicated by error bars.

The means, standard deviations, skewness, and kurtosis for the comprehension task comparing inferential and explicit comprehension in narrative text for each grade level 2-6, are shown in Table 6.2.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Type</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>infer</td>
<td>3.52</td>
<td>.162</td>
<td>-2.13</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>4.41</td>
<td>.136</td>
<td>1.95</td>
<td>1.11</td>
</tr>
<tr>
<td>3</td>
<td>infer</td>
<td>2.48</td>
<td>.220</td>
<td>1.35</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>4.43</td>
<td>.124</td>
<td>1.22</td>
<td>-0.73</td>
</tr>
<tr>
<td>4</td>
<td>infer</td>
<td>2.83</td>
<td>.199</td>
<td>0.41</td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>4.48</td>
<td>.137</td>
<td>0.41</td>
<td>-3.80</td>
</tr>
<tr>
<td>5</td>
<td>infer</td>
<td>2.66</td>
<td>.188</td>
<td>-0.74</td>
<td>-0.37</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>4.00</td>
<td>.192</td>
<td>-0.02</td>
<td>-1.78</td>
</tr>
<tr>
<td>6</td>
<td>infer</td>
<td>3.69</td>
<td>.223</td>
<td>1.26</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>4.45</td>
<td>.145</td>
<td>-2.33</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Table 6.2: Inferential and explicit comprehension in narrative text for grades 2-6, showing Means, Standard Error, Skewness, and Kurtosis indices for each task across each of the grade levels 2-6.
Figure 6.2: Mean scores for inferential and explicit comprehension in factual text for each grade level 2-6. Standard Error of Measurement at each level indicated by error bars.

The means, standard deviations, skewness, and kurtosis for the comprehension task comparing inferential and explicit comprehension in narrative text for each grade level 2-6, are shown in Table 6.3.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Type</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>infer</td>
<td>2.83</td>
<td>.204</td>
<td>0.93</td>
<td>-1.13</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>4.53</td>
<td>.124</td>
<td>-4.40</td>
<td>6.13</td>
</tr>
<tr>
<td>3</td>
<td>infer</td>
<td>3.37</td>
<td>.206</td>
<td>-1.87</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>3.30</td>
<td>.187</td>
<td>-3.00</td>
<td>3.87</td>
</tr>
<tr>
<td>4</td>
<td>infer</td>
<td>3.20</td>
<td>.182</td>
<td>-2.04</td>
<td>-0.60</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>3.90</td>
<td>.100</td>
<td>-0.18</td>
<td>-0.70</td>
</tr>
<tr>
<td>5</td>
<td>infer</td>
<td>3.23</td>
<td>.228</td>
<td>-2.70</td>
<td>1.84</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>3.80</td>
<td>.176</td>
<td>-1.91</td>
<td>1.34</td>
</tr>
<tr>
<td>6</td>
<td>infer</td>
<td>3.50</td>
<td>.184</td>
<td>-1.26</td>
<td>-0.26</td>
</tr>
<tr>
<td></td>
<td>explicit</td>
<td>4.33</td>
<td>.154</td>
<td>-3.41</td>
<td>2.56</td>
</tr>
</tbody>
</table>

Table 6.3: Inferential and explicit comprehension in factual text for grades 2-6, showing Means, Standard Error, Skewness and Kurtosis for each task at each grade level 2-6.

As can be seen in Table 6.1, and Figure 6.1, results for inferential and explicit comprehension indicate a consistent trend in ease of explicit comprehension over inferential comprehension across all grade levels 2-6, when reading narrative text. A
similar pattern is evident (Table 6.1, and Figure 6.2), in results for factual texts which indicate a consistent trend in ease of explicit comprehension over inferential comprehension across all grade levels 2, 4, 5, & 6, with the exception of the grade 3 students.

For grade 2 students, inferential comprehension was more difficult than explicit comprehension in both narrative text \((p < .01)\), and factual text \((p < .01)\). For students in grade 3, inferential comprehension was more difficult than explicit comprehension in narrative text \((p < .01)\), but not in factual text. For students in grade 4, inferential comprehension was more difficult than explicit comprehension in both narrative text \((p < 0.1)\), and factual text \((p < 0.1)\). For students in grade 5, inferential comprehension was more difficult than explicit comprehension in both narrative text \((p < 0.1)\), and factual text \((p < 0.5)\). Students in grade also found inferential comprehension more difficult than explicit text in both narrative \((p < 0.1)\), and factual text \((p < 0.1)\).

As the students in grades 3 and 4 read different texts from the students in grades 5 and 6, grade level influences were examined for grades 3 and 4 students and grades 5 and 6 students separately. Indicators of the comparison between inferential and explicit comprehension at each grade level (repeated measures ANOVA, F value, repeated measures t-test (2 tailed), the influence of grade level and then interaction, are shown below in Table 6.2.

Results indicate that at both the grade 3-4, and 5-6 levels the difference in comprehension type-inferential or explicit, was significant \((p = < .01)\), in narrative text. This trend did not continue for factual text, with the difference in type of comprehension, inferential or explicit, only significant at the grade 5-6 level \((p = < .01)\). The interaction of text type, narrative and factual, and grade level was only significant at the grade 5-6 levels for both narrative \((p = < .01)\), and factual texts \((p = < .05)\). For both comprehension types, inferential and explicit, the changes over the grade levels for both factual and narrative text were not significant.
Table 6.4: Indicators of the comparison between inferential and explicit comprehension at grades 3-4, and 5-6 in both narrative and factual texts. Note: * $p = < .01$ ** $p = < .05$

The degrees of freedom for all indicators for grades 3-4 & 5-6 are (1,58).

**Summary of current section:** Comparative ease of explicit comprehension over inferential comprehension of text for both narrative and factual text at each grade level 2-6.

The current section examined the comparative ease of explicit comprehension over inferential comprehension for both narrative and factual text genres at each grade level 2-6. Results indicate that for all grade levels 2-6, inferential comprehension was more difficult than explicit comprehension when reading narrative texts. Inferential comprehension was also more difficult than explicit comprehension for students in grades 2, 4, 5, & 6, when reading factual texts. The only exception to this trend was at the grade 3 level where there was no apparent difference in difficulty for students between inferential and explicit comprehension when reading factual texts. These results provide strong support for hypothesis 1, that inferential comprehension will be more difficult than explicit comprehension across the grade levels 2-6, with the exception of the results for students in grade 3.

The following section compares factual and narrative tasks for each type of comprehension, inferential and explicit at each grade level 2-6. It examines the effect of text type, factual and narrative, on both inferential and explicit comprehension.

**6.2 Comparison of factual and narrative texts for each type of comprehension task, inferential and explicit, across the five grade levels 2-6.**

The current section compares factual and narrative texts for each type of comprehension at each grade level 2-6. It examines the effect of text type on both
inferential and explicit comprehension. Means for inferential and explicit comprehension of the two text types were compared using general linear modelling with repeated measures comparing the two types of text and grade trends for inferential and explicit comprehension. (N=30 for each text, 2-tailed t-test, df= 29). The present study speculates that one type of text type, factual text will be more difficult than narrative text for generating inferences.

Inferential comprehension was examined for each type of text, narrative and factual, at each grade level 2-6. Means for inferential comprehension of the two text types were compared using general linear modelling with repeated measures comparing the two types of text and grade levels for inferential comprehension (N=30 for each text (2-tailed t-test, df = 29). Trends in these data (Figure 6.3), indicate that for students in grade 2, inferring in narrative text was easier than inferring in factual text (t (29) = 3.44, p < .01). Inferring in factual text was easier than inferring in narrative text for students in grade 3, (t (29) = 3.97, p < .01), and grade 5, (t (29) = 2.47, p <.01). For students in grades 4 & 6, results did not differ when inferring in the the two text types, narrative and factual.

Explicit comprehension was examined for each type of text, narrative and factual, at each grade level 2-6. Means for explicit comprehension of the two text types were compared using general linear modelling with repeated measures comparing the two types of text and grade levels for explicit comprehension (N=30 for each text (2-tailed t-test, df = 29). Trends in these data (6.4), indicate that the only grade level where there was a difference in explicit comprehension between narrative and factual text was at the grade 4 level (t (29) = 3.393, p < .05). No differences were indicated at the grade 2, 3, 5, & 6 levels.
The means, standard error, skewness, and kurtosis for the comprehension task comparing inferential and explicit comprehension in narrative text for each grade level 2-6, are shown in Table 6.5.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Type</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>narrative</td>
<td>3.50</td>
<td>.157</td>
<td>-2.03</td>
<td>1.63</td>
</tr>
<tr>
<td></td>
<td>factual</td>
<td>2.83</td>
<td>.203</td>
<td>0.29</td>
<td>1.13</td>
</tr>
<tr>
<td>3</td>
<td>narrative</td>
<td>2.50</td>
<td>.213</td>
<td>0.65</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>factual</td>
<td>3.36</td>
<td>.206</td>
<td>-1.87</td>
<td>0.01</td>
</tr>
<tr>
<td>4</td>
<td>narrative</td>
<td>2.86</td>
<td>.196</td>
<td>0.24</td>
<td>-0.47</td>
</tr>
<tr>
<td></td>
<td>factual</td>
<td>3.20</td>
<td>.181</td>
<td>-1.30</td>
<td>-0.60</td>
</tr>
<tr>
<td>5</td>
<td>narrative</td>
<td>2.63</td>
<td>.182</td>
<td>-1.30</td>
<td>-0.60</td>
</tr>
<tr>
<td></td>
<td>factual</td>
<td>3.23</td>
<td>.228</td>
<td>-2.70</td>
<td>1.84</td>
</tr>
<tr>
<td>6</td>
<td>narrative</td>
<td>3.60</td>
<td>.232</td>
<td>-1.30</td>
<td>-0.93</td>
</tr>
<tr>
<td></td>
<td>factual</td>
<td>3.50</td>
<td>.184</td>
<td>-1.26</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

Table 6.5: Inferential comprehension in narrative and factual text grades 2-6, showing Means, Standard Error, Skewness and Kurtosis for each task at each grade level 2-6.
Figure 6.4: Mean scores for explicit comprehension in narrative and factual text for each grade level 2-6. Standard Error of Measurement at each level indicated by error bars.

Table 6.6: Explicit comprehension of narrative and factual text grades 2-6, showing Standard Error, Skewness and Kurtosis indices for each task across the grade levels 2-6.
Summary of current section: Comparison of factual and narrative texts for each type of comprehension, inferential and explicit, across the five grade levels 2-6.

The current section compared text types, factual and narrative, for each type of comprehension, inferential and explicit across grade levels 2-6. Trends in the effect of text type on inferential comprehension indicated that for students in grades 3 & 5, inferring in factual texts was easier than inferring in narrative texts. The opposite was the case for grade 2 students, with inferential comprehension easier in narrative text than factual text. In relation to effect of text type on explicit comprehension, narrative text was easier than factual text for students in grade 4.

These results provide little support for hypothesis 3, that at each grade level 2-6, inferential comprehension will be easier in narrative text than factual text. The only result supporting this prediction was at the grade 2 level, where students found inferential comprehension easier in narrative text than factual text. Possible reasons for these results will be discussed in the following chapter.

The following section compares the relative ease five types of inference at each grade level in both narrative and factual texts.

6.3 Comparison of the relative ease of each of the five types of inference in both narrative and factual texts at each grade level 2-6.

The present section examines the comparative ease of inferential comprehension for each of the five types of inference used in this study- inferring feeling /emotions, inferring cause/effect, inferring motive/goal, inferring character traits, and inferring conventions of text, in both narrative and factual text at each grade level 2-6. Mean scores and Standard Deviations for the five types of inferences at each grade level 2-6, for both narrative and factual text, are shown in Table 6.3.

The present study speculates that inferential comprehension is acquired developmentally, and that at each grade level 2-6, some inferential skills will be easier to apply than others. Means for each inference type were compared using general linear modelling with repeated measures comparing the five types of inference at each grade level 2-6, for both narrative and factual text. (N=30 for each text), 2-tailed t-test, df= 29).
Pairwise comparisons were used to examine the results for each of the five inference types at each grade level 2-6 in both narrative and factual text (Tables 6.3-6.8, and Figures 6.4 – 6.14). The following Table sets out the Means and Standard Deviations for the five inference types at each grade level 2-6, in both narrative and factual text. The following Table is also cross-referenced to Test Questions and Answers (Appendix B).

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Text Type</th>
<th>Inferring Feelings / Emotions</th>
<th>Inferring Cause/Effect</th>
<th>Inferring Motive/Goal</th>
<th>Inferring Character Trait</th>
<th>Inferring Conventions of Text</th>
<th>Cross Reference to Test Questions and Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Narrative</td>
<td>means: 1.00 std dev: .00</td>
<td>means: .47 std dev: .51</td>
<td>means: .60 std dev: .49</td>
<td>means: .97 std dev: .30</td>
<td>means: .40 std dev: .49</td>
<td>TEST QUESTIONS BASED ON TEXT &quot;THE POTATO PEOPLE&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 3, answer: (b)</td>
<td>*Question 7, answer: (c)</td>
<td></td>
<td>*(Test Questions and Answers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 9, answer: (b)</td>
<td>*Question 5, answer: (b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>means: .53 std dev: .51</td>
<td>means: .47 std dev: .49</td>
<td>means: .83 std dev: .38</td>
<td>means: .83 std dev: .38</td>
<td>means: .23 std dev: .43</td>
<td>TEST QUESTIONS BASED ON TEXT &quot;MONKEY CHAIN&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 3, answer: (b)</td>
<td>*Question 7, answer: (b)</td>
<td></td>
<td>*(Test Questions and Answers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 9, answer: (d)</td>
<td>*Question 5, answer: (b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Narrative</td>
<td>means: .57 std dev: .50</td>
<td>means: .83 std dev: .38</td>
<td>means: .40 std dev: .49</td>
<td>means: .83 std dev: .38</td>
<td>means: .30 std dev: .47</td>
<td>TEST QUESTIONS BASED ON TEXT &quot;THAT MAGNETIC DOG&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 3, answer: (b)</td>
<td>*Question 7, answer: (b)</td>
<td></td>
<td>*(Test Questions and Answers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 9, answer: (d)</td>
<td>*Question 5, answer: (b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>means: .87 std dev: .35</td>
<td>means: .73 std dev: .45</td>
<td>means: .83 std dev: .38</td>
<td>means: .83 std dev: .38</td>
<td>means: .13 std dev: .35</td>
<td>TEST QUESTIONS BASED ON TEXT &quot;JUNGLE BOY&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 1, answer: (b)</td>
<td>*Question 7, answer: (b)</td>
<td></td>
<td>*(Test Questions and Answers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 9, answer: (d)</td>
<td>*Question 5, answer: (b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Narrative</td>
<td>means: .63 std dev: .49</td>
<td>means: .93 std dev: .25</td>
<td>means: .33 std dev: .48</td>
<td>means: .57 std dev: .50</td>
<td>means: .33 std dev: .48</td>
<td>TEST QUESTIONS BASED ON TEXT &quot;THAT MAGNETIC DOG&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 3, answer: (b)</td>
<td>*Question 7, answer: (b)</td>
<td></td>
<td>*(Test Questions and Answers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 9, answer: (D)</td>
<td>*Question 5, answer: (b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>means: .83 std dev: .38</td>
<td>means: .63 std dev: .49</td>
<td>means: .83 std dev: .38</td>
<td>means: .70 std dev: .47</td>
<td>means: .20 std dev: .41</td>
<td>TEST QUESTIONS BASED ON TEXT &quot;JUNGLE BOY&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 1, answer: (b)</td>
<td>*Question 7, answer: (b)</td>
<td></td>
<td>*(Test Questions and Answers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 9, answer: (d)</td>
<td>*Question 5, answer: (b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Narrative</td>
<td>means: .47 std dev: .51</td>
<td>means: .27 std dev: .45</td>
<td>means: .73 std dev: .45</td>
<td>means: .63 std dev: .49</td>
<td>means: .57 std dev: .50</td>
<td>TEST QUESTIONS BASED ON TEXT &quot;KENSUKE&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 3, answer: (d)</td>
<td>*Question 7, answer: (c)</td>
<td></td>
<td>*(Test Questions and Answers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Question 9, answer: (d)</td>
<td>*Question 5, answer: (d)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6.7: Means and standard deviations for five different inference types in narrative and factual text at each grade level 2-6

Pairwise comparisons for each of the five inference types in both narrative and factual text at each grade level 2-6, are presented in the following section.

Results for Grade 2 students

Results of pairwise comparisons for the five inference types in both narrative and factual texts for grade 2 students are presented in Table 6.4, and Figures 6.5, and 6.6.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Narrative/Inferential Tasks</th>
<th>Mean Diff.</th>
<th>Factual/Inferential Tasks</th>
<th>Mean Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>Motive/Goal</td>
<td></td>
<td>Motive/Goal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td>.333</td>
<td>Cause/Effect</td>
<td>.100</td>
</tr>
<tr>
<td></td>
<td>Convent. of Text</td>
<td>.400*</td>
<td>Convent. of Text</td>
<td>.367</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.200</td>
<td>Feelings / Emotions</td>
<td>.067</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.100</td>
<td>Character Traits</td>
<td>.367*</td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td></td>
<td>Cause/Effect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Convent of Text</td>
<td>.067</td>
<td>Convent of Text</td>
<td>.267</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.533*</td>
<td>Feelings / Emotions</td>
<td>.033</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.433*</td>
<td>Character Traits</td>
<td>.467*</td>
</tr>
<tr>
<td></td>
<td>Conventions of text</td>
<td></td>
<td>Conventions of text</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motive/Goal</td>
<td>.400*</td>
<td>Motive/Goal</td>
<td>.367</td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td>.067</td>
<td>Cause/Effect</td>
<td>.267</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.600*</td>
<td>Feelings / Emotions</td>
<td>.300</td>
</tr>
</tbody>
</table>
Table 6.8: Pairwise comparisons for Inference types in narrative and factual text for grade 2 students (*p= < .05   **p= <.01)

<table>
<thead>
<tr>
<th>Inference type</th>
<th>Text Type</th>
<th>Mean</th>
<th>Stand. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings/emotions</td>
<td>narrative</td>
<td>1.00</td>
<td>.000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Character trait</td>
<td>narrative</td>
<td>.90</td>
<td>.055</td>
<td>6.57</td>
<td>7.57</td>
</tr>
<tr>
<td>Motive/goal</td>
<td>narrative</td>
<td>.80</td>
<td>.074</td>
<td>-3.70</td>
<td>1.63</td>
</tr>
<tr>
<td>Cause/effect</td>
<td>narrative</td>
<td>.47</td>
<td>.092</td>
<td>0.33</td>
<td>-2.55</td>
</tr>
</tbody>
</table>

Table 6.9: Inferring in five inference types in narrative text for grade 2 students, showing Means, Standard Error, Skewness and Kurtosis.
Results indicate a significant main effect for this task, Wilks’ $\Lambda = .18$, $F(4, 26) = 28.11$, ($p< .01$), (partial eta squared) = .81. Pairwise comparisons (Table 6.4, and Figure 6.5, above), indicate that for students in grade 2, inferring feelings/emotions was easier than inferring using conventions of text (difference in Means = .66 ($p < .05$), and inferring cause and effect (difference in Means = 533 ($p < .05$), when reading narrative text. Inferring motive/goal was also easier for the grade 2 students, than inferring reasons for using conventions of text (difference in Means) = .400 ($p < .05$), when reading this text type. Inferring character trait was also easier for the grade 2 students than both inferring reasons for using conventions of text (difference in Means) = .500 ($p < .05$), and inferring cause/effect (difference in Means) = .433 ($p < .05$), when inferring in narrative text.

These results for students in grade 2 reading narrative text, provide partial support for hypothesis 3, that at each year level some inferential skills will be easier to apply than others. For example inferring feelings/emotions, and inferring character trait, were found to be easier than inferring cause and effect as well as inferring reasons for using conventions of text, for students at this level, when reading narrative text.

![Mean](image)

**Figure 6.6:** Means for ease of inferring five inference types in factual text for grade 2 students. Standard Error of Measurement represented by Error Bars
Table 6.10: Ease of inferring five inference types in factual text for grade 2 students, indicating Standard Error, Skewness and Kurtosis indices for each of the tasks.

Results indicate a significant main effect for this task, Wilks’Λ = .17, \( F(4, 26) = 30.21 \), \( p = .01 \), (partial eta squared) = .82. Pairwise comparisons (Table 6.4, and Figure 6.6 above), indicate that inferring character trait was easier than the four other inference types- compared to inferring motive/goal (difference in Means) = .367 \( p < .05 \), inferring feelings/emotions (difference in Means) = .433 \( p < .05 \), inferring cause/effect (difference in Means) = .467 \( p < .05 \), and inferring reasons for using conventions of text (difference in Means) = 733 \( p < .01 \), for grade 2 students when reading factual texts.

These results for students in grade 2, reading factual text, provide partial support for hypothesis 3, that at each year level some inferential skills will be easier than others, with inferring character trait easier than the four other inference types, inferring feelings/emotions, inferring motive/goal, inferring cause/effect, and inferring conventions of text.

Trends in ease of inference type across the two text types, narrative and factual for the grade 2 students, indicates that using conventions of text was the most difficult inference type.

**Results for Grade 3 students**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Narrative/Inferential Tasks</th>
<th>Mean Diff.</th>
<th>Factual/Inferential Tasks</th>
<th>Mean Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>Motive/Goal</td>
<td>Cause/Effect</td>
<td>.433*</td>
<td>Motive/Goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Covert. of Text</td>
<td>.100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feelings/Emotions</td>
<td>.167</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Traits</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motive/Goal</td>
<td>.433*</td>
<td></td>
<td>Motive/Goal</td>
</tr>
<tr>
<td>Grade</td>
<td>Narrative/Inferential Tasks</td>
<td>Mean Diff.</td>
<td>Factual/Inferential Tasks</td>
<td>Mean Diff.</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------</td>
<td>------------</td>
<td>---------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Cause/Effect</td>
<td>Convent of Text</td>
<td>.533*</td>
<td>Cause/Effect</td>
<td>Convent of Text</td>
</tr>
<tr>
<td></td>
<td>Feelings/Emotions</td>
<td>.267</td>
<td></td>
<td>Feelings/Emotions</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.433*</td>
<td></td>
<td>Character Traits</td>
</tr>
<tr>
<td>Conventions of text</td>
<td>Motive/Goal</td>
<td>.100</td>
<td>Conventions of text</td>
<td>Motive/Goal</td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td>.533*</td>
<td></td>
<td>Cause/Effect</td>
</tr>
<tr>
<td></td>
<td>Feelings/Emotions</td>
<td>.267</td>
<td></td>
<td>Feelings/Emotions</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.100</td>
<td></td>
<td>Character Traits</td>
</tr>
<tr>
<td>Feelings/Emotions</td>
<td>Motive/Goal</td>
<td>.167</td>
<td>Feelings/Emotions</td>
<td>Motive/Goal</td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td>.267</td>
<td></td>
<td>Cause/Effect</td>
</tr>
<tr>
<td></td>
<td>Convent of Text</td>
<td>.267</td>
<td></td>
<td>Convent of Text</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.167</td>
<td></td>
<td>Character Traits</td>
</tr>
<tr>
<td>Character Traits</td>
<td>Motive/Goal</td>
<td>.000</td>
<td>Character Traits</td>
<td>Motive/Goal</td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td>.433*</td>
<td></td>
<td>Cause/Effect</td>
</tr>
<tr>
<td></td>
<td>Convent of Text</td>
<td>.100</td>
<td></td>
<td>Convent of Text</td>
</tr>
<tr>
<td></td>
<td>Feelings/Emotions</td>
<td>.167</td>
<td></td>
<td>Feelings/Emotions</td>
</tr>
</tbody>
</table>

Table 6.11: Pairwise comparisons for Inference types in narrative and factual text for grade 3 students. ( * p = < .05  **p = < .01)

Figure 6.7: Means for ease of inferring five inference types for grade 3 students in narrative text. Standard Error of Measurement represented by error bars.
Table 6.12: Ease of inferring five inference types in narrative text for grade 3 students indicating Standard Error, Skewness and Kurtosis indices for each task.

<table>
<thead>
<tr>
<th>Inference type</th>
<th>Text Type</th>
<th>Mean</th>
<th>Stand. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings/emotions</td>
<td>narrative</td>
<td>.566</td>
<td>.092</td>
<td>-0.66</td>
<td>-2.47</td>
</tr>
<tr>
<td>Character trait</td>
<td>narrative</td>
<td>.400</td>
<td>.090</td>
<td>1.00</td>
<td>-2.34</td>
</tr>
<tr>
<td>Motive/goal</td>
<td>narrative</td>
<td>.400</td>
<td>.090</td>
<td>1.00</td>
<td>-2.34</td>
</tr>
<tr>
<td>Cause/effect</td>
<td>narrative</td>
<td>.833</td>
<td>.069</td>
<td>-4.4</td>
<td>1.98</td>
</tr>
<tr>
<td>Conventions of text</td>
<td>narrative</td>
<td>.300</td>
<td>.085</td>
<td>2.15</td>
<td>-1.49</td>
</tr>
</tbody>
</table>

Results indicate a significant main effect for this task, Wilks’ Λ = .35, F(4,26) = 11.78, (p = <.01). Pairwise comparisons (Table 6.5, and Figure 6.7, above) indicate for grade 3 students, inferring cause/effect was easier than three of the other inference types—inferring character trait (difference in Means) = .433 (p <.01), inferring motive goal (difference in Means) = .433 (p <.01), and inferring reasons for using conventions of text (difference in Means) = .533 (p <.01).

These results for students in grade 3 reading narrative text, provide partial support for hypothesis 3, that at each year level some inferential skills will be easier to apply than others, with inferring cause/effect easier than three other inference types, inferring character traits, motive/goal and inferring reasons for using conventions of text.

Figure 6.8: Means for ease of inferring five inference types in factual text for grade 3 students. Standard Error of measurement represented by error bars.
Table 6.13: Ease of inferring five inference types in factual text for grade 3 students indicating Means, Standard Error, Skewness and Kurtosis indices for each of the tasks.

Results indicate a significant main effect for this task, Wilks’ $\Lambda = .22$, ($F$ (4,26) = 22.47, ($p$ = <.01), partial text squared = .77. Pairwise comparisons (Table 6.5, and Figure 6.8) indicate that inferring conventions of text was significantly more difficult that inferring all four other inference types: inferring feelings emotions (difference in Means) = .733 ($p$ < .05), inferring character trait (difference in Means) = .700 ($p$ < .05), inferring motive/goal (difference in Means) = .700 (p <.05), and inferring cause effect (difference in Means) = .600 ($p$ = <.05).

These results for grade 3 students reading factual text, provide partial support for hypothesis 3, that at each year level some inferential skills will be easier than others, with results indicating that inferring conventions of text was significantly more difficult than all four of the other inference types. Trends in ease of inference type across the two text types, narrative and factual for the grade 3 students, also indicate that using conventions of text was the most difficult inference type. This finding, along with the other results for grade 3 students will be examined in more detail in the following chapter.

Results for grade 4 students:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Narrative/Inferential Tasks</th>
<th>Mean Diff.</th>
<th>Factual/Inferential Tasks</th>
<th>Mean Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 4</td>
<td>Motive / Goal</td>
<td>Cause/Effect</td>
<td>.600*</td>
<td>Motive / Goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Covent. of Text</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feelings / Emotions</td>
<td>.300*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Traits</td>
<td>.233</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cause / Effect</td>
<td>Motive/Goal</td>
<td>.600*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convent of Text</td>
<td>.600*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feelings / Emotions</td>
<td>.300*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Traits</td>
<td>.367*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motive/Goal</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>Narrative/Inferential Tasks</td>
<td>Mean Diff.</td>
<td>Factual/Inferential Tasks</td>
<td>Mean Diff.</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------</td>
<td>------------</td>
<td>--------------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>Conventions of text</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td>.600*</td>
<td>Cause/Effect</td>
<td>.433*</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.300</td>
<td>Feelings / Emotions</td>
<td>.633*</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.233</td>
<td>Character Traits</td>
<td>.500*</td>
</tr>
<tr>
<td></td>
<td>Conventions of text</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.300*</td>
<td>Feelings / Emotions</td>
<td>.633*</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.067</td>
<td>Character Traits</td>
<td>.133</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motive/Goal</td>
<td>.300*</td>
<td>Motive/Goal</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Cause/Effect</td>
<td>.300*</td>
<td>Cause/Effect</td>
<td>.200</td>
</tr>
<tr>
<td></td>
<td>Convent of Text</td>
<td>.300</td>
<td>Convent of Text</td>
<td>.633*</td>
</tr>
<tr>
<td></td>
<td>Character Trait</td>
<td>.067</td>
<td>Character Trait</td>
<td>.133</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.067</td>
<td>Feelings / Emotions</td>
<td>.133</td>
</tr>
</tbody>
</table>

Table 6.14: Pairwise comparisons for Inference types in narrative and factual text for grade 4 students. ( * p = < .05  ** p = < .01)

![Figure 6.9: Ease of inferring five inference types in narrative text for grade 4 students. Standard Error of Measurement represented by error bars](image)

<table>
<thead>
<tr>
<th>Inference type</th>
<th>Text Type</th>
<th>Mean</th>
<th>Stand. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings/emotions</td>
<td>narrative</td>
<td>.633</td>
<td>.089</td>
<td>1.36</td>
<td>-2.14</td>
</tr>
<tr>
<td>Character trait</td>
<td>narrative</td>
<td>.566</td>
<td>.092</td>
<td>0.60</td>
<td>2.06</td>
</tr>
<tr>
<td>Motive/goal</td>
<td>narrative</td>
<td>.333</td>
<td>.087</td>
<td>1.74</td>
<td>-1.86</td>
</tr>
<tr>
<td>Cause/effect</td>
<td>narrative</td>
<td>.333</td>
<td>.046</td>
<td>-8.57</td>
<td>14.65</td>
</tr>
<tr>
<td>Conventions of text</td>
<td>narrative</td>
<td>.333</td>
<td>.087</td>
<td>1.74</td>
<td>1.86</td>
</tr>
</tbody>
</table>

Table 6.15: Ease of inferring in five inference types in narrative text for grade 4 students, indicating Means, Standard Error, Skewness and Kurtosis indices for each task.
Results indicate a significant main effect for this task, Wilks’Λ = .33, F(4, 26) = 12.99, (p < .01), partial eta squared= .66. Pairwise comparisons (Table 6.6, and Figure 6.9) indicate that for students in grade 4, reading narrative text, inferring cause/effect was easier than inferring the four other inference types- inferring feeling/emotions (difference in Means) = .300 (p < .05), inferring character trait (difference in Means) = .367 (p <.05), inferring motive/goal (difference in Means) = .600 (p< .05), and inferring reasons for using conventions of text (difference in Means) = .600 (p <.05). Inferring feelings/emotions compared to inferring motive/goal was also easier for the grade 4 students (difference in Means) = .300 (p < .05).

These results for students in grade 4, reading narrative text, provide partial support for hypothesis 3, that at each year level some inferential skills will be easier than others, with inferring cause/effect easier than the four other inference types, inferring feelings/emotions, inferring character trait, inferring motive/goal, and inferring reasons for using conventions of text.

Figure 6.10:  Ease of inferring five inference types in factual text for grade 4 students.  
Standard Error of Measurement represented by error bars.
<table>
<thead>
<tr>
<th>Inference type</th>
<th>Text Type</th>
<th>Mean</th>
<th>Stand. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings/emotions</td>
<td>factual</td>
<td>.833</td>
<td>.069</td>
<td>-4.41</td>
<td>1.98</td>
</tr>
<tr>
<td>Character trait</td>
<td>factual</td>
<td>.700</td>
<td>.085</td>
<td>-1.10</td>
<td>-1.49</td>
</tr>
<tr>
<td>Motive/goal</td>
<td>factual</td>
<td>.833</td>
<td>.692</td>
<td>-4.41</td>
<td>-1.20</td>
</tr>
<tr>
<td>Cause/effect</td>
<td>factual</td>
<td>.633</td>
<td>.089</td>
<td>-1.36</td>
<td>-2.14</td>
</tr>
<tr>
<td>Conventions of text</td>
<td>factual</td>
<td>.200</td>
<td>.074</td>
<td>1.89</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Table 6.16: Ease of inferring five inference types in factual text for grade 4 students showing Means, Standard Error, Skewness and Kurtosis indices for each task.

Results indicate a significant main effect for this task, Wilks’ $\Lambda = .45$, $F(4, 26) = 7.69$, ($p<.01$), partial eta squared= .54. Pairwise comparisons (Table 6.6, and Figure 6.10) indicate for grade 4 students reading factual text, inferring conventions of text was more difficult than the four other inference types- inferring character trait (difference in Means) = .500 ($p<.05$), inferring cause/effect (difference in Means) = .433 ($p<.05$), inferring motive/goal (difference in Means) = -.633 ($p<.05$), and inferring feeling/emotions (difference in Means) = .633, ($p<.05$).

These results for grade 4 students reading factual text, provide partial support for hypothesis 3, that at each year level some inference skills will be easier than others, with inferring reasons for using conventions of text more difficult than the other four inference types. Trends in ease of inference type across the two text types, narrative and factual for the grade 4 students, also indicates that using conventions of text was the most difficult inference type. This finding, along with the other results for grade 3 students will be examined in more detail in the following chapter.

Results for grade 5 students:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Narrative/Inferential Tasks</th>
<th>Mean Diff.</th>
<th>Factual/Inferential Tasks</th>
<th>Mean Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 5</td>
<td>Motive / Goal</td>
<td></td>
<td>Motive/Goal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cause / Effect</td>
<td>.467*</td>
<td>Convent. of Text</td>
<td>.183*</td>
</tr>
<tr>
<td></td>
<td>Covent. of Text</td>
<td>.167</td>
<td>Feelings / Emotions</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.267</td>
<td>Character Traits</td>
<td>.158</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.100</td>
<td>Feelings / Emotions</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>Convent of Text</td>
<td>.300</td>
<td>Character Traits</td>
<td>.175*</td>
</tr>
<tr>
<td>Cause / Effect</td>
<td>Motive / Goal</td>
<td>.467</td>
<td>Cause / Effect</td>
<td>.183*</td>
</tr>
<tr>
<td></td>
<td>Convent of Text</td>
<td>.300</td>
<td>Motive/Goal</td>
<td>.183*</td>
</tr>
<tr>
<td>Grade</td>
<td>Narrative/Inferential Tasks</td>
<td>Mean Diff.</td>
<td>Factual/Inferential Tasks</td>
<td>Mean Diff.</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------</td>
<td>------------</td>
<td>---------------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.200</td>
<td>Feelings / Emotions</td>
<td>.025</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.367</td>
<td>Character Traits</td>
<td>.175*</td>
</tr>
<tr>
<td></td>
<td>Conventions of text Motive / Goal</td>
<td>.167</td>
<td>Conventions of text Motive / Goal</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>Cause / Effect</td>
<td>.300</td>
<td>Cause / Effect</td>
<td>.200*</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.100</td>
<td>Feelings / Emotions</td>
<td>.175*</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.067</td>
<td>Character Traits</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.267</td>
<td>Feelings / Emotions</td>
<td>.158</td>
</tr>
<tr>
<td></td>
<td>Motive / Goal</td>
<td>.200</td>
<td>Cause / Effect</td>
<td>.025</td>
</tr>
<tr>
<td></td>
<td>Cause / Effect</td>
<td>.100</td>
<td>Convent of Text</td>
<td>.175*</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.167</td>
<td>Character Trait</td>
<td>.175*</td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>.100</td>
<td>Character Traits</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>Cause / Effect</td>
<td>.367</td>
<td>Cause / Effect</td>
<td>.200*</td>
</tr>
<tr>
<td></td>
<td>Convent of Text</td>
<td>.067</td>
<td>Convent of Text</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>.167</td>
<td>Feelings / Emotions</td>
<td>.175*</td>
</tr>
</tbody>
</table>

Table 6.17: Pairwise comparisons for Inference types in narrative and factual text for grade 5 students (*p = < .05 **p = < .01)
Figure 6.11: Ease of inferring five inference types in narrative text for grade 5 students. Standard Error of Measurement represented by error bars.

<table>
<thead>
<tr>
<th>Inference type</th>
<th>Text Type</th>
<th>Mean</th>
<th>Stand. Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings/emotions</td>
<td>narrative</td>
<td>.466</td>
<td>.092</td>
<td>0.33</td>
<td>2.55</td>
</tr>
<tr>
<td>Character trait</td>
<td>narrative</td>
<td>.633</td>
<td>.089</td>
<td>1.36</td>
<td>-2.14</td>
</tr>
<tr>
<td>Motive/goal</td>
<td>narrative</td>
<td>.733</td>
<td>.082</td>
<td>-2.60</td>
<td>0.98</td>
</tr>
<tr>
<td>Cause/effect</td>
<td>narrative</td>
<td>.266</td>
<td>.082</td>
<td>2.60</td>
<td>-0.98</td>
</tr>
<tr>
<td>Conventions of text</td>
<td>narrative</td>
<td>.566</td>
<td>.092</td>
<td>-1.65</td>
<td>-2.47</td>
</tr>
</tbody>
</table>

Table 6.18: Showing Means, Standard Error, Skewness and Kurtosis indices for each of the inference types for grade 5 students inferring in narrative text.

Results for grade 5 students reading narrative text, indicate a significant main effect for this task, Wilks’\(\Lambda\) = .67, \(F(4, 26) = 3.07, (p < .05)\), partial eta squared= .32. Pairwise comparisons (Table 6.7, and Figure 6.11) indicate that there was only one significant comparison in inference types for the grade 5 students when comparing the easiest inference, motive/goal to the most difficult inference, cause/effect. The difference for the grade 5 students between these two inference types was significant (difference in Means) = .467, (\(p<.05\)).

These results for grade 5 students reading narrative text, provide partial support for hypothesis 3, that at each grade level some inferential skills will be easier to apply than others, with inferring motive/goal easier than inferring cause/effect.
Table 6. Ease of inferring inference types in factual text for grade 5 students showing Standard Means, Standard Error, Skewness, and Kurtosis indices for each task.

Results indicate a significant main effect for this task, Wilks’Λ = .79, F(4, 26), p = <.01, (partial eta squared = .29). Pairwise comparisons (Table 6.7, and Figure 6.12, above) indicate that for students in grade 5, reading factual text, feelings/emotions was easier than inferring character trait (difference in Means) = .175, p < .05, and inferring conventions of text (difference in Means) = .175, p < .05. Inferring cause/effect was also easier than inferring conventions of text (mean Difference) = .175, p < .05, and inferring character trait (difference in Means) = .175, p < .05, for the grade 5 students. These results provide partial support for hypothesis 3, that at each grade level some inferential skills will be easier to apply than others, with grade 5 students finding inferring cause/effect easier than inferring character trait, reasons for using conventions of text, and motive/goal, when reading factual text. Examination of trends across the five inference types for the two text types, narrative and factual do
not indicate any common trends in order of difficulty. These findings will be discussed in more detail in the following chapter.

**Results for grade 6 students**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Narrative/Inferential Tasks</th>
<th>Mean Diff.</th>
<th>Factual/Inferential Tasks</th>
<th>Mean Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 6</td>
<td>Motive / Goal</td>
<td>Cause / Effect</td>
<td>.067</td>
<td>Motive / Goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convent. of Text</td>
<td>.100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feelings / Emotions</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Traits</td>
<td>.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cause / Effect</td>
<td>Motive / Goal</td>
<td>.067</td>
<td>Cause / Effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convent of Text</td>
<td>.167</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feelings / Emotions</td>
<td>.067</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Traits</td>
<td>.267*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conventions of text</td>
<td>Motive / Goal</td>
<td>.100</td>
<td>Conventions of text</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cause / Effect</td>
<td>.167</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feelings / Emotions</td>
<td>.100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Traits</td>
<td>.100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feelings / Emotions</td>
<td>Motive/Goal</td>
<td>.000</td>
<td>Feelings/Emotions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cause/Effect</td>
<td>.067</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convent of Text</td>
<td>.100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Trait</td>
<td>.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Character Traits</td>
<td>Motive/Goal</td>
<td>.200</td>
<td>Character Trait</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cause/Effect</td>
<td>.267*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convent of Text</td>
<td>.100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feelings / Emotions</td>
<td>.200</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.20: Pairwise comparisons for Inference types in narrative and factual text for grade 6 students ( * p = < .05  ** p = < .01)
Results indicate there was no significant main effect for this task, Wilks’ $\Lambda = 72$, $F(4, 26) = 2.51$, ($p > .05$), (partial eta squared = .27). Results of pairwise comparisons (Table 6.8, and Figure 6.13, above) indicate however, that for students in grade 6, inferring character trait in narrative text was easier than inferring cause/effect (difference in Means = .267 ($p < .05$), when reading narrative text.

These results for grade 6 students reading narrative text, provide partial support for hypothesis 3, that at each year level some inferential skills will be easier to apply than others, with inferring character trait easier than inferring cause/effect, when reading narrative text.
Results indicate a significant main effect for this task, Wilks’$\Lambda$ = .78, $F(4, 26) = 7.33$ ($p < .01$), (partial eta squared), 20. Pairwise comparisons (Table 6.8), and Figure 6.14, indicate that for students in grade 6, inferring in factual text, feelings/emotions was easier than inferring character trait (difference in Means) = .175 ($p < .05$), and inferring conventions of text (difference in Means) = .175, $p < .05$.

Partial support for hypothesis 3 is indicated in these results for grade 6 students reading factual text, with results indicating that inferring feelings/emotions was easier than two of the other inference types- inferring conventions of text and inferring character trait. Examination of trends across the five inference types for the two text types, narrative and factual do not indicate any common trends in order of difficulty at
the grade 6 level. These findings will be discussed in more detail in the following chapter.

Further confirmation of these trends are made by examining the following table showing actual numbers of students at each grade level who correctly answered the inferential questions in both narrative and factual text.

Table 6.3 below indicates the total number of students at each grade level 2-6 who correctly answered the five inference questions in both narrative and factual text. Highest and lowest number of students at each level in both text types indicated in bold. Students in grades 3 & 4 answered the same inference questions in both narrative and factual text, as did students in grades 5 & 6. Students in grade 2 answered a separate set of inference questions in both narrative and factual text.

<table>
<thead>
<tr>
<th>Text type</th>
<th>Inference type</th>
<th>Total number of students at each grade level who correctly answered each of the five inferential questions correctly in both narrative and factual texts.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Grade 2</td>
</tr>
<tr>
<td>Narrative</td>
<td>Feelings/emotions</td>
<td>30</td>
</tr>
<tr>
<td>Narrative</td>
<td>Motive/goal</td>
<td>24</td>
</tr>
<tr>
<td>Narrative</td>
<td>Character/trait</td>
<td>27</td>
</tr>
<tr>
<td>Narrative</td>
<td>Cause/effect</td>
<td>14</td>
</tr>
<tr>
<td>Narrative</td>
<td>Conventions of text</td>
<td>12</td>
</tr>
<tr>
<td>Factual</td>
<td>Feelings/emotions</td>
<td>16</td>
</tr>
<tr>
<td>Factual</td>
<td>Motive/goal</td>
<td>18</td>
</tr>
<tr>
<td>Factual</td>
<td>Character/trait</td>
<td>29</td>
</tr>
<tr>
<td>Factual</td>
<td>Cause/effect</td>
<td>15</td>
</tr>
<tr>
<td>Factual</td>
<td>Conventions of text</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 6.23: Total number of students at each grade level 2-6 who correctly answered the five inference questions in both narrative and factual text.

In the table above the highest and lowest number of students at each level in both text types is indicated in bold. Students in grades 3 & 4 answered the same inference questions in both narrative and factual text, as did students in grades 5 & 6. Students in grade 2 answered a separate set of inference questions in both narrative and factual text.
**Summary:** Comparison of the relative ease of each of the five types of inference in both narrative and factual texts at each grade level 2-6.

The current section examined the relative ease of each of the five inference types, inferring feeling/emotions, inferring cause/effect, inferring motive/goal, inferring character traits, and inferring conventions of text, in both narrative and factual text at each grade level 2-6. The present study speculates that inferential comprehension is acquired developmentally, and that at each year level some inference skill will be more difficult than others.

Trends in ease of inference types in narrative text across the grade levels 2-6, indicate that for students in grade 2 inferring feelings/emotions (30 students answered this correctly), and inferring character trait were the easiest inference types, while for students in both grade 3, and grade 4, inferring cause/effect was the easiest inference type. For students in grades 5, the easiest inference type was inferring motive/goal, while the easiest inference type for the grade 6 students was inferring character trait. Examination of the easiest inference type across the grade levels 2-6 in narrative text, reveals the only common trend is inferring cause/effect at the grade 3 and grade 4 grade levels.

The most difficult inference type in narrative text was conventions of text for students in grades 2, & 3. Inferring conventions of text and motive/goal were equally the most difficult for students in grade 4. Inferring cause/effect was the most difficult inference for students in grades 5 & 6.

Trends in ease of inference type for factual text indicate that inferring character trait was the easiest inference type for students in grade 2, with inferring motive/goal the second easiest not only for grade 2 students, but for students in grades 3 & 4 as well. Inferring feeling/emotions was the easiest inference type for students in grades 3 & 4, and second easiest for students in grades 5 & 6. Inferring cause/effect was the easiest inference type for students in grades 5 & 6.

The most difficult inference type in factual text for students in grade 2, 3, & 4 was inferring reasons for using conventions of text. This inference type was also the second most difficult for students in grades 5 & 6. Inferring character trait was the
most difficult inference type for students in grade 5 & 6, and second most difficult inference type for students in grades 3 & 4.

A further trend in both narrative and factual text is apparent in the data for students in grades 3 & 4 who completed the same tests for the two text types. Students in both grade 3 & 4 demonstrate identical patterns in ease of inference from easiest inferences to most difficult inferences, in both narrative and factual texts, although mean scores differ according to grade level. When comparing the pattern from the easiest to most difficult inference type across the five inference types, for grades 5 & 6 who completed the same tests, the pattern and mean scores are identical for factual text, but not for narrative text.

It is interesting to note the trend in inference type occurring in the data for both narrative and factual text at the grade, 2, 3, & 4 levels, with reasons for using conventions of text appearing as the most difficult inference type in both narrative and factual text.

While these results provide partial support for hypothesis 3, that inferential comprehension is acquired developmentally, with some inferential skills easier to apply than others at each year level, the number of trends across inference types and grade levels suggest the results may have more to do with the interaction of text type with the inference type, than any clear developmental trends over grades 2-6. Across the two text types the only consistent trend in ease of inference type was inferring conventions of text, which was the most difficult type in both narrative and factual text for students in grade 2, 3, & 4.

The following chapter examines these results in more detail and discusses possible reasons for the trends noted in this section.

The following section examines the relationship between various psycholinguistic and cognitive factors and inferential and explicit reading comprehension for students in grades 2 to 6.

6.4 Relationship between various psycholinguistic and cognitive factors and inferential reading comprehension

The present section examines the relationship between various psycholinguistic and cognitive factors and developmental trends in inferential and explicit reading
comprehension for factual and narrative texts. These factors include vocabulary knowledge, short term working memory, paraphrasing ability and text interrogative ability. The present study predicts that a positive relationship exists between each of these four factors and inferential reading comprehension of both narrative and factual texts for students in grade 2 to 6.

A Pearson Correlation (2 tailed), was used to examine the linear relationship between these four psycholinguistic and cognitive factors and both inferential and explicit reading comprehension in narrative and factual texts (N= 30 for all analyses), for students in grades 2-6.

These factors and their relationship with inferential and explicit comprehension in narrative and factual texts were examined in the following order:

6.4.1 Vocabulary knowledge
The present study speculates that inferential comprehension will be influenced by the reader’s breadth of vocabulary network knowledge. Breadth of vocabulary knowledge was examined using three subtests from The Test of Word Knowledge (Wiig & Secord, 1990).

1. Expressive Vocabulary
2. Synonyms
3. Figurative Usage

6.4.1.1 Expressive Vocabulary
Results for the relationship between Expressive Vocabulary and inferential and explicit reading comprehension of narrative and factual texts were examined at each grade level 2-6, followed by an examination of trends over the five grade levels 2-6.

As seen in Table 6.9, results indicate a positive relationship between expressive vocabulary and inferential comprehension, in both the narrative/inferential text ($r = .537, p < .01$), and the factual/inferential text ($r = .456, p = <.05$), for grade 2 students.

A positive relationship between expressive vocabulary and inferential or explicit comprehension of either narrative or factual text was not evident in the data for grade 3 students. For students in grade 4, results indicate a positive relationship between expressive vocabulary and factual/inferential text ($r = .380, p < .05$). Significant results were also evident in the grade 5 data, with a positive relationship indicated between($r
= .485, \( p < .01 \)). For grade 6 students results indicate a positive relationship between expressive vocabulary and the factual/inferential text \( (r = .724, p = < .01) \).

An examination of trends in these results indicate a positive relationship between expressive vocabulary and inferential reading comprehension in factual text at all grade levels, with the exception of the grade 3 results. The only positive relationship between expressive vocabulary and narrative inferential text was at the grade 2 level. The only relationship between expressive vocabulary and explicit text was at the grade 5 level, although this result was, in common with other positive results across the grade levels, for factual text. These results provide strong support for the prediction in the present study that inferential reading comprehension will be influenced by the readers’ breadth of vocabulary knowledge. Possible reasons for this trend in positive relationships between expressive vocabulary across the grade levels 2, 4, 5 & 6, and inferential reading comprehension in factual text, will be discussed in the following chapter.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test of Word Knowledge (Wigg &amp; Secord)</th>
<th>Text Type</th>
<th>Comprehension</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>Expressive Vocabulary</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.537**</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.426*</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.233</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.026</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Expressive Vocabulary</td>
<td>Narrative</td>
<td>Inferential</td>
<td>-.128</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>-.072</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>-.181</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>-.135</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Expressive Vocabulary</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.294</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.380*</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.142</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.008</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Expressive Vocabulary</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.086</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.624**</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.301</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.485**</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Grade 6</td>
<td>Expressive Vocabulary</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.233</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.724**</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>-.191</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.040</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Table 6.24: Correlations for Test of Word Knowledge (Expressive Vocabulary) and Inferential and explicit comprehension in Narrative and Factual texts

Notes: *\( p < .05 \), ** \( p < .01 \)
The following section examines the relationship between inferential and explicit comprehension of narrative and factual text, and synonyms.

### 6.4.1.2 Synonyms

Results for the relationship between synonyms and inferential and explicit comprehension of narrative and factual texts were examined at each grade level 2-6 individually, followed by an examination of trends over the five grade levels 2-6.

As seen in Table 6.10, the only positive relationships between synonyms and narrative and factual text, were at the grade 5 and 6 level. Results for grade 5 students indicate a positive relationship between knowledge of synonyms and ability to infer in both factual/inferential texts \( (r = 0.624, p = <.01) \), factual/explicit texts \( (r = 0.485, p = <.01) \), and narrative/explicit texts \( (r = 0.459, p = <.05) \).

For grade 6 students a positive relationship was evident between knowledge of synonyms and the two inferential texts, narrative/inferential \( (r = 0.576, p = < .01) \), and factual/inferential \( (r=0.724, p=<.01) \).

Further examination of trends in the grade 5 & 6 data reveal that of the five significant results across these two grades, 3 relate to inferential reading comprehension: for grade 5 students inferring in factual/inferential texts \( (r = 0.624, p = <.01) \), and for grade 6 students inferring in narrative/inferential text \( (r = 0.576, p = < .01) \), and factual/inferential text \( (r=0.724, p=<.01) \). The two remaining significant results in the grade 5 & 6 data both relate to explicit comprehension for grade 5 students: narrative/explicit \( (r = 0.459, p = <.05) \), and \( (r = 0.485, p = <.01) \).

While these results provide partial support for the prediction that inferential reading comprehension is influenced by the reader’s breadth of vocabulary network knowledge, the only positive relationship is at the grade 5 & 6 level. Further discussion in relation to this trend will be covered in the following chapter.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test of Word Knowledge (Wigg &amp; Secord)</th>
<th>Text Type Narrative/ Factual</th>
<th>Comprehension Inferential/ Explicit</th>
<th>Pearson Correlation Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>Synonyms</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.182</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.311</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.284</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>-.144</td>
<td>30</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Synonyms</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.215</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>-.082</td>
<td>30</td>
</tr>
</tbody>
</table>
Table 6.25: Correlations for Test of Word Knowledge (Synonyms) and Inferential and explicit comprehension in Narrative and Factual texts Note: *p < .05, **p < .01

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test of Word Knowledge (Wigg &amp; Secord)</th>
<th>Text Type</th>
<th>Comprehension</th>
<th>Pearson Correlation Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Narrative/ Factual</td>
<td>Narrative</td>
<td>Explicit</td>
<td>.138</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.180</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Synonyms</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.326</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.328</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.191</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.230</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Synonyms</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.192</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.624**</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.459*</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.485**</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Grade 6</td>
<td>Synonyms</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.576**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.724**</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.236</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.309</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

The following section examines the relationship between inferential and explicit comprehension of narrative and factual text, and figurative Usage.

6.4.1.3 Figurative Usage

The relationship between Figurative Usage and inferential and explicit comprehension of narrative and explicit text was examined at each individual grade level 2-6. This is followed by an examination of trends over the five grade levels 2-6.

As seen in Table 6.1.3, no significant correlations were evident in the data for students in grades 2 & 3 in relation to figurative usage and inferential and explicit comprehension of narrative and factual text. However, significant relationships are evident between figurative usage and explicit and inferential comprehension in narrative and factual text at the grade 4, 5 & 6 levels. For students in grade 4, results demonstrate a positive relationship between figurative usage and factual/inferential texts ($r = .409, p = <.05$), while results for students in grade 5 indicate a positive relationship between figurative usage and factual/inferential texts ($r = .624, p = <.01$), and factual/explicit texts ($r = .485, p = <.01$). At the grade 6 level, figurative usage was strongly correlated with inferential texts, for both narrative/inferential ($r = .392, p = <.05$), and factual/inferential texts ($r = .724, p = <.01$).
An examination of the trends in these results for students in grade 4-6 indicate, that of the five comprehension tasks where a positive relationship was evident between comprehension of text and figurative usage, four of the tasks related to inferential comprehension: the grade 4 factual text ($r = .409, p = .05$), the grade 5 factual text ($r = .624, p = .01$), the grade 6 narrative text ($r = .392, p = .05$), and the grade 6 factual text ($r = .724, p = .01$). Trends in inferential comprehension and text type indicate that of the four positive results across the grade levels 4-6, three relate to factual texts: ($r = .409, p = .05$), at the grade level, ($r = .624, p = .01$), at the grade 5 level, and ($r = .724, p = .01$), at the grade 6 level.

These results provide partial support for the prediction that inferential reading comprehension is influenced by the reader’s breadth of vocabulary network knowledge, with evidence of positive relationships in relation to Figurative Usage in results for grades 4, 5, & 6. Further discussion in relation to this trend will be covered in the following chapter.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test of Word Knowledge (Wiig &amp; Secord, 1992)</th>
<th>Text Type Narrative/ Factual</th>
<th>Comprehension Inferential/ Explicit</th>
<th>Pearson Correlation Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>Figurative Usage</td>
<td>Narrative Inferential</td>
<td>.147</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Inferential</td>
<td>.273</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative Explicit</td>
<td>.132</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Explicit</td>
<td>-.167</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Grade 3</td>
<td>Figurative Usage</td>
<td>Narrative Inferential</td>
<td>.185</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Inferential</td>
<td>-.139</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative Explicit</td>
<td>.111</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Explicit</td>
<td>.119</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td>Figurative Usage</td>
<td>Narrative Inferential</td>
<td>.229</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Inferential</td>
<td>.409*</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative Explicit</td>
<td>.243</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Explicit</td>
<td>.114</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Grade 5</td>
<td>Figurative Usage</td>
<td>Narrative Inferential</td>
<td>.036</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Inferential</td>
<td>.624**</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative Explicit</td>
<td>.277</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Explicit</td>
<td>.485**</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Grade 6</td>
<td>Figurative Usage</td>
<td>Narrative Inferential</td>
<td>.392*</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Inferential</td>
<td>.724**</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative Explicit</td>
<td>.236</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual Explicit</td>
<td>.040</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.26: Correlations for Test of Word Knowledge (Figurative Usage) and Inferential and explicit comprehension in Narrative and Factual texts Note: *$p < .05$, **$p < .01$
Summary of the relationship between vocabulary knowledge and comprehension

The current section examined the relationship between vocabulary knowledge and inferential and explicit comprehension of narrative and factual texts for students in grades 2-6, based on the results from three subsets from The Test of Word Knowledge (Wiig & Secord, 1992), Expressive Vocabulary, Synonyms, and Figurative Usage.

An interesting trend is apparent in this data. Of the 16 significant relationships evident in the results for the 3 components of Word Knowledge-Expressive Vocabulary, Synonyms, and Figurative Usage, across grades 2-6, only two were related to students in grade 2, with no positive relationships evident at the grade 3 level. Of the 16 positive relationships demonstrated in grades 2, 4, 5, & 6, between vocabulary knowledge and reading comprehension, 12 related to inferential comprehension tasks, and 4 to explicit comprehension tasks. These results provide positive support overall for the relationship between inferential reading comprehension and vocabulary knowledge. Of the 12 significant relationships between inferential tasks and vocabulary knowledge, 10 related to factual texts and 2 to narrative text. This trend in the positive relationship between vocabulary knowledge and factual text is also of significance. Of the 16 positive relationships between inferential reading comprehension and vocabulary knowledge, 6 related to Expressive Language, 5 related to Synonyms, and 5 to Figurative Language.

These results provide strong support for hypothesis 3, that inferential comprehension is influenced by the reader’s breadth of vocabulary knowledge, particularly for students in the upper primary grades as increased emphasis is placed on factual texts with more topic-specific vocabulary. These trends will be discussed further in the following chapter.

6.4.2 Working Memory

The present section examines the relationship between working memory and developmental trends in inferential and explicit reading comprehension for narrative and factual texts. The present study predicts that inferential reading comprehension is
influenced by the reader’s working memory. Working Memory was assessed using the Automated Working Memory Assessment (Alloway, 2007).

Two tests were used from this battery of tests:

1. Digit Recall test (Verbal short-term memory)

2. Backwards Digit Recall test. (Working memory)

The following sections provide an examination of the data for each grade level 2-6 in relation to comprehension type, inferential and explicit, and text type, narrative and explicit. This is followed by an examination of trends in the results over the five grade levels 2-6.

**6.4.2.1 Digit Recall Test**

Results for the relationship between the Digit Recall test and inferential and explicit comprehension of narrative and explicit text was examined at each individual grade level 2-6, followed by an examination of trends over the five grade levels 2-6.

As can be seen in Table 6.12, results indicate a lack of significant correlations between the digit recall test and ability to infer in narrative or factual text at the grade 2 level. However, results for grade 3 students indicate a significant correlation between the digit recall test and inferring in both narrative ($r = .370$, $p < .05$), and factual text ($r = .458$, $p < .05$). Results for grade 4 students were similar to results for the grade 3 students, with a significant correlation between the digit recall test and both the narrative/inferential text ($r = .373$, $p < .05$), and the factual/inferential text ($r = .568$, $p < .01$). For grade 5 students both the factual/inferential text ($r = .624$, $p < .01$), and the factual/explicit text ($r = .485$, $p < .05$), were significantly correlated with the digit recall test. Results for grade 6 students indicate a significant correlation between the digit recall test and the following three texts- narrative/inferential text ($r = .734$, $p < .01$), factual/inferential text ($r = .479$, $p < .01$), and the narrative/explicit text ($r = .427$, $p < .05$).

Trends indicate that while no significant results were apparent at the grade 2 level, there was an even spread across grades 3-6 in the number of significant correlations between the digit recall test and inferential comprehension tasks. Of these 7 significant results relating to inferential text across grade levels 3-6, three of the results were for narrative text: at the grade 3 level ($r = .370$, $p < .05$), the grade 4 level
(r = .373, p = .05), and the grade 6 level (r = .734, p = .01), and four of the positive results related to factual text: at the grade 3 level (r = .458, p = .05), at the grade 4 level (r = .568, p = .01), at the grade 5 level (r = .624, p = .01), and at the grade 6 level (r = .479, p = .01). The only significant result for explicit comprehension was at the grade 6 level for narrative text (r = .427, p = .05).

The fact that 7 of the significant relationships described above related to inferential tasks provides support for hypothesis 5, that inferential comprehension is influenced by the reader’s short term memory. This trend was particularly strong at the grade 3, 4, & 6 levels, where both inferential tasks at each level were positively related to short term memory. Text type was not a significant factor in these results with an even spread of narrative and factual texts related to significant outcomes.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Working Memory Assessment (Alloway, 2007)</th>
<th>Text Type Narrative/ Factual</th>
<th>Comprehension Inferential/ Explicit</th>
<th>Pearson Correlation Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>Digit Recall Test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.139</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.013</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.137</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.028</td>
<td>30</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Digit Recall Test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.370*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.458*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.128</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.204</td>
<td>30</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Digit Recall Test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.373*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.568**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>-.042</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.125</td>
<td>30</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Digit Recall Test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>-.097</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.624**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.309</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.485**</td>
<td>30</td>
</tr>
<tr>
<td>Grade 6</td>
<td>Digit Recall Test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.734**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.479**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.427*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.078</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 6.27: Correlations for Short Term Memory (Digit Recall test), and Inferential and explicit comprehension in Narrative and Factual texts Note: * p < .05
** p < .01
6.4.2.2 Backwards Digit Recall Test

Results for the relationship between the Backwards Digit Recall Test and inferential and explicit comprehension of narrative and explicit text, were examined at each individual grade level 2-6, followed by an examination of trends over the five grade levels 2-6.

As can be seen in Table 6.13, the data indicates that at each grade level 2-6 there was a significant correlation between inferential comprehension tasks and the backwards digit recall task. Results indicated a positive relationship between inferential comprehension tasks and the backwards digit recall task at the grade 2 level for the factual inferential task ($r = .448$, $p = .05$), at the grade 3 level for the factual/inferential task ($r = .458$, $p = .05$), at the grade 4 level for the factual inferential task ($r = .568$, $p = .01$), at the grade 5 level for the factual inferential task ($r = .624$, $p = .01$), and at the grade 6 level for both the narrative inferential task ($r = .388$, $p = .05$), and the factual inferential task ($r = .724$, $p = .01$). The only significant relationship between the backwards digit recall task and explicit comprehension task was at the grade 5 level for the factual explicit task($r = .485$, $p = .01$).

An examination of trends across the grade levels 2-6 demonstrates a significant relationship between factual/inferential tasks and the backwards digit recall task at each of these levels: at the grade 2 level, ($r = .448$, $p = .05$), the grade 3 level ($r = .458$, $p = .05$), the grade 4 level ($r = .568$, $p = .01$), the grade 5 level ($r = .624$, $p = .01$), and the grade 6 level ($r = .724$, $p = .01$). The only exception to this trend in significant relationships between inferential comprehension tasks in factual text, and the backward digit recall task was at the grade 5 level with a positive relationship indicated between the digit recall task and the narrative inferential task ($r = .388$, $p = .05$).

These results provide strong support for the prediction that inferential comprehension is influenced by the reader’s working memory. A further trend in these results is the relationship between short term working memory and factual inferential tasks. This will be discussed further in the following chapter.
<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Working Memory Assessment (AWMA, Alloway, 2007)</th>
<th>Text Type Narrative/ Factual</th>
<th>Comprehension Inferential/ Explicit</th>
<th>Pearson Correlation Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>Backwards Digit Recall test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.139</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.448*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>-.225</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>-.186</td>
<td>30</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Backwards Digit Recall test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.227</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.458*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.134</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.026</td>
<td>30</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Backwards Digit Recall test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.061</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.568**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.160</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.067</td>
<td>30</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Backwards Digit Recall test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.006</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.624**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.009</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.485**</td>
<td>30</td>
</tr>
<tr>
<td>Grade 6</td>
<td>Backwards Digit Recall test</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.388*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.724**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.063</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.133</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 6.28: Correlations for Backwards Digit Recall test, and Inferential and explicit comprehension in Narrative and Factual texts. Note: * p < .05  ** p < .01

Summary: Digit Recall and Backwards Digit Recall Tests.

When comparing results of the 2 memory tests, the Digit Recall test and the Backwards Digit Recall test, similar trends are apparent. Results for both memory tasks, the digit recall task and the backward digit recall task indicate a significant relationship with inferential reading comprehension tasks. This trend was apparent for both narrative and factual texts at each grade level with the exception of grade 2, in the digit recall test, and in factual text at each grade level for the backwards digit recall test. Results of both tests provide strong support for the prediction that inferential reading comprehension is influenced by the reader’s short term and working memory. These results will be discussed in more details in the following chapter.
6.4.3 Paraphrasing task

The present study predicts that inferential comprehension will be influenced by the reader’s ability to paraphrase a text. The ability to paraphrase was measured using the Paraphrasing Task (Munro, 2005, Appendix C).

Results of the paraphrasing Task were firstly examined by looking at developmental aspects of the skill of paraphrasing across the grade levels 2-6 (Figure 6.16). This is followed by examining the data for each grade level 2-6 in relation to comprehension type, inferential and explicit, and text type, narrative and explicit. This is followed by an examination of trends in the results over the five grade levels 2-6.

![Figure 6.16: Means for paraphrasing task at each grade level 2-6. Standard Error of Measurement represented by error bars.](image-url)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Mean</th>
<th>Standard Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>9.90</td>
<td>.847</td>
<td>2.12</td>
<td>1.22</td>
</tr>
<tr>
<td>3</td>
<td>15.00</td>
<td>.867</td>
<td>0.37</td>
<td>-0.99</td>
</tr>
<tr>
<td>4</td>
<td>16.00</td>
<td>.876</td>
<td>1.43</td>
<td>0.29</td>
</tr>
<tr>
<td>5</td>
<td>23.20</td>
<td>.702</td>
<td>0.22</td>
<td>0.63</td>
</tr>
</tbody>
</table>
Table 6.29: Results for paraphrasing Task showing Standard Error, Skewness, and Kurtosis indices for each task

As can be seen in Table 6.14, results for students at the grade 2 level indicate a significant correlation between the comprehension tasks and the paraphrasing task in both inferential tasks- the Results for grade 3 students indicate a significant correlation between the comprehension tasks and the paraphrasing task, in both the factual/inferential task \((r = .458, p = <.05)\), and the narrative/explicit task \((r = .363, p = < .05)\). At the grade 4 level, results indicate a significant correlation between the paraphrasing task and the factual/inferential task \((r = .464, p = < .01)\), and the narrative/explicit task \((r = .568, p = <.01)\). Results in grade 5 demonstrate a significant correlation between the paraphrasing task and the two inferential tasks - the narrative/inferential task \((r = .486, p=< .01)\), and the factual /inferential task \(( r = .624, p= <.01)\), as well as the factual/explicit task \((r = .485, p= <.01)\). At the grade 6 level, significant correlations were apparent between the paraphrasing task and both inferential tasks - the narrative/inferential task \((r = .492, p= <.01)\), and the factual/inferential task \(( r = .724, p= < .01)\). Three significant results related to explicit comprehension- at the grade 3 level for the factual/explicit task \((r = .363, p= <.05)\), at the grade 4 level for the narrative/explicit task \((r = .568, p= <.01)\), and at the grade 5 level for the factual/explicit task \((r = .485, p= <.01)\).

Trends across the grades levels 2-6 suggest a strong correlation between the paraphrasing task and inferential comprehension, spread evenly across the five grade levels 2 -6, with 8 of the 11 significant correlations indicated in the data related to inferential tasks, and 3 to explicit tasks. In relation to text types, narrative and factual, 5 of the 8 significant relationships between inferential comprehension and the paraphrasing task related to factual texts, and 3 to narrative text. Of particular note in these results, is that at each of the grade levels 2-6, a significant relationship was apparent between paraphrasing and factual text.

These results provide strong support for the prediction that inferential comprehension is influenced by the reader’s ability to paraphrase a text. This finding will be discussed further in the following chapter.
<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Paraphrasing task (Munro, 2005)</th>
<th>Text Type</th>
<th>Comprehension Type</th>
<th>Pearson Correlation Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>Paraphrasing task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.565**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.363*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.279</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>-.092</td>
<td>30</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Paraphrasing task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.196</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.458*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.363*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.178</td>
<td>30</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Paraphrasing task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.139</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.464**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.568**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>-.016</td>
<td>30</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Paraphrasing task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.486**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.624**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.053</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.485**</td>
<td>30</td>
</tr>
<tr>
<td>Grade 6</td>
<td>Paraphrasing task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.492**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.724*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.164</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.246</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 6.30: Correlations for Paraphrasing task and inferential and explicit comprehension in Narrative and Factual texts. Note: * $p < .05$  ** $p < .01$

6.4.4 Text Interrogative Ability

The present study speculates that inferential comprehension is influenced by the reader’s ability to identify questions answered by a written text. The ‘Questioning Task’ (Munro, 2005), (Appendix C), was used for this purpose.

Results for the questioning task were examined firstly by looking at developmental aspects of the Questioning Task across the grade levels 2-6 (Figure 6.15). Secondly the data at each grade level 2-6 in relation to comprehension type (inferential/explicit), and text type (narrative/factual), was examined. This was followed by an examination of trends in the results over the five grade levels 2-6.
Figure 6.15: Mean scores for questioning task at each grade level 2-6. Standard Error of Measurement represented by Error Bars.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Mean</th>
<th>Standard Error</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>11.86</td>
<td>.810</td>
<td>-2.48</td>
<td>0.48</td>
</tr>
<tr>
<td>3</td>
<td>12.26</td>
<td>.507</td>
<td>0.47</td>
<td>-1.15</td>
</tr>
<tr>
<td>4</td>
<td>14.00</td>
<td>.454</td>
<td>3.92</td>
<td>2.14</td>
</tr>
<tr>
<td>5</td>
<td>14.90</td>
<td>.250</td>
<td>-2.5</td>
<td>1.20</td>
</tr>
<tr>
<td>6</td>
<td>15.23</td>
<td>.430</td>
<td>-9.71</td>
<td>22.50</td>
</tr>
</tbody>
</table>

Table 6.31: Results for Questioning Task showing Standard Error, Skewness, and Kurtosis indices for each task.

As can be seen in Table 6.15, results for students at the grade 2 level indicate a significant correlation between the questioning task and the two inferential tasks- the narrative/inferential task ($r = .469$, $p < .01$), and the factual/inferential task ($r = .364$, $p < .05$). At both the grade 3 & 4 levels, data indicate a significant correlation between the questioning task and the factual/inferential task, ($r = .458$, $p < .05$) at grade 3 level, and ($r = .568$, $p < .01$) at the grade 4 level. At the grade 5 level, data indicates that 3 of the 4 tasks completed were significantly correlated with the questioning task, ($r = .367$, $p < .05$) for the factual/inferential task, ($r = .624$, $p < .01$).
for the narrative/explicit task, and \((r = .485, p < .01)\) for the factual/explicit task. Data at grade 6 level indicate a significant correlation between the questioning task and both the narrative/inferential task \((r = .502, p < .01)\), and the factual/inferential task \((r = .529, p < .01)\).

Trends spread relatively evenly across the grade levels 2-6 indicate that of the nine significant results, seven demonstrated positive relationships between the questioning tasks and inferential tasks. At grades 2 & 6, both inferential tasks, narrative/inferential and factual/inferential were positively related to the questioning task. Only two significant correlations were evident between the questioning task and explicit comprehension, both at the grade 5 level. In relation to text type, the correlations between inferential comprehension and the questioning task were stronger for factual texts compared to narrative texts, with 3 significant correlations for narrative texts, and 6 for factual texts.

These results provide strong support for the prediction that a significant relationship exists between inferential comprehension and the reader’s ability to identify questions answered by a written text. This strong relationship between the results for the questioning task and factual text will be discussed in more detail in the following chapter.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Questioning Task (Munro, 2005)</th>
<th>Text Type</th>
<th>Comprehension Comprehension</th>
<th>Pearson Correlation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Narrative/ Factual</td>
<td>Inferential/ Explicit</td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td>Grade 2</td>
<td>Questioning task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.469**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.364*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>-.155</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.138</td>
<td>30</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Questioning task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>-.223</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.458*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.138</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>-.090</td>
<td>30</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Questioning task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.283</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.568**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.151</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>-.051</td>
<td>30</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Questioning task</td>
<td>Narrative</td>
<td>Inferential</td>
<td>.053</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Inferential</td>
<td>.367*</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Explicit</td>
<td>.624**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factual</td>
<td>Explicit</td>
<td>.485**</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative</td>
<td>Inferential</td>
<td>.502**</td>
<td>30</td>
</tr>
</tbody>
</table>
Table 6.32: Correlations for Questioning task, and Inferential and explicit comprehension in Narrative and Factual texts  
Note: * p < .05     ** p < .01

Variability of the data

Skewness and Kurtosis were calculated, and on the whole there was a only a minor variation from a normal distribution in the first section of tests, with skewed outliers evident in the multi-choice answers to the inferential and explicit questions in both narrative and factual text grades 2-6. These minor variations from a normal distribution were all explicit questions- grade 2 explicit, grade 3 explicit, and grade 6 explicit. According to Field, (2018), these results are not unusual for results from questions using a multi-choice answer format for indicating choice of answer.

A small number of results were evident in the second section which relate to the ease of inferring a range of inferences where significant variations from a normal distribution were observed in the ease of inferring character trait for grade 2 students in both narrative and factual text, grade 3 students inferring feelings/ emotions and conventions of print, in factual text, and grade 4 students inferring in cause/effect in narrative text. It may well be that that moderate data set (N=30), may have made a difference. However, these particular results need to be considered with caution.

There is also an issue with the results for the grade 6 questioning task, where the results indicate a significant variation from a normal distribution were evident. This could be due to the effect of the scoring system for the Questioning Task where students received a score of ‘1’ if they created a question that was answered in the text, ‘0’, if they created a question that was not answered in the text, ‘0’, if they created a statement rather than a question, and ‘0’, for a fragment of words, or a mixture of isolated words, or no response. These results therefore need to be considered with caution.

Summary of current section

The current section examined the relationship between various psycholinguistic and cognitive factors and developmental trends in inferential and explicit reading.
comprehension for narrative and factual texts for students in grades 2-6. These factors included vocabulary knowledge, short term and working memory, paraphrasing ability and text interrogative ability. Across these four factors, 52 significant results were noted. Of the 52 significant results across these 4 factors, 40 related to inferential comprehension, and 12 related to explicit comprehension. In general terms, these results suggest a strong, positive relationship between inferential reading comprehension and vocabulary knowledge, short term and working memory, paraphrasing ability and interrogative ability across the grade levels 2-6.

In relation to text type, narrative and factual, examination of the data for grades 2-6, note that of the 40 significant results relating specifically to inferential comprehension, 29 related to factual text, and 12 related to narrative text. These results suggest a strong relationship in the data between inferential reading comprehension and factual text. These trends will be discussed in more detail in the following chapter.

6.5 Concluding Remarks:
The current chapter examined the mechanism of inferencing during reading comprehension of narrative and factual texts by primary school students in grades 2-6. It also examined the influence of various psycholinguistic and cognitive factors on developmental trends in the acquisition of this ability.

The results discussed in this chapter are summarised as follows.

The first section (6.1), examined the comparative ease of explicit comprehension over inferential comprehension of text for both narrative and factual text at each grade level 2-6. Results indicate that students in all grades 2-6 found inferential comprehension more difficult than explicit comprehension in both narrative and factual text, although the difference was not significant for grade 3 students in factual text.

The second section (6.2), compared factual and narrative texts for each type of comprehension, inferential and explicit, across all grades 2-6. Results indicate that for students in grade 3 & 5 inferring was significantly easier in factual than narrative text. The opposite was the case for grade 2 students who found inferring in narrative text significantly easier than inferring in factual text.
The third section (6.3), examined the comparative ease of inferring in each of the five inference types in both narrative and factual texts at each grade level 2-6. Results indicate that at each grade level 2-6, some inference types were more difficult than others in both narrative and factual texts, while some inference types such as inferring reasons for using conventions of text, was the most difficult for students in grades 2, 3, & 4, in both factual and narrative text.

The fourth section (6.4), examined the relationship between various psycholinguistic and cognitive factors and inferential reading comprehension. These factors and their relationship with inferential and explicit comprehension in both narrative and factual texts were examined in the following tasks- vocabulary knowledge, short term working memory, paraphrasing, and text interrogative ability.

Vocabulary knowledge was assessed using the subtests- expressive vocabulary, synonyms, and figurative language. Results for vocabulary knowledge indicate a significant relationship between expressive vocabulary and inferential comprehension in factual text at all grade levels 2-6, with the exception of the grade 3 cohort. The only other significant relationship indicated in these results was between expressive vocabulary and inferential comprehension was at the grade 2 level. The only positive results for the relationship between synonyms and inferential comprehension were demonstrated at the grade 5 & 6 level, with a relatively even spread across both narrative and factual text. Results for figurative language indicate strong positive relationships with inferential comprehension at the grade 4, 5, & 6 levels, particularly in factual text.

The digit recall test, demonstrated a significant relationship with inferential comprehension across the grade levels 3-6, in both narrative and factual texts. However, a significant relationship between factual inferential comprehension and working memory was indicated across the grade levels 2-6, in the backwards digit task.

Trends in the results for the paraphrasing task indicate a strong correlation between paraphrasing and inferential comprehension spread evenly across the grade levels 2-6, particularly in relation to factual inferential texts.

Likewise, results for the questioning task demonstrate positive relationships with inferential comprehension across all grade levels 2-6, with a strong concentration of
positive relationships in both narrative and factual tests evident at the grade 5 & 6 levels.
Chapter 7  Discussion of outcomes

In the following discussion of outcomes, it is important to bear in mind that a number of cognitive and psycholinguistic factors may relate to or interact with, those examined in the comprehension tasks in the present study, for example the standards of coherence a reader brings to the text (van den Broek, Risden, Trabasso & Basche (2001), as these standards assume a direct connection between the level of comprehension achieved and the standards the reader holds. While these standards have not been examined as part of the present study, they need to be considered in future studies. In addition, three inference types examined in this study, inferring feelings/emotions, inferring character traits, and inferring a character’s motives, involve cognitive and affective perspective taking. This is referred to in the literature as theory of mind. While not examined in the present study, it is seen as an important area to consider for future studies.

7.1  Comparative ease of explicit comprehension over inferential comprehension of text in both narrative and factual text

In examining the comprehension results for this section, and the following section, it is important to recognise that different researchers use different control groups matched according to different variables, making general conclusions from this literature quite challenging.

While previous studies have examined the relationship between explicit comprehension and inferential comprehension at various grade levels, predominately in narrative text, the scope of the present study was more comprehensive by examining this relationship across each of the grade levels 2-6, in both narrative and factual text.

Results demonstrated that students at grade levels 2, 3, 4, 5, & 6, found inferential comprehension significantly more difficult than explicit comprehension in narrative text. A similar pattern emerged in results for factual text, with students at each grade level 2, 4, 5, & 6 finding inferential comprehension more difficult than explicit comprehension. The only exception to this pattern in factual text was at the grade 3 level. These results support the prediction that inferential reading comprehension is more difficult than explicit comprehension (Cain & Oakhill, 1998; Oakhill & Yuill, 1996;
Cain & Oakhill, 2004), and that building a situation model can be difficult for some students at all grade levels (Yuill & Oakhill, 1991).

It is interesting to note however, that despite all students in the present study being classified as ‘at’ or ‘above’ the expected level based on the results of the PAT R Reading Comprehension test for their age level, results of the present study indicate some students continued to find the process of building a successful situation model a challenging task. While the question of whether the students in the present study who were considered to be at the expected level, or above the expected level according to their standardised test results (PAT R), could be considered less-skilled readers according to Yuill & Oakhill’s (1991), description above, while outside the parameters of the present study, is worthy of further consideration.

The one exception to the results for ease of explicit comprehension over inferential comprehension, was for factual texts at the grade 3 level, where this cohort of students found inferential comprehension easier than explicit comprehension, although this result was not significant. Implications for education in relation to these findings will be discussed in chapter 8, which follows.

### 7.2 Comparison of factual and narrative texts for each type of comprehension, inferential and explicit

While the present study notes that familiarity with narrative text structure enables reasonable inferences to be made by most students (Kispal, 2008), even good readers can struggle with inferring in factual text, due to the unfamiliar material, and complexity of ideas presented in a variety of structures (Williams, Taylor & deCani, 1984; Williams, Hall & Lauer, 2004). While studies have demonstrated that primary school aged students are sensitive to text structure (Englert & Thomas, 1987; Williams, Hall, & Lauer, 2004), the majority of these studies have examined inferential reading comprehension in narrative text, with students at, or above the 4th grade level. The present study examined the influence of text structure on drawing inferences in both narrative and factual text, and predicted that inferential reading comprehension would be influenced by the structure of the text, with drawing inferences in narrative text easier than drawing inferences in factual text across the grade levels 2-6.

The one result in the present study supporting the claim that inferring is easier in narrative text than factual text, was at the grade 2 level. For the students in grades 3 &
inferring was significantly easier in factual text, than narrative text, while there was no difference in results for inferring in the two text types, narrative and factual at the grade 4 & 6 levels. While the grade 2 results support the claim that inferring in factual text can be significantly more difficult than inferring in narrative text (Hidi & Hildyard, 1983; McCutchen & Perfetti, 1982), due to the difference in text structure (Duke, 2000; Williams, Hall & Lauer, 2004), it needs to be acknowledged that the grade 2 factual text was different in organisation to the other factual texts used at the grade 3 & 4 levels, and the grade 5 & 6 levels. The grade 2 factual text was a ‘step-by-step’ procedural text (see copy of text, ‘Monkey Chain’, (Appendix B), which may have made the process of inferencing more difficult than the narrative text at this level. The difference in the structure of the factual text at the grade 2 level (‘Monkey Chain’, Appendix B), compared to the structure of factual texts at both the grade 3-4, level (‘Jungle Boy’, Appendix B), and the grade 5-6, level (‘Phar Lap’, Appendix B), has been acknowledged as a design fault in the previous chapter. Further studies therefore, would need to be carried out with factual text to ensure consistency in formats, for results to be reliable. It needs to be acknowledged also, that as prior knowledge relating to the content of the factual texts was not assessed, this could have affected the results.

Implications for education in relation to these findings will be discussed in the following chapter.

7.3 Comparison of the relative ease of the five types of inference in both narrative and factual text at each grade level 2-6.

The present study examined the ease with which students at each grade level 2-6, develop inferential comprehension skills. As noted previously, while there appears to be consensus in the literature that children develop the ability to make inferences gradually and systematically as they mature and become more experienced readers (Siegler, 1995; van den Broek, 1989a; Thompson & Myers, 1985), the majority of this research has focussed on narrative text. The little research available in developmental aspects of inferential reading comprehension in factual text has focussed predominately on elementary school students, and adults (Englert & Hiebert, 1984; Narvaez, van den Broek, & Ruiz, 1999; Singer, Harkness, & Stewart, 1997). As noted by
Englert & Hiebert (1984), these results suggest a positive and incremental relationship between grade level, reading ability and knowledge of discourse types and structures, such as factual texts. The present study examined the skill of inferencing in both narrative and factual text at each grade level 2-6.

While results of the present study noted the level of support for the first part of hypothesis 3, that inferential comprehension is acquired developmentally, and at each grade level some inferential skills will be easier to apply than others, the current section discusses these findings in relation to the second part of hypothesis 3, that this sequence is influenced by whether the inference draws on automatic versus controlled processes, and the retrieval, deletion or the generation of knowledge (Kintsch, 1993). As noted in Table 4.1, the easiest inference types in the present study according to the Elaborated Classification System for inferences in reading comprehension (adapted from Kintsch, 1993), are inferring cause/effect, and inferring feelings/emotion, followed by inferring motive/goal. The most difficult inference types in the present study according to this classification system, are inferring conventions of text, and inferring character traits. While it needs to be kept in mind that participants in this study were a sample of different students at each grade level 2-6 at one point in time, rather than a longitudinal study following the same students over a period of time, some tentative observations can still be made in regard to developmental aspects of the results of the present study, in relation to the Elaborated Classification System for inferences in reading comprehension (adapted from Kintsch, 1993).

Results for narrative text indicated a developmental sequence at the grade 2, 3, & 4 levels, with the easiest inference type for these three groups of children, inferring feelings emotions, and the most difficult inference type, inferring using conventions of text. These results provide support for the Elaborated Classification System for inferences in reading comprehension (adapted from Kintsch, 1993). They indicate that for these students, inferring feelings/ emotions by searching for bridging knowledge and linking ideas with other ideas that are in the text, but not explicitly linked with each other, was the easiest process, while inferring conventions of text through the construction or generalisation of information in unfamiliar domains, was the most difficult process.
Results for students in grades 5 & 6, inferring in narrative text, could also be seen as supporting the Elaborated Classification System’s (adapted from Kintsch, 1993), developmental model; the inference types that were most difficult for students in grade 2, 3, & 4, were no longer the most difficult for the grades 5 & 6 students. These results raise the possibility that for students at the grade 5 & 6 level, the ease of drawing inferences may have less to do with the ease of drawing one type of inference over another inference type in a developmental sequence as indicated in results for students in grade 2, 3, and 4, but more to do with particular texts used to draw the inferences. For example, the same narrative text was used for students in grades 5 & 6, and both grades found inferring cause/effect the most difficult, although results for the two grades differed in the inference type they found the easiest.

Results in factual text for grade 2 students provide support for Kintsch’s Elaborated Classification System (adapted from Kintsch, 1993), only in regard to the results for the most difficult inference type for this group, inferring using conventions of text. However, an important consideration to keep in mind when comparing the results for the grade 2 students to those of all other grades, is that the grade 2 factual text, as previously mentioned, was a procedural text, completely different in format to the factual text at all other grade levels. For students in 3, 4, 5 & 6 results in inferring in factual text provided strong support for a developmental sequence of inferential comprehension, as indicated in Kintsch’s Elaborated Classification System (adapted from Kintsch, 1993), with results indicating the two easiest inference types across each of these levels were inferring feelings/emotions and inferring motive/goal, and the two most difficult inferences, inferring conventions of text and inferring character traits. The fact that this sequence was consistent over each of the grade levels 3-6, does not provide support for the idea that at each year level some inferential skills will be easier than others, depending on whether the inference draws on retrieval, deletion or the generation of knowledge. However, it is interesting to note that this consistent trend in ease of inferring at each grade level, was apparent in factual text, despite children in grades 3 & 4, using different texts to the children in grades 5 & 6 to answer inferential questions, but not in narrative text.

What needs to be acknowledged however when discussing the findings in this section, is that having a single question at each grade level to test the ability to infer in each of
the five inference types examined in both narrative and factual text is a limiting factor of this design. Further examination of inferential comprehension would need to include multiple questions to examine inference types. Implications for education in relation to these findings will be discussed in the following chapter.

7.4 The relationship between vocabulary knowledge and the skill of making inferences while reading both narrative and factual text.

The present study examined the relationship between inferential reading comprehension and the reader’s breadth of vocabulary network knowledge. Three subtests from the Test of Word Knowledge (Wiig & Seccord, 1992), Expressive Vocabulary, Synonyms, and Figurative Usage, were used to examine this relationship. While previous studies have examined this relationship at various grade levels, and predominantly in narrative text, the present study examined this relationship across each of the grade levels 2-6, in both narrative and factual text.

It has been well established in the literature that good comprehenders tend to have good vocabularies (Anderson & Freebody, 1981; Cain, Oakhill & Lemmon, 2005; Hirsch, 2003), and that the extent of an individual’s vocabulary is a powerful predictor of reading comprehension, (Blachowicz & Fisher, 2006; Freebody & Anderson 1983). Results from the present study indicated that of the 16 significant relationships in vocabulary knowledge, 12 related to inferential comprehension tasks, and 4 to explicit comprehension tasks. These results provide support for the claim that a strong relationship exists between vocabulary knowledge and inferential reading comprehension (Cain, Oakhill, & Lemmon, 2004; Perfetti, 1985). As noted by Rupley, Logan, & Nichols (1998/1999), possessing a rich source of vocabulary is a crucial factor for children in successfully creating inferences from unknown words they encounter in text.

It is interesting to note that in the present study the relationship between vocabulary knowledge and inferential comprehension was strongest at the upper grades. This result provides support for studies claiming that age can affect the ability to infer the meanings of new words from context (Carnine, Kameenui, & Coyle, 1984. Werner & Kaplan (1952), suggest that performance in inferring meanings of new words from context generally improves between the ages of 8 and 13, with significant changes
occurring around the ages of 10 to 11 years of age. Results of the present study support this trend. As suggested by Nagy, Herman, & Anderson (1985), and Nagy & Herman (1987), learning the meanings of words from context is a relatively slow, incremental and cumulative process, based on many years of wide reading. Findings in the present study support these claims with the strongest relationships between vocabulary knowledge and inferencing ability concentrated predominately at the upper grades.

Another important finding in the present study was the predominance of positive relationships between vocabulary knowledge and inferential comprehension in factual text, in contrast to narrative text. Of the 12 significant relationships between inferential tasks and vocabulary knowledge, 10 related to factual texts. These results support the claim by Gardner (2004), that factual texts contain a far greater density of specialised vocabularies and lexical density than narrative texts. As noted in the results, of the 16 positive relationships between inferential reading comprehension and vocabulary knowledge, 6 related to Expressive Language, 5 related to Synonyms, and 5 related to Figurative Language. These results provide support for the need for a strong emphasis in the curriculum for these components of word knowledge, particularly in relation to factual text.

However, as mentioned in the Literature chapter, it is important to keep in mind that the existence of a positive relationship between vocabulary knowledge and inferential reading comprehension as suggested in the results of this study, does not mean there is a causal relationship between the two (Cain, Oakhill, & Bryant, 2004; Pressley, 2000; Paris & Hamilton, 2009;).

7.5 The relationship between Working Memory and inferential reading comprehension

The present study examined the relationship between inferential reading comprehension and the reader’s working memory. Two components of the Automated Working Memory Assessment (Alloway, 2007), the digit recall task and the backwards digit recall task, were used to examine this relationship. While previous studies have examined the relationship between a reader’s working memory and inferential reading comprehension at various grade levels, this study examines this relationship across each of the grade levels 2-6, in both narrative and factual text.
It is important to recognise that a number of cognitive and psycholinguistic factors such as executive functioning, may have contributed to the results discussed in this section on working memory. As mentioned in the literature review, difficulties with executive functioning, can contribute to low scores of working memory for tasks such as the backward digit span used in the present study. Consideration of executive functioning will be recommended for future studies.

Results for both working memory tasks, the digit recall task and the backwards digit recall task indicate a significant relationship with inferential reading comprehension, providing strong support for the prediction that inferential reading comprehension is influenced by the reader’s working memory. The fact that this trend in results was apparent at each grade level 2-6, for the backwards digit recall test, which is considered to be a more significant and reliable indicator of working memory capacity, and inferential comprehension of factual text, provides strong support for Just & Carpenter’s (1992), Capacity Constrained model of working memory. This model stresses the importance of cognitive capacity in constructing the foundations of textural representations. Just & Carpenter’s model suggests that readers with high working memory spans are at an advantage in comprehension, as components of comprehension are demanding on working memory.

These results provide strong support for the prediction in the present study that inferential reading comprehension is influenced by the reader’s working memory. As noted by Brainerd & Pressley (1985), as comprehension performance deteriorates, readers with high working memory spans enjoy advantages in comprehension. Implications for education in relation to these findings will be discussed in the following chapter.

7.6 The relationship between Interrogative Ability and inferential reading comprehension

The present study examined the relationship between the ability to identify questions answered by a written text, and inferential reading comprehension. The Questioning Task (Munro, 2005), was used to examine this relationship.

A number of studies have demonstrated that teaching students to generate their own questions improves their comprehension of text, for example studies by Dreher & Gambrell, (1985), Cohen (1983), Davey & McBride (1986), and Taboada & Guthrie
(2006). However, the majority of these studies examined the relationship between student self-questioning and literal comprehension, or comprehension generally. The only study to look at student self-questioning and inferential comprehension was the study by Davey & McBride (1986), who examined this skill with students in grade 6. The remainder of the studies cited in the literature involved students in grades 3-4.

The present study examined the relationship between the ability to generate questions answered by a written text, and inferential comprehension of both narrative and factual text, in students across the grade levels 2 to 6. Results of the present study, indicating that at each grade level 2-6, a significant relationship was evident between inferential reading comprehension and the questioning task, not only provides support for these claims, but further, suggest that this relationship is particularly important in regard to factual text. For example at every grade level 2-6, a significant relationship was evident between the questioning task and inferential comprehension of factual text. This finding has substantial implications for teaching practice, and will be discussed in the following chapter.

7.7 The relationship between Paraphrasing and inferential reading comprehension

The present study examined the relationship between the reader’s ability to paraphrase a text and inferential reading comprehension of narrative and factual text across the grade levels 2-6. The Paraphrasing Task (Munro, 2005), was used to examine this relationship.

With the exception of the study by Gillam, Fargo & Robertson (2009), who examined the skill of paraphrasing using a ‘Think-Aloud’ strategy with fourth grade students with and without language impairments, previous studies have only examined this skill with students at middle and upper school levels. As indicated in the results of the present study, a strong relationship exists between the paraphrasing task and inferential reading comprehension across the grade levels 2-6. These results indicated that 8 of the 11 significant relationships observed in the data were between the paraphrasing task and inferential reading comprehension. The most significant trend in these results related to factual text, where at each grade level 2-6, a significant relationship was evident between the paraphrasing task and inferring in factual text.
Gillam et al., (2009), noted, based on the results of their study, that “children who produced accurate paraphrases were more likely to perform better on measures of comprehension than children who produced inaccurate paraphrases” (p. 90). This claim is supported in the results for the present study. While Gillam et al., go on to suggest that “the general structure of narrative text may lend itself to the generation of inferences and expository text to the generation of paraphrases“(p.90), results of the present study note however, that a strong relationship exists across all grade levels 2-6, between paraphrasing and inferential comprehension, and in particular paraphrasing and inferential comprehension of factual text.

Results of this study provide strong support for the suggestion by Munro (2003), that a possible aspect of the inferring mechanism is the use of paraphrasing as a mediating process, leading to the prediction that readers who can paraphrase a text more easily, are also able to comprehend text at an inferential level. Not only do the results of the present study support this contention by Munro (2003), but add further weight to this argument by demonstrating a positive relationship between inferential comprehension and paraphrasing, across the grade levels 2-6, particularly when reading factual text.

This finding has substantial implications for teaching practice, and will be discussed in the following chapter.

### 7.8 Concluding Remarks

Results for the first three hypotheses of the present study extended the findings of previous studies by examining inferential reading comprehension across grades 2-6, in both narrative and factual texts. Results of the remaining four hypotheses of the present study both also extend the findings of previous studies, as well as provide new insight into a range of factors that influence inferential reading comprehension in both narrative and factual text for students in grade 2-6.

Results for the first three hypotheses of the present study indicate:

1. That the students in the present study in grades 2-6, found inferential reading comprehension more difficult than explicit reading comprehension in both narrative and factual text across the grade levels 2-6, with the exception of the grade 3 students inferring in factual text.
2. Mixed results for the influence of text structure on inferring in both narrative and factual texts. Results indicated that inferring was easier in narrative text for grade 2 students, while inferring in factual text was easier than narrative text for students in grade 3 & 5. For students in grades 4 & 6, there was no differences in ease of inferring between the two text types, narrative and factual.

3. Some support for the prediction that inferential reading comprehension is acquired developmentally, and at each grade level some inferences will be easier to generate than others, and that this developmental sequence will be influenced by retrieval, deletion or the generation of knowledge, based on the Elaborated Classification System (adapted from Kintsch, 1993), for inferences in reading comprehension. Results for inferring in narrative text indicated some support for a developmental sequence, as the inferences the students in grades 2, 3, & 4 found difficult, were no longer difficult for the students in grade 5 & 6. Support for a developmental sequence when inferring in factual text, according to the Elaborated Classification System (Adapted from Kintsch, 1993), was indicated in results for students in grades 3, 4, 5 & 6, in both the two easiest inferences, inferring inferring feelings/emotions and inferring motive/goal.

Although these results provide partial support for the study’s first 3 hypotheses, other plausible explanations might be offered for these results, most significantly the influence of prior knowledge. If prior knowledge had been examined, enabling a more robust examination of inferential comprehension, results may be more reliable.

Results for the four remaining hypotheses of the present study provide:

1. Support for the claim that inferential reading comprehension is influenced by the reader’s breadth of vocabulary network knowledge with results indicating the strongest relationships between vocabulary knowledge and inferencing ability were concentrated predominately at the upper grades. The predominance of positive relationships between vocabulary knowledge and inferential reading comprehension across the grade levels 2-6, was in factual text.

2. Support for the claim that inferential reading comprehension is influenced by the reader’s working memory, with results for the more rigorous of the two memory tasks administered, the backwards digit recall task, highly predictive of inferential
reading comprehension across the grade levels 2-6, in both narrative and factual texts.

3. Support for, as well as providing new evidence for the claim that a significant relationship exists between the ability to identify questions answered by a written text, and inferential reading comprehension, with results indicating a positive relationship with inferential reading comprehension across the grade levels 2-6. The fact that relationships between interrogative ability and inferential comprehension were significant across all grade levels 2-6, provides new insight into, and extends the knowledge of what is already known regarding the influence of this skill on inferential comprehension for students in grade 2-6.

4. New evidence for the claim that a significant relationship exists between inferential reading comprehension and the reader’s ability to paraphrase a text, with results indicating a positive relationship exists between this skill and inferential reading comprehension across the grade levels 2-6, with particularly strong results evident in factual text.

While the findings of the present study have some important implications for educational practice, it is important to note the predictive limitations of a cross sectional design on which this study was based. As noted by Solum (2015), the main limitation of a cross sectional study design is that the ‘exposure and outcome’ (Solem, p. 205), are being examined at the same or similar timeframe, unlike a longitudinal study which enables observation of how a variable may change over time. However, longitudinal studies also have their weaknesses as well as strengths. Drawbacks of this design however include considerations such as expenses and human resources. Additionally, given the timeframe, subjects are more likely to drop out of the study, affecting the sample size (Gratton & Jones, 2004).

While recommendations and observations can be made in relation to the results of this study, conclusion can not be drawn due to the study’s cross sectional design. Additional data from follow up studies as students progress through grade levels would need to be collected to establish the reliability of these results. Therefore the results of this study must be treated as tentative, with findings replicated in longitudinal studies with larger groups of students to enable more reliable results.
The results of this study provide strong support for the situation model of text comprehension in the generation of inferences.
Chapter 8  Implications for practice

A number of important implications for practice are recommended in the light of the results of this study.

As noted by Kintsch & Rawson (2007), in their comparison of expert and ‘novice’ comprehenders, “The novice comprehender reading unfamiliar material must expend considerable effort, and to expend it in just the right way, to achieve adequate results” (p. 225). Kintsch & Rawson use the term ‘novice comprehenders’ to describe the opposite of the actions taken by ‘expert comprehenders’. One implication of the present study therefore, poses an important question. How do we build a bridge between literal comprehension and inferential comprehension for all students regardless of their grade level, or perceived level of reading comprehension, in order for them to become expert readers? In other words, how do we change novice readers into expert readers who become engaged in active, strategic processing as they read in order to create successful situation models? One of the most powerful strategies for helping students to become expert readers is through the strategies included in the Reciprocal Teaching model (Palinscar & Brown, 1984).

The Reciprocal Teaching model: (Palincsar & Brown, 1984), has a solid evidence base for effectiveness in creating successful situation models. This model focusses on four main strategies, 1. Clarification, 2. Summarisation, 3. Prediction and 4. Question Generation. Given that the 4 main strategies in this model align well with strategies examined in the present study, inferencing, paraphrasing and self-generation of questions, it is a highly relevant model to recommend to teachers, keen to improve their student’s reading skills in general, and inferencing skills in particular. The strategies in this model by Palincsar & Brown (1984), are particularly helpful in identifying and supporting poor and less-skilled comprehenders. Although this model was trialled with seventh grade poor readers, the authors note it can be adapted for all age groups. As noted by Palincsar & Brown (1984), the difficulty for teachers in trying to ascertain the most successful comprehension strategies for instructional purposes can be daunting. They suggest however, that there is considerable agreement in the literature in relation to the most robust and successful activities: (1) ‘understanding the purposes of reading, both explicit and implicit; (2) activating relevant background
knowledge; (3) allocating attention so that concentration can be focused on the major content at the expense of trivia; (4) critical evaluation of content for internal consistency, and compatibility with prior knowledge and common sense; (5) monitoring ongoing activities to see if comprehension is occurring, by engaging in such activities as periodic review and self-interrogation; and (6) drawing and testing inferences of many kinds, including interpretation, predictions, and conclusion’ (p. 119).

A simple strategy such as Initiating a discussion about inferences sits well with the Reciprocal Teaching approach comes from Marzano (2010), who suggests that by posing 4 questions teachers can begin an important discussion about inferences in their classrooms. This strategy involves students reflecting on the effectiveness of the inferences they make:

Question 1: What is my inference?

Question 2: What information did I use to make this inference?

Question 3: How good was my thinking?

Question 4: Do I need to change my thinking?

Text Types: One of the most important skills students in secondary schools need to learn is the ability to understand factual material (Katims & Harris, 1997). However, in order for this to happen, a strong emphasis on comprehension instruction based on factual text needs to be introduced in the primary school curriculum (Williams, 2008; Williams, Hall, Lauer, Stafford, DeSisto, & deCani, 2005). Teaching reading comprehension strategies to young children within the context of content areas, based on texts about social studies, or science for example, would be an effective way to counter the current emphasis on narrative text in the early years of schooling (Williams, Hall, & Lauer, 2004; Pressley, 2002). If readers are unaware of the underlying structure of factual texts, they may well treat the material as “a list of facts” (Cook & Mayer (1988 p. 448).

Teaching reading comprehension strategies to young children within the context of content areas, based on texts about social studies, or science for example, would be an effective way to counter the current emphasis on narrative text in the early years of schooling (Williams, Hall, & Lauer, 2004; Pressley, 2002). If readers are unaware of the
underlying structure of factual texts, they may well treat the material as “a list of facts” (Cook & Mayer, 1988, p. 448).

Teaching reading comprehension strategies to young children within the context of content areas, based on texts about social studies, or science for example, would be an effective way to counter the current emphasis on narrative text in the early years of schooling (Williams, Hall, & Lauer, 2004; Pressley, 2002). If readers are unaware of the underlying structure of factual texts, they may well treat the material as “a list of facts” (Cook & Mayer, 1998, p. 448). Observations have also been made that on few occasions only, do teachers read non-fiction books aloud to students (Campbell, Kapinus & Beatty, 1995). In the first year of schooling children need to be provided with more experience with factual text (Williams, 2008).

**Working memory:** It is important to note that many of the reading activities students encounter in classrooms, “impose quite considerable burdens on working memory” (Gathercole & Alloway, 2007, p. 9). This claim has important implications for classroom practice, especially for students encountering problems with reading comprehension, and in particular inferential reading comprehension. “Approximately 70% of children with learning difficulties in reading obtain very low scores on tests of working memory that are rare in children with no special educational needs” (Gathercole & Alloway, 2007, p. 12).

Alloway (2007), provides a number of classroom recommendations for reducing working memory loads for students experiencing learning difficulties. While these recommendations are general in nature, and not specifically targeted at supporting inference generation, they are important in light of the claim by Gathercole & Alloway (2007), that a strong relationship exists between learning difficulties students experience in reading, and working memory.

Alloway’s suggestions include:

- Reducing the amount and complexity (for example, of language structures), of information to be retained;
- Reducing unnecessary processing demands in activities requiring storage demand in memory;
• Either simplifying complex tasks by breaking down into steps, or where appropriate providing a ‘wholistic’ overview of the tasks demands.

**Questioning:** Being able ‘to identify questions answered by a text is a key aspect of effective literacy practice’, (Munro, 2002, p. 7), however, many secondary students have difficulty with this skill. Students are familiar with being asked for answers to comprehension questions, however they are less familiar with generating questions for themselves (Munro, 2002). While teacher generated questions have dominated reading comprehension instruction, (Dole, Duffy, Roehler, & Pearson, 1991), suggestions have been made that this practice actually interferes with comprehension (Kispal, 2008). Results of the present study indicated a significant relationship between inferential reading comprehension and the Questioning Task. Of particular note were the results for students generating their own questions and inferential reading comprehension of factual text, where at each grade level 2-6, a significant relationship was observed. These results provide a strong evidence base for the inclusion and development of, self questioning skills across each of the grade levels 2-6, within reading comprehension programs in primary schools. Questioning is part of The Reciprocal Teaching model: (Palincsar & Brown, 1984).

**Paraphrasing:** A significant relationship has been shown to exist between the paraphrasing and inferential reading comprehension. While a this relationship has been shown to exist in narrative text, results for factual text are particularly striking with a significant relationship demonstrated between paraphrasing and inferring in factual text across each of the grade levels 2-6. These results have important implications for teaching practice.

Paraphrasing is an effective strategy for increasing students’ understanding of text that teachers can use as part of the repertoire of practices they use in the classroom (Fisk & Hurst, 2003). A strategy that teachers can implement with students on an everyday basis consists of providing students with simple sentences for the particular content area they are working on, and demonstrating how to change as many words as possible (Munro.2006). For example teachers need to demonstrate to students how to:

• Segment the sentence into key ideas
• Suggest synonyms for key words
• Link synonyms into a proposition or a relationship. Rearrange phrases and verbalise the new sentence
• Check that the new sentence has the same meaning as the original sentence
• Check the sentence fits with the earlier sentences. Each sentence has a purpose or reason for being included in the text. Readers need to take account of the conceptual links between sentences. Check that the paraphrase fulfils the same purpose as the original sentence. (Munro, 2006)

Hagaman & Reid (2008), developed a paraphrasing strategy, known as the RAP (Read, Ask, Paraphrase) strategy, which the authors claim improves inferential comprehension. This strategy was developed in response to research which demonstrates that while explicit instruction in reading comprehension improves student’s reading comprehension (Pressley, Brown, El-Dinary, & Allferbach, 1995), comprehension is often “rudimentary” (p. 22). As noted by the authors, this three-step strategy requires students to:

• Read a paragraph
• Ask yourself, ‘what was the main idea and two details?’
• Put information in your own words.

The authors note that this strategy can be with both primary and secondary school students to support students who find reading comprehension difficult.

While recent research has led to significant improvements in the knowledge base for teaching readers in the primary grades, “evidence –based improvements in the teaching practices of reading comprehension are sorely needed” (RAND Report, Snow, 20002, p. xi). Snow (2002), notes that a number of factors influenced the decision for the RAND Reading Study Group to focus on reading comprehension. One of these reasons was the finding that “little direct attention has been devoted to helping teachers develop the skills they need to promote reading comprehension, ensure content learning through reading, and deal with the differences in comprehension skills their students display” (p. xi, xii).
While some students acquire reading comprehension strategies informally, explicit strategy instruction has been found to be highly effective in enhancing comprehension (Snow, 2002). Snow, (2002), also noted the importance of professional development in preparing teachers for effective reading comprehension instruction, particularly in relation to low performing students. As noted by Pardo (2004), once teachers understand how the factors of reader, text and context interact to make meaning, they can more effectively teach their students to be successful comprehenders.
Chapter 9  Conclusions and directions for the future

Findings from this study provide confirmation of the crucial role played by inference in reading comprehension of both narrative and factual text, for students in grade 2-6. These findings confirm the important role played by vocabulary knowledge and working memory in the development of inferential reading comprehension, and highlight the positive relationship between the readers’ ability to generate questions, and paraphrase a text, and inferential reading comprehension. These results point to the need for a coordinated and whole-school approach to classroom practice regarding the teaching of inferential reading skills across the primary school school years.

Based on the results of this study a number of conclusions can be made:

1. While inferential reading comprehension was found to be more difficult than explicit comprehension in both narrative and factual text, it needs to be emphasized that these results were based on one question for each inference type in narrative text and one inference type in factual text. Further research needs to be carried out on multiple questions for each inference type in both narrative and factual texts to clarify this situation. Furthermore the fact that prior knowledge was not taken into account in this study is a design weakness, and this needs to be taken into consideration in future studies.

2. The differing formats and structures of texts need to be considered in relation to the ease or otherwise of building successful situation models. This consideration needs to be taken into account in future studies. For example the grade 2 factual text was a different structure to the texts at the remaining grade levels, and this factor may have affected results.

3. A more extensive examination of prior knowledge needs to be a factor in future studies to ensure the results are reliable. For example an examination of the prior knowledge required for completing the comprehension, paraphrasing and and self-questioning tasks needs to be undertaken, and consideration given to how this knowledge changes over time across the grade levels and text type.

4. An examination of the broader range of executive functions of which working memory is a part.
5. While there was some indication of a developmental sequence in the acquisition of inferential reading comprehension, these results were based on one question for each inference type in both narrative and factual text. These findings therefore need to be seen as tentative, and further studies examining this aspect of inferential reading comprehension need to be carried out.

6. As indicated in the results, strong support was evident in the relationship between vocabulary and inferential reading comprehension in both narrative and factual texts. Importantly, of the twelve significant relationships observed, ten related to inferring in factual text. While this finding is not surprising, it is often overlooked in classroom programs, where it is assumed that students possess the necessary vocabulary knowledge, including figurative language, to support inferential comprehension. This finding has important implications for all students, but in particular for students for whom English is a second language. In any assessment of vocabulary consideration needs to be given to the understanding that words can be polysemous as well as figurative, and the implications this has for the teaching of inferential reading comprehension.

7. Supporting students with poor working memory who are struggling with inferential reading comprehension is extremely important. Professional development for teachers in understanding the important relationship between working memory and inferential reading comprehension generally, and in particular, inferential comprehension of factual text, needs to be seen as a priority. Teacher’s knowledge of student difficulties in this area is particularly important given the strong focus on factual texts in classroom programs, and the amount of research required of students at the upper grades of schooling.

8. The finding of a strong positive relationship between both paraphrasing and questioning and inferential reading comprehension, particularly in factual text has important implications for the future. Reading programs need to include the development of these skills as an important part of classroom programs across the school.

9. Consideration given to the role of two areas which were not included in this study, but need to be included in further studies, as an understanding of the
possible contributions they make to inferential reading comprehension is important. These two areas are:

- Standards of coherence (van den Broek et., al., 2011)
- Perspective-taking/ theory of mind (Healey & Grossman, 2018)

10. Examination of the relationship between a number of relevant inference types and perspective taking, theory of mind, emotions and evaluation of character, and how these develop in relation to age groups studied.

In relation to the design of the study:

- More than one question to test each type of inference
- Consistency in format for factual text used
- Larger cohort of students at each level
- Need for a consistent approach for distractor items on multiple choice questions
- Consideration of a longitudinal study

Need for further consideration:

While all the students in the study were considered to be ‘At the expected level’ according to the PAT-R Reading Assessment used at the school where this study took place, some students still struggled with the inferential skills required to build a successful situation model of reading comprehension. To enable a more accurate assessment of reading comprehension pretesting students at each grade level using Hannon & Daneman’s (2001), test ‘A new tool for measuring and understanding individual differences in the component processes of reading comprehension’, would be a step forward. This tool provides separate measures for reproducing a text from inferencing, and use of knowledge (Kintsch & Kintsch, 2005).

Further directions for the future include:

(1) Examining the incorrect responses. What do the incorrect responses tell us about the strategies used by individual students to make sense of the text in order to answer the question/s?
Examination of the linguistic characteristics of the texts used in the paraphrasing and questioning tasks. Important to more about the key vocabulary, frequency, age of acquisition, concreteness, imaginability, word type, and how these characteristics change over time.

Investigate students who have high literal comprehension but low inferential comprehension, and explore ways to build a bridge between these two types of comprehension.

Further consideration needs to be given to prior knowledge necessary for completing the comprehension, paraphrasing and questioning tasks across the grade levels and text types, and how this changes across grade levels.

While the present study used the the Flesch-Kincaid Grade Level Readability Test (Kincaid, Fishburne, Rogers, & Chissom, 1975), other readability formulas could be investigated. For example Graesser et al., (2007) argue that the development of their web-based software tool, Coh-Metrix, will eventually replace current readability formulas. They claim that Coh-Metrix “incorporates new modules and metrics in computational linguistics that allow us to analyse text on over 50 measures of cohesion and 200 measures of language” (Graesser et al., 2007, p. 307). The authors concede however, that whether the metrics of cohesion in Coh-Metrix has any validity in the context of psychological models and brain mechanisms, remains a question.

As noted in the results section of the present study, the relationship between paraphrasing and inferential reading comprehension was particularly strong, with 8 of the 11 significant correlations indicated in the data related to relationships between paraphrasing and inferential reading comprehension. Of these 8 significant relationships, 5 related to factual inferential texts, and 3 to narrative inferential texts. Results for the positive relationships between inferential comprehension of factual texts and paraphrasing are of particular significance, as they are spread evenly across the levels 2-6. These results have particular implications for classroom reading comprehension programs, as the relationship between paraphrasing and inferential reading comprehension of both narrative and factual text has not been investigated previously across the primary school grades 2-6. Given the significance of these findings directions for the future could
also include the trailing of paraphrasing activities in the Prep and grade 1 classes. Activities could be adapted at these levels, with a focus on oral language, particularly with picture books, factual-based Big Books, and online resources. Developing these skills at the Prep and grade 1 levels, would provide a strong basis for further development of these skills in grade 2-6.

(7) Directions for the future could also include the trailing of student self-questioning activities in the Prep and grade 1 classes. Activities could be adapted at these levels, with a focus on oral language, particularly with picture books, and factual Big Books, as well as online resources. As noted in the literature, students at junior grade levels are rarely exposed to factual texts. This exposure is important as students need an increased awareness of text structures as they progress through their school years as the emphasis shifts from reading a storyline to reading for information. Early exposure to these the skills of self-questioning in factual text at the Prep and grade 1 levels, would provide a strong basis for further development in grades 2-6.

(8) A strong direction for the future should be on ensuring teachers include a focus on words with multiple meanings in school literacy programs across all grade levels. Beginning to explore figurative language as well as polysemous words in the early years of school through the use of picture story books for example, would gradually build up the skills and knowledge necessary for a more sophisticated understanding of this area of language in the upper grades where results of the present study have demonstrated the important relationship it has with inferential reading comprehension.

(9) While we know a great deal about comprehension strategies used by skilled readers within traditional text environments (Pressley, 2000; 2002), much less is known about how readers construct meaning within electronic environments such as the internet (Leu, Kinzer, Coiro, & Cammack, 2004). These observations have important implications for future directions in understanding inferential reading comprehension of factual text. An important direction therefore would be to investigate how the findings of this study apply to digital texts.

(10) A strong recommendation for future studies is to investigate the role of two areas which were not included in this study, but should be included in further
studies, as an understanding of the possible contributions they make to inferential reading comprehension is important for teachers in supporting students comprehension difficulties. These two areas are: standards of coherence (van den Broek et al., 2011), and executive functions.

9.1 Final Word

A number of theoretical models have been outlined in this study of inferential reading comprehension. The present study has drawn on a combination of Kintsch’s construction-integration model (Kintsch, 1998), and Just & Carpenter’s capacity-constrained model (Just & Carpenter, 1992), and is based on Kintsch’s (1998), situation model. Based on an understanding of actions readers take in this situation model, readers in the present study interpreted characters feelings, goals, motives, actions, and settings in terms of the their existing knowledge. Semantic propositions in the reader’s existing knowledge were used to interpret the text propositions. This level of meaning can modify previous constructed representations and can influence subsequent constructions. Each of these types of representation specify individual sentences and links between them (Kinnunen & Vauras, 1995). In order to comprehend the text students in the present study were required to read at a deeper level according to this model, with successful readers integrating these representations to create an overall impression or representation of the text. This integration process explains the actions taken by readers in the present study in making inferences, creating questions, and paraphrasing text by synthesising ideas abstracted from the text with their existing knowledge.

The Elaborated Classification system for inferences in reading comprehension was adapted from Kintsch (1993), and used in the present study to describe the processes that deliver the outcomes in relation to the five inferences types which were the focus of the study. They were defined by Kintsch (1993), as controlled processes where the reader searches for different types of knowledge through linking ideas at the same level (Accreditation of information), by a retrieval or generation process, or through or linking with higher levels (Reduction of information), by a deletion or generation process in a search to maintain meaning. This model enabled the inferences in the present study to be classified according to these actions.
A proposal is made for future studies to extend Kintsch’s situation model (1998), to a model which includes cross referencing to a range of relevant executive functions, as well as links to standards of coherence (van den Broek et al., 2011).

As noted in the literature, research into inferential reading comprehension has focussed on identifying and examining individual processes involved in this skill at particular grade levels, with a predominant focus on upper primary and secondary grade levels. The present study, however, has confirmed and extended these findings by examining component skills such as vocabulary knowledge and working memory and the contribution these constructs make to inferential comprehension across each of the grade levels 2 to 6, in both narrative and factual texts. This study has demonstrated that these skills and processes are equally important for the development of inferential reading comprehension at the lower grade levels, as they are at the upper levels, and are of particular importance in regard to inferential comprehension of factual texts.

This research has also broken new ground by examining the skills of paraphrasing and student self-questioning across the grade levels 2-6, demonstrating the positive relationship these skills have with inferential reading comprehension, particularly in regard to factual text. Recommendations have been made for the implementation of a whole school approach to the teaching of paraphrasing and self-questioning strategies, particularly with factual text, beginning at the Prep and grade 1 levels. If implemented, this approach would provide a strong basis for further development of these important skills in grades 2-6, and the ability of students to become proficient in inferential reading comprehension would be enhanced in preparation for the challenges of secondary school, where the focus on factual texts increases significantly.
References

ACER. (2008). *Progressive Achievement in Reading*.


Trabasso (Eds.), *Learning and comprehension of text*. Hillsdale, NJ: Lawrence Erlbaum Associates.


Butcher, K. R., & Davies, S. (2015). Cognitive processes during diagram interaction in an intelligent tutoring system


Daneman, M., & Hannon, B. (2001). Using working memory theory to investigate the construct validity of multiple-choice reading comprehension tests such as the SAT. *Journal of Experimental Psychology: General, 130*(2), 208-223.


Dickenson, J. R. (2013). How many questions do multiple-choice questions really have? *Developments in Business Simulation and Experimental Learning, 40*, 171-175


Keene, E. O. (2002). From good to memorable: Characteristics of highly effective comprehension teaching In C. C. Block, B. L. Gambell & M. Pressley (Eds.), *Improving Comprehension Instruction* (pp. 80-105). San Francisco: Jossey-Boss.


Munro, J. (2012b). Professional discussion with supervisor of thesis


representation. In J. L. Otero, J. A. Leon & A. C. Graesser (Eds.), *The psychology of science text comprehension* (pp. 131-154). Mahwah, NJ: Erlbaum.


Appendices
Appendix A:
Consultancy Process

1. Selection of texts

2. Selection of the inference types

3 & 4: Selection of inferential questions and multiple-choice answers for each of the inferential questions

5. Selection of explicit questions and multiple-choice answers for each of the tests at each grade level

1. Selection of texts:

Grade 5/6, and grade 3/4 texts:

(a) Four tests were chosen by the researcher: 1 based on a factual text and 1 based on a narrative text from the ICAS test papers (2007-2009), for the grade 3-4 students, and 1 based on a factual text, and 1 based on a narrative text for the grade 5-6 students. These texts were chosen on the basis of an appropriate *Flesh-Kincaid Readability Measure* for the two age groups.

(b) A consultancy process then took place with three literacy specialist teachers from the same Region as the school where the present study took place. These teachers were asked to assess the suitability of these ICAS texts for the grade levels they were going to be used for (grade 3-4, and grade 5-6).

(c) As a result of this consultancy process, both the ICAS texts for the 3-4 students, the narrative and the factual text, as well as the narrative text for the grade 5-6 students were considered suitable by the literacy specialist teachers. However, as they were unsure of the suitability of the 5-6 factual text they completed a trialling session with their students. On the basis of this session they considered the ICAS factual texts chosen for the grade 5-6 students to be unsuitable, as it was too difficult for the grade 5 students and too easy for the grade 6 students.

(d) The literacy teachers were then provided with another ICAS factual text for the 5-6 levels, which they also considered to be unsuitable.

(e) An alternative text, *Literal & Inferential Comprehension Tasks, Unpublished manuscript, University of Melbourne (Munro, 2012)*, was given to the literacy specialist teachers. They considered this text to be a suitable factual text for the grade 5/6 comprehension test.

The grade 2 narrative text was chosen from the ICAS grade 3 tests as ICAS does not produce English tests at the grade 2 level. The grade 2 comprehension tests were therefore chosen from the grade 3, ICAS English tests (2007-2009), by the researcher, based on an appropriate *Flesh-Kincaid Readability Measure*, as well as the results of a
Pilot Study based on a narrative text The Pilot Study was conducted by the researcher with 25 grade 2 students who were not part of the present study. The following Table indicates the percentage of correct answers made by the grade 2 students for the five inferential questions used in the Pilot Study, which were taken directly from the grade 3, ICAS English test (2003).

<table>
<thead>
<tr>
<th>Five inferential Questions from the Grade 3, ICAS English Test (2003), based on the text ‘Queenie the Bantam’ (narrative text)</th>
<th>Percentage of correct responses from the 25 students in the grade 2 Pilot study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infer the relationship between text and illustration in a narrative</td>
<td>98%</td>
</tr>
<tr>
<td>Infer the meaning of a clause in context</td>
<td>60%</td>
</tr>
<tr>
<td>Infer the author’s purpose in the use of bold print in a narrative</td>
<td>81%</td>
</tr>
<tr>
<td>Infer the purpose of a layout feature in a narrative</td>
<td>79%</td>
</tr>
<tr>
<td>Infer the main idea in a narrative</td>
<td>70%</td>
</tr>
</tbody>
</table>

On the basis of this consultancy process, and results of the pilot study with the grade 2 students, six texts were chosen for the present study. Five were from the ICAS materials (2007-2009), and the remaining text, a factual text (Unpublished manuscript, Munro, 2012), based on the story of Phar Lap, was used for the students in grade 5 & 6, as none of the factual texts from the ICAS materials (2007-2009), were considered appropriate by the literacy teachers.

2. Selection of inference types:

To enable comparisons across the results for the grade level tests grade 2, grade 3-4, and 5-6, a small number of changes had to be made in the way some inferences were described from the way they were described in the ICAS materials. For example, a broader description such as ‘inferring a motive/goal’, used in the present study in place of the descriptions used in the ICAS documentation such as ‘infer a reason/motive for a character’s action’. 
All of these slight changes made in broadening the descriptions of inference types in the ICAS materials were taken to the literacy teachers, who considered them to be appropriate descriptions for the inference types chosen. The only decision in changing the definition of inference types was to come up with a more general term for the inferences in the ICAS materials, for example ‘infer the purpose of a diagram’, ‘infer the reason the author used ( ) brackets in the sentence’, ‘infer the reason for repeating a phrase’. ‘infer the purpose of using bold print’, ‘infer the reason writers use descriptions to convey meaning’. ‘infer the purpose of using bold text’, ‘infer the reason for the language style used in a narrative’. The literacy teachers agreed with the researcher of the present study, that the description ‘infer the reasons for using conventions of text’, would be an accurate way of describing these inference types.

3 & 4: Selection of inferential questions and multiple choice answers for each of the texts

To enable comparisons to be made of the 5 inference types chosen across the grade levels 2-6, a number of new inferential questions and multiple-choice answers were created by Munro (2010). These are noted in copies of the questions for each of the tests in the Appendix.

All new questions and multiple choice answers for the grade 2 tests were trialled as part of the grade 2 pilot study carried out by the researcher, as well as going through the consultancy process with the literacy teachers.

The process for this consultation was as follows:

(a) literacy teachers were provided with the proposed questions (Munro, 2010), for each of the tests, the grade 2 narrative and factual test, the grade 3-4 narrative and factual test, and the grade 5-6 narrative and factual text, and were asked to consider if the questions were assessing the type of inferential comprehension they were meant to be assessing.

(b) The literacy teaches approved all the questions designed by Munro (2010).

(c) The literacy teachers then examined the multiple-choice answers for each of the new questions, and found them to be satisfactory.

All new questions and/or multi-choice answers created by Munro (2010), have been noted on the copy of the tests in the Appendix.
5. Selection of explicit questions and multiple-choice answers for each of the tests

The same consultancy process as described above took place for the selection of explicit questions and multiple-choice answers for each of the comprehension tests at each of the levels, grade 2, grade 3-4, and grades 5-6.
Appendix B: Test Questions and answers

Appendix B: Inferential and explicit questions for comprehension tests based on narrative and factual texts (the grade 2 Narrative & Factual tests, the grade 3 & 4 Narrative & Factual tests, and the grade 5 & 6 Narrative and Factual tests). All six texts on which these questions are based, follow this section of questions.

<table>
<thead>
<tr>
<th>Grade 2 test questions: Based on factual text ‘Monkey Chain’ (*ICAS Paper ‘A’, 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions requiring an Inference to be made</td>
</tr>
<tr>
<td>Question 1: (infer Motive/Goal) The instructions suggest that you use nail scissors to cut around the monkey’s tail because nail scissors:</td>
</tr>
<tr>
<td>(a) are easier for young children to use</td>
</tr>
<tr>
<td>(b) help you cut along curvy lines (correct answer)</td>
</tr>
<tr>
<td>(c) are smaller</td>
</tr>
<tr>
<td>(d) are good for cutting out templates</td>
</tr>
<tr>
<td>Note: Changed from ICAS classification (infer reason for using nail scissors), to inferring motive goal (Munro, 2012).</td>
</tr>
<tr>
<td>(*ICAS questions and answers)</td>
</tr>
<tr>
<td>Question 2: (Answer stated explicitly in text) According to the information in the illustration, how are the monkeys joined together?</td>
</tr>
<tr>
<td>(a) with string</td>
</tr>
<tr>
<td>(b) by their feet</td>
</tr>
<tr>
<td>(c) by their tails or arms (correct answer)</td>
</tr>
<tr>
<td>(d) with hooks or a chain</td>
</tr>
<tr>
<td>(*ICAS question and answers)</td>
</tr>
<tr>
<td>Question 3: (Infer feeling/emotion) The author thinks that making a monkey chain is ‘heaps of fun’ because:</td>
</tr>
<tr>
<td>(a) A chain of monkeys can do funny things and make us laugh (correct answer)</td>
</tr>
<tr>
<td>(b) A chain of monkeys looks good and makes us feel happy</td>
</tr>
<tr>
<td>(c) A group of swinging monkeys in the zoo can do lots of tricks</td>
</tr>
<tr>
<td>(d) A chain of swinging monkeys is easy to make</td>
</tr>
<tr>
<td>Note: New question and multiple-choice answers (Munro, 2012).</td>
</tr>
<tr>
<td>(*ICAS questions and answers)</td>
</tr>
<tr>
<td>Question 4: (Answer stated explicitly in text) In which step do you first use coloured paper?</td>
</tr>
<tr>
<td>(a) Step 1</td>
</tr>
<tr>
<td>(b) Step 3</td>
</tr>
<tr>
<td>(c) Step 4</td>
</tr>
<tr>
<td>(d) Step 2 (correct answer)</td>
</tr>
<tr>
<td>(*ICAS question and answers)</td>
</tr>
<tr>
<td>Question 5: (infer the reason for using conventions of print)</td>
</tr>
<tr>
<td>In Step 3, the words ‘Don’t forget the bananas!’ are placed in brackets like this (……….), to:</td>
</tr>
<tr>
<td>(a) Make a joke of the instruction</td>
</tr>
<tr>
<td>(b) Include more information about colours</td>
</tr>
<tr>
<td>(c) Show that the instruction is less important (correct answer)</td>
</tr>
<tr>
<td>(d) Tell you to complete the instruction quickly</td>
</tr>
<tr>
<td>Note: Changed from ICAS classification ‘identify the purpose of’, to ‘infer the reason for using conventions of print’, Munro 2012)</td>
</tr>
<tr>
<td>(*ICAS question and answers)</td>
</tr>
<tr>
<td>Question 6: (Answer stated explicitly in text) Why is this monkey included in the information? (outline of monkey included next to this question in ICAS test)</td>
</tr>
<tr>
<td>(a) To help you decide where to hang the monkeys</td>
</tr>
<tr>
<td>(b) To give you a pattern for making monkeys (correct answer)</td>
</tr>
<tr>
<td>(c) To show you how many monkeys to make</td>
</tr>
<tr>
<td>(d) To show you that cutting out monkeys can be tricky</td>
</tr>
<tr>
<td>(Note: New question and multiple-choice answers, Munro 2012).</td>
</tr>
<tr>
<td>Question 7: (infer character traits) The three monkeys on the left -hand side of the page are holding bananas because most people think:</td>
</tr>
<tr>
<td>Question 8: (Answer stated explicitly in text) The instructions tell you to paint:</td>
</tr>
</tbody>
</table>
### Grade 2 test questions: Based on factual text ‘Monkey Chain’ (*ICAS Paper ‘A’, 2008)

<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(a)</em> monkeys like holding things</td>
<td><em>(a)</em> faces and bodies on both sides of the paper <strong>(correct answer)</strong></td>
</tr>
<tr>
<td><em>(b)</em> monkeys like things that are yellow</td>
<td><em>(b)</em> faces on one side of the paper</td>
</tr>
<tr>
<td><em>(c)</em> monkeys like throwing bananas</td>
<td><em>(c)</em> bodies on one side of the paper</td>
</tr>
<tr>
<td><em>(d)</em> monkeys like eating bananas <strong>(correct answer)</strong></td>
<td><em>(d)</em> faces on both sides of the paper</td>
</tr>
</tbody>
</table>

**Note:** New question and multiple-choice answers created by Munro (2012).

### Question 5: (Infer cause/effect)

If you don’t use a template for making your monkeys they may be

- *(a)* different colours
- *(b)* more difficult to cut out
- *(c)* different sizes and may not hang together properly **(correct answer)**
- *(d)* difficult to paint

**Note:** New question and multiple-choice answers created by Munro (2012)

### Grade 2 test questions: Based on narrative text ‘The Potato People’ (*ICAS Paper ‘A’, 2007)

<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 1:</strong> (Infer feeling/emotion)</td>
<td><strong>Question 2:</strong> (Answer stated explicitly in text)</td>
</tr>
<tr>
<td>How can the reader tell that Granma was pleased to see Jack?</td>
<td>After Jack and Grandma hugged they:</td>
</tr>
<tr>
<td><em>(a)</em> She opened the door</td>
<td><em>(a)</em> Played music, romped on the ground, read stories and ate biscuits</td>
</tr>
<tr>
<td><em>(b)</em> She hugged him <strong>(correct answer)</strong></td>
<td><em>(b)</em> Played hide and seek, watched television, read stories and ate cake</td>
</tr>
<tr>
<td><em>(c)</em> She gave him some potatoes</td>
<td><em>(c)</em> Played hide and seek, romped on the ground, had a drink and ate cake</td>
</tr>
<tr>
<td><em>(d)</em> She showed him the compost heap</td>
<td><em>(d)</em> Played hide and seek, romped roly-poly on the ground, read stories and ate cake <strong>(correct answer)</strong></td>
</tr>
</tbody>
</table>

*(ICAS question and answers)*

**Note:** New question and multiple-choice answers created by Munro (2012).

<table>
<thead>
<tr>
<th><strong>Question 3:</strong> (infer motive/goal)</th>
<th><strong>Question 2:</strong> (Answer stated explicitly in text)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grandma buried the potato people because</td>
<td>Where did grandma bury the potato people?</td>
</tr>
<tr>
<td><em>(a)</em> they were too raw to eat</td>
<td><em>(a)</em> In the compost bin <strong>(correct answer)</strong></td>
</tr>
<tr>
<td><em>(b)</em> she was hiding them from Jack</td>
<td><em>(b)</em> In the rubbish bin</td>
</tr>
<tr>
<td><em>(c)</em> she wanted them to <strong>grow</strong> <strong>(correct answer)</strong></td>
<td><em>(c)</em> In the vegetable garden</td>
</tr>
<tr>
<td><em>(d)</em> Jack wanted to keep them out of the rain</td>
<td><em>(d)</em> In the front garden</td>
</tr>
</tbody>
</table>

*(ICAS question and answers)*

**Note:** New question and multiple-choice answers created by Munro (2012)

<table>
<thead>
<tr>
<th><strong>Question 5:</strong> (Infer the reason for using conventions of text)</th>
<th><strong>Question 6:</strong> (Answer stated explicitly in text)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why did the author say that Grandma and Jack ‘dug and they dig and they dug’?</td>
<td>Grandma and Jack put on their raincoats because</td>
</tr>
<tr>
<td></td>
<td><em>(a)</em> They liked wearing their coats</td>
</tr>
<tr>
<td></td>
<td><em>(b)</em> They thought it might rain</td>
</tr>
</tbody>
</table>

*(ICAS question and answers)*

**Note:** New question and multiple-choice answers created by Munro (2012)
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questions requiring an Inference to be made</strong></td>
</tr>
<tr>
<td>(a) Because the potatoes were buried deep in the ground</td>
</tr>
<tr>
<td>(b) To show that they did a lot of digging (correct answer)</td>
</tr>
<tr>
<td>(c) Because they had trouble finding any potatoes at first</td>
</tr>
<tr>
<td>(d) There were big potatoes and little potatoes</td>
</tr>
</tbody>
</table>

**Note:** New question and multiple-choice answers created by Munro (2012)

<table>
<thead>
<tr>
<th>Question 7: (infer character traits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How can you tell that Jack’s Grandmother liked children?</strong></td>
</tr>
<tr>
<td>(a) She buried the potato people in the compost heap for children to find</td>
</tr>
<tr>
<td>(b) She put on her raincoat and gumboots like children do</td>
</tr>
<tr>
<td>(c) She played lots of games with Jack and read him stories (correct answer)</td>
</tr>
<tr>
<td>(d) She got a big fork to help Jack with the potatoes</td>
</tr>
</tbody>
</table>

**Note:** New question and multiple-choice answers created by Munro (2012)

<table>
<thead>
<tr>
<th>Question 8: (Answer stated explicitly in text)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>When Grandma and Jack looked at the compost heap they saw</strong></td>
</tr>
<tr>
<td>(a) Some dead stalks (correct answer)</td>
</tr>
<tr>
<td>(b) Their old raincoats</td>
</tr>
<tr>
<td>(c) Some gardening forks</td>
</tr>
<tr>
<td>(d) Two pairs of gumboots</td>
</tr>
</tbody>
</table>

*ICAS question and answers*

<table>
<thead>
<tr>
<th>Question 9: (infer cause/effect)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The brown and dead stalks that were lying on top of the compost heap came from the potatoes that Jack and his grandma dug up.</strong></td>
</tr>
<tr>
<td>This sentence tells us that the potatoes they dug up:</td>
</tr>
<tr>
<td>(a) Were all different sizes</td>
</tr>
<tr>
<td>(b) Were not growing while they were in the compost heap (correct answer)</td>
</tr>
<tr>
<td>(c) Were at different places in the compost heap</td>
</tr>
<tr>
<td>(d) Would have filled a pot.</td>
</tr>
</tbody>
</table>

**Note:** New question and multiple-choice answers created by Munro (2012)

<table>
<thead>
<tr>
<th>Question 10: (Answer stated explicitly in text)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After Jack and Grandma had finished digging up all the potatoes, what did Jack want to do?</strong></td>
</tr>
<tr>
<td>(a) Cook some potatoes</td>
</tr>
<tr>
<td>(b) Make a little potato woman and a little potato man (correct answer)</td>
</tr>
<tr>
<td>(c) Make a cake</td>
</tr>
<tr>
<td>(d) Play in the rain</td>
</tr>
</tbody>
</table>

*ICAS question and answers*

**Note:** * ICAS material is owned by UNSW Global Pty Limited

<table>
<thead>
<tr>
<th>Grade 3 &amp; 4 test questions: Based on factual text ‘Jungle Boy’ (ICAS Paper ‘B’ 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questions requiring an Inference to be made</strong></td>
</tr>
<tr>
<td><strong>Question 1: (Infer feeling/emotion)</strong></td>
</tr>
<tr>
<td>In the first paragraph Ari tells us about himself. From reading these details how do you think he feels?</td>
</tr>
<tr>
<td>(a) Shy</td>
</tr>
<tr>
<td>(b) Proud (correct answer)</td>
</tr>
<tr>
<td>(c) Lonely</td>
</tr>
<tr>
<td>(d) Unhappy</td>
</tr>
</tbody>
</table>

| **Question 2: (Answer stated explicitly in text)** |
| Where does Ari live? |
| (a) Near the end of the world’s greatest river, beside a much bigger river |
| (b) Near the middle of the world’s greatest river, beside a much smaller river |
| (c) Near the start of the world’s greatest river, beside a much smaller river (correct answer) |
| (d) Near the start of the world’s greatest river, beside a much bigger river |
### Grade 3 & 4 test questions: Based on factual text *Jungle Boy* (ICAS Paper ‘B’ 2008)

<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note:</strong> New question and multiple-choice answers created by Munro (2012)</td>
<td><strong>Note:</strong> New question and multiple-choice answers created by Munro (2012)</td>
</tr>
</tbody>
</table>

**Question 3: (Infer character trait)**

From information in the text we can tell that Ari is:

(a) A person who prefers to be alone
(b) A responsible person **(correct answer)**
(c) A person who prefers to stay inside the family hut rather than play outside
(d) A person who worries about new experiences

**Note:** New question and multiple-choice answers created by Munro (2012)

**Question 4: (Answer stated explicitly in text)**

According to the text the Cochanquinas river:

(a) Is bigger than the Amazon River
(b) Sometimes swells to become five metres wide when the rains come
(c) Has more water than all the rivers in the world put together
(d) Flows into the Amazon River **(correct answer)**

**Note:** New question and multiple-choice answers created by Munro (2012)

**Question 5: (infer the reason for using conventions of text)**

Which of the following descriptions of the flood season is different from the others?

(a) Purple and black clouds fill the sky
(b) Spears of lightening rip down
(c) Rain falls so hard it can knock little children flat on the ground
(d) Thunder booms like great monsters roaring **(correct answer)**

**Note:** New question and multiple-choice answers created by Munro (2012)

**Question 6: (Answer stated explicitly in text)**

Heavy rain falls on the jungle where Ari lives at any time of the year, but usually:

(a) After a very hot day **(correct answer)**
(b) After a mild day
(c) Before a hot day
(d) Before a cool day

**Note:** New question and multiple-choice answers created by Munro (2012)

**Question 7: (infer motive/goal)**

When the writer says ‘We have a jungle in the river!’, he is trying to be:

(a) Rude
(b) Annoying
(c) Sympathetic
(d) Humorous **(correct answer)**

*ICAS question and answers.*

**Question 8: (Answer stated explicitly in text)**

In the text the sound of thunder is compared to the sound made by:

(a) Monsters **(correct answer)**
(b) Children
(c) Spears
(d) Rain

*ICAS question and answers.*

**Question 9: (infer cause/effect)**

If Ari were to wake up and find himself floating away on his sleeping mat, what might have happened?

(a) Dogs might have pulled his mat into the river
(b) The rains must have been heavier than they had ever been before **(correct answer)**
(c) He might have been trying to get away from snakes
(d) Most of the straw had blown away from his sleeping mat

**Note:** New question and multiple-choice answers created by Munro (2012)

**Question 10: (Answer stated explicitly in text)**

Which of the following is NOT a reason why Ari’s house is built on top of tall poles? The poles:

(a) Let air blow underneath the huts and keeps them cool
(b) Stop pigs, dogs or snakes from getting into the huts
(c) Allow warm air to blow underneath the huts and keeps them warm **(correct answer)**
(d) Stop the river from reading the huts when the rains fall

**Note:** New question and multiple-choice answers created by Munro (2012)

*ICAS material is owned by UNSW Global Pty Limited*
<table>
<thead>
<tr>
<th>Grade 3 &amp; 4 test questions: Based on narrative text <em>That Magnetic Dog</em> (ICAS Paper ‘B’ 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questions requiring an inference to be made</strong></td>
</tr>
</tbody>
</table>
| **Question 1:** (Infer Motive/Goal)  
'It just seemed to follow her around’. The narrator made this statement to make the reader think that: | **Question 2:** (Answer stated explicitly in text)  
What do magnets attract? |
| (a) He found it surprising that Skitty ate so much  
(b) He did not know how Skitty got so much food *(correct answer)*  
(c) He thought that Skitty's behaviour was very strange  
(d) He was not concerned about Kitty’s magnetic look.  
* *(ICAS question and answers)* | (a) Food  
(b) Keys *(correct answer)*  
(c) Dogs  
(d) People  
* *(ICAS question and answers)* |
| **Question 3:** (Infer feeling/emotion)  
The narrator said that ‘it isn’t only food she attracts, she attracts people too’. By saying this the narrator means: | **Question 4:** (Answer stated explicitly in text)  
When mum had a biscuit: |
| (a) People thought that sharing food with her was the right thing to do  
(b) People liked Skitty so much they gave her what she wanted *(correct answer)*  
(c) Skitty has things to eat all day  
(d) People were attracted to her because she liked the same food they did.  
*Note: New question and multiple-choice answers created by Munro (2012)* | (a) Skitty goes to sleep under the table  
(b) Skitty gets a biscuit too *(correct answer)*  
(c) Skitty wants a biscuit  
(d) Skitty sits near mum  
*Note: New question and multiple-choice answers created by Munro (2012)* |
| **Question 5:** (Infer the reason for using conventions of text)  
At the end of the story the author writes “There’s no escaping that magnetic look”, to: | **Question 6:** (Answer stated explicitly in text)  
Even though the family is not allowed to feed Skitty at the dinner Table |
| (a) Remind the reader that Skitty attracted food  
(b) See if the reader remembers what the story is about  
(c) Help us understand how strongly people were attracted to Skitty *(correct answer)*  
(d) Help the reader understand the title of the story  
*Note: New question and multiple-choice answers created by Munro (2012)* | (a) Food always goes in her direction *(correct answer)*  
(b) Sometimes she just smells the food  
(c) Sometimes she just looks at the food  
(d) She wouldn’t eat the food even if it was given to her.  
*Note: New question and multiple-choice answers created by Munro (2012)* |
| **Question 7:** (Infer character traits)  
What does the reader know about Skitty from reading the text? | **Question 8:** (Answer stated explicitly in text)  
Why did the narrator’s family never have to ask “who wants the last bit?” |
| (a) Skitty likes to lick people  
(b) Skitty’s only favourite food is cake  
(c) Skitty is much loved by the family *(correct answer)*  
(d) Skitty steals food from under the table  
* *(ICAS question and answers)* | (a) Because they take it in turns to have the last bit  
(b) Because the last bit was always thrown away  
(c) Because the last bit was put in the refrigerator  
(d) Because Skitty would always get the last bit anyway *(correct answer)*  
*Note: New question and multiple-choice answers created by Munro (2012)* |
Grade 3 & 4 test questions: Based on narrative text 'That Magnetic Dog' (ICAS Paper 'B' 2008)

<table>
<thead>
<tr>
<th>Questions requiring an inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 9: (infer cause/effect)</strong></td>
<td></td>
</tr>
<tr>
<td>When dad and the narrator made a cake, they did not worry about cleaning up because:</td>
<td></td>
</tr>
<tr>
<td>(a) The floor was dirty and then batter wouldn’t be noticed</td>
<td></td>
</tr>
<tr>
<td>(b) They were careful to make sure that no batter was spilt and would be eaten</td>
<td></td>
</tr>
<tr>
<td>(c) They knew that mum would clean up any batter that was spilt</td>
<td></td>
</tr>
<tr>
<td>(d) Any batter that spilt would be eaten</td>
<td></td>
</tr>
<tr>
<td><em>(correct answer)</em></td>
<td></td>
</tr>
</tbody>
</table>

*Note: New question and multiple-choice answers created by Munro (2012)*

Grade 5 & 6 test questions: Based on narrative text ‘Kensuke’ (ICAS Paper ‘D’ 2008)

<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 1: (infer Motive/Goal)</strong></td>
<td></td>
</tr>
<tr>
<td>The narrator said &quot;We live in a cocoon&quot;, because:</td>
<td></td>
</tr>
<tr>
<td>(a) They no longer spoke politely to each other</td>
<td></td>
</tr>
<tr>
<td>(b) Kensuke now hated the narrator</td>
<td></td>
</tr>
<tr>
<td>(c) The narrator and Kensuke had lost their friendship <em>(correct answer)</em></td>
<td></td>
</tr>
<tr>
<td>(d) They now lived in different parts of the cave</td>
<td></td>
</tr>
</tbody>
</table>

*Note: New question and multiple-choice answers created by Munro (2012)*

<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 3: (infer feelings/emotions)</strong></td>
<td></td>
</tr>
<tr>
<td>How might the narrator have felt after Kensuke told him the story of Tomachi losing her baby?</td>
<td></td>
</tr>
<tr>
<td>(a) Sorry for Tomachi because she was constantly losing her baby</td>
<td></td>
</tr>
<tr>
<td>(b) Sorry for Kensuke because he had to keep comforting Tomachi when she lost her baby</td>
<td></td>
</tr>
<tr>
<td>(c) Sorry for Kikanbo because he would get into trouble with his mother for running off again</td>
<td></td>
</tr>
<tr>
<td>(d) Sad, because he now understood the reason for Kensuke’s feelings <em>(correct answer)</em></td>
<td></td>
</tr>
</tbody>
</table>

*Note: New question and multiple-choice answers created by Munro (2012)*

<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 5: (infer the reason for using conventions of text)</strong></td>
<td></td>
</tr>
<tr>
<td>In the second paragraph the narrator used the words ‘he always kept that distance between us,’ to</td>
<td></td>
</tr>
<tr>
<td>(a) Suggest that the narrator and Kensuke now slept in different parts of the cave</td>
<td></td>
</tr>
</tbody>
</table>

*Note: New question and multiple-choice answers created by Munro (2012)*

<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 6: (infer the reason for using conventions of text)</strong></td>
<td></td>
</tr>
<tr>
<td>Which word in the second paragraph indicates that the narrator regretted his action?</td>
<td></td>
</tr>
<tr>
<td>(a) ‘wandered’</td>
<td></td>
</tr>
<tr>
<td>(b) ‘distance’</td>
<td></td>
</tr>
</tbody>
</table>
### Grade 5 & 6 test questions: Based on narrative text ‘Kensuke’ (ICAS Paper ‘D’ 2008)

#### Questions requiring an Inference to be made

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Suggest that the narrator knew Kensuke wanted to be alone</td>
<td>(c) ‘grieved’ (correct answer)</td>
</tr>
<tr>
<td>(c) Provide information on what sort of person Kensuke was</td>
<td>(d) ‘explained’</td>
</tr>
<tr>
<td><em>(correct answer)</em></td>
<td><em>(ICAS question and answers)</em></td>
</tr>
</tbody>
</table>

#### Questions where the answer is stated explicitly in the text

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Be alone (correct answer)</td>
<td>(b) Be alone (correct answer)</td>
</tr>
<tr>
<td>(c) Speak only to the orang-utans</td>
<td>(d) Not speak at all</td>
</tr>
</tbody>
</table>

Note: New question and multiple-choice answers created by Munro (2012)

### Question 7: (Infer character traits)

The orang-utans often came to Kensuke when they were upset or frightened because he:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Was a kind and gentle person</td>
</tr>
<tr>
<td>(b)</td>
<td>Was generous with his time</td>
</tr>
<tr>
<td>(c)</td>
<td>Was friendly and helpful</td>
</tr>
<tr>
<td>(d)</td>
<td>Helped them find their lost babies</td>
</tr>
</tbody>
</table>

*(correct answer)*

Note: New question and multiple-choice answers created by Munro (2012)

### Question 8: (Answer stated explicitly in text)

The narrator knew that Kensuke preferred to:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Speak angrily to the narrator</td>
</tr>
<tr>
<td>(b)</td>
<td>Be alone (correct answer)</td>
</tr>
<tr>
<td>(c)</td>
<td>Speak only to the orang-utans</td>
</tr>
<tr>
<td>(d)</td>
<td>Not speak at all</td>
</tr>
</tbody>
</table>

*(correct answer)*

Note: New question and multiple-choice answers created by Munro (2012)

### Question 9: (Infer cause/effect)

The narrator went to Watch Hill because he wanted to:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Get some peace from the orang-utans</td>
</tr>
<tr>
<td>(b)</td>
<td>Convince himself that Kensuke would forgive him (correct answer)</td>
</tr>
<tr>
<td>(c)</td>
<td>Practise asking Kensuke to forgive him</td>
</tr>
<tr>
<td>(d)</td>
<td>Be alone because he had lost his friend</td>
</tr>
</tbody>
</table>

*(correct answer)*

Note: New question and multiple-choice answers created by Munro (2012)

### Grade 5 & 6 test questions: Based on factual text ‘Phar Lap the Champion’, Chase and Krantz (1995). (Permission provided to use text in Appendix) (All questions, and multi-choice answers, Munro, 2012)

#### Questions requiring an Inference to be made

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughout the world flags were lowered when Phar Lap died:</td>
<td>(a) Would trick his mother by pretending to run away</td>
</tr>
<tr>
<td>(a) Because people wanted to show how shocked they felt that he had been murdered</td>
<td>(b) Sometimes ran away from his mother</td>
</tr>
<tr>
<td>(b) To let people know that he had died tragically</td>
<td>(c) Would often run away from his mother (correct answer)</td>
</tr>
<tr>
<td>(c) Because people were very fond of Phar Lap</td>
<td>(d) Would wait for Kensuke to find him</td>
</tr>
<tr>
<td>(d) Because people wanted to show their respect for this horse (correct answer)</td>
<td></td>
</tr>
</tbody>
</table>

*(New Question and multi-choice answers, Munro, 2012).*

### Question 2: (Answer stated explicitly in text)

The author describes the 1930’s as a time when:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>When everyone could find work if they really wanted to</td>
</tr>
<tr>
<td>(b)</td>
<td>Everyone could make money if they worked hard</td>
</tr>
<tr>
<td>(c)</td>
<td>There were a lot of people unemployed (correct answer)</td>
</tr>
<tr>
<td>(d)</td>
<td>Times were tough for some people</td>
</tr>
</tbody>
</table>

*(New Question and multi-choice answers, Munro, 2012).*

### Question 3: (Infer feeling/emotion)

Headlines were made all over the world when Phar won...
<table>
<thead>
<tr>
<th>Questions requiring an Inference to be made</th>
<th>Questions where the answer is stated explicitly in the text</th>
</tr>
</thead>
</table>
| The author claims that Phar Lap was a 'ray of light to Australians' in the 1930's because: | (a) The Agua Caliente Cup in Australia  
(b) The Melbourne Cup in Australia  
(c) The Agua Caliente Cup in Mexico *(correct answer)*  
(d) The Agua Caliente Cup in America |
| (a) Light travels fast  
(b) People were looking for something special to take their minds off their everyday lives *(correct answer)*  
(c) He survived a shooting attempt  
(d) Australians love sunlight | *(Question and multi-choice answers, Munro, 2012)* |

**Question 5:** *(Infer the reason for using conventions of text)*  
The author used the group of words 'beauty, strength and courage' to refer to the big red horse because:  
(a) They help the reader understand how fast Phar Lap could race  
(b) They help the reader today to understand how Australians at the time felt about Phar Lap *(correct answer)*  
(c) Authors often use words like this to create special effects for readers  
(d) Authors often use these words to describe very fast horses.  
*(New Question and multi-choice answers, Munro, 2012)*

**Question 6:** *(Answer stated explicitly in text)*  
After Phar Lap died, two vets found:  
(a) Some unknown poison in his body  
(b) Traces of arsenic in his body *(correct answer)*  
(c) Poison in his feedbags  
(d) Insect spray in his grazing paddock  
*(Question and multi-choice answers, Munro, 2012)*

**Question 7:** *(Infer character traits)*  
Tommy used his body to shield Phar Lap when criminals tried to shoot him. This action demonstrates that Tommy:  
(a) Was a risk taker  
(b) Was acting responsibly because Phar Lap was worth a lot of money  
(c) Knew Phar Lap couldn't protect himself *(correct answer)*  
(d) Thought his action might make him a hero  
*(Question and multi-choice answers, Munro, 2012)*

**Question 8:** *(Answer stated explicitly in text)*  
Phar Lap collapsed and died:  
(a) After winning prize money worth nearly $1 000 000  
(b) While he was training for the Melbourne Cup  
(c) After winning the Agua Caliente Handicap in Mexico  
(d) Two weeks and a day after Tommy had taken him to California *(correct answer)*  
*(Question and multi-choice answers, Munro, 2012)*

**Question 9:** *(Infer cause/effect)*  
Throughout the world flag were lowered when Phar Lap died:  
(a) Because people wanted to show how shocked they felt that he had been murdered  
(b) To let people know that he had died tragically  
(c) Because people were very fond of him  
(d) Because people wanted to show their respect for the horse *(correct answer)*  
*(Question and multi-choice answers, Munro, 2012)*

**Question 10:** *(Answer stated explicitly in text)*  
Phar Lap ran eighth in the Melbourne Cup because:  
(a) He started the race badly  
(b) He wasn’t fit and was too slow  
(c) The Victorian Racing Club insisted he carry huge weights *(correct answer)*  
(d) He was behind from the start and never caught up  
*(Question and multi-choice answers, Munro, 2012)*

**Note:** ICAS material is owned by UNSW Global Pty Limited
Read Monkey Chain and answer questions 7 to 12.

Monkey Chain!

Make a string of swinging monkeys to hang out in your room. They're heaps of fun!

What you need:
- Pencil
- Sheet of cardboard
- Scissors
- Sheets of different coloured paper
- Paintbrush
- Poster paints in different colours

**OOPS!** Cutting around the monkeys' tails is a bit fiddly. Use nail scissors to make it easier.

1. Trace or copy the monkey outline onto the cardboard, then cut it out.
2. Use this monkey as a template. Draw a round frame and different coloured sheets of paper.
3. Cut out your monkeys. Print both sides back on both sides of the paper. Glue to get the monkey.
4. Stick the monkeys together by the frame or tails. Tie a string up in your room!
One Friday when the clouds were big and black
and the rain dribbled down the window panes
and splashed on the tin roof, there was a knock at
the door.

"Jack!" gasped Grandma, and they hugged and
hugged.
They played hide and seek.
They jumped silly silly on the ground.
They rode horses. And they ate cake.

"Grandma?" asked Jack. "What happened to our
little potato people?"

"I buried them outside in the compost heap,"
said Grandma, "and they grow and grow."

"Let's go and look," said Jack.

So they put on their raincoats, pulled on their
rainboots, and went out in the rain to see. But
all they could see were the stalks, now brown
and dead, lying on top of the ground.

So Grandma brought a big fork and Jack fetched
a little fork and they dug and they dug and they
dug.

First Grandma found one potato, then Jack
found two potatoes. They found big potatoes
and they found little potatoes. Soon there were
hundreds and hundreds of potatoes.

When there were no more potatoes left to dig,
they hung up their forks, they took off their
raincoats, they put away their rainboots and
they washed their hands.

"Grandma?" said Jack.

"Yes!" said Grandma.

"Let's make a little potato man and a little potato
woman?"

And they did.
Jungle Boy

My name is Andy. I am nine years old. I am the son of a chief, and I live near the start of the world's greatest river.

The river in the Amazon. It has more water than all the other rivers in the world put together. My tribe lives beside a much smaller river called the Cochaquiras. The Cochaquiras flows into the Amazon in the country of Peru.

Our river is usually about 400 metres wide. But when the heavy rains come, the Cochaquiras sometimes swells to become two kilometres wide, and it covers the trees. During the rains, we don't have a river in the jungle. We have a jungle in the river.

Heavy rain falls on our jungle at any time of the year, usually after a very hot day. During the afternoon, purple and black clouds fill the sky. Spors of lightning rip down. Thunder booms like great monstors roaring. Rain falls so hard, it can knock little children flat on the ground.

I live on a high bank beside the river in huts built on top of tall poles. The poles let air blow underneath the huts, and that helps keep us cool. The poles also stop pigs or dogs or snakes from getting into our huts. And they stop the river from reaching us when the rains fall. I don't want to wake up and find myself floating away on my straw sleeping mat!
Magnetic objects attract metal objects like keys and spoons.

My dog Skitty doesn’t attract metal. She attracts food.

When Mum has a biscuit with her tea, Skitty gives her that look ... that magnetic look. Before you know it, Skitty has a biscuit too. Sometimes even two! That magnetic look can be very strong.

We're not allowed to feed Skitty at the dinner table. But somehow, food always goes in her direction.

When Dad and I make a cake we don't worry about any butter that spills on the floor. We know it will disappear.

And we never ask, 'Who wants the last bit?' Skitty always gets the last bit. Sometimes, she even gets the first bit!

Not that Skitty steals food. She doesn't have to. It just seems to follow her around.

Skitty has magnetic pull. It isn't only food she attracts; she attracts people too. There's no escaping that magnetic look.
Kensuke

There I stood, rooted as a long-rooted, eating-juice, amulet. I knew never what had happened. He was not angry or
slap on me. He turned him to the soul. It wasn’t
that it didn’t speak—she didn’t—she was no longer talked to one
another as she had before. We lived each in our respective
cocoones, quiet, civil, always polite, but not together anymore. He
closed his one itself and wrapped himself in his thoughts.
The moment had gone from his eyes, the laughter in the cave
house was silenced. He never said no—he did not need to—just
I knew that now he would prefer to paint alone, to fish alone, to
be alone.

So, I decided to stay here. I packed up the island with Sachi, hoping when I
returned that she might have forgotten that we could be friends
again. But alas, she kept, that "Kensuke" between us. I gained for
my lost friendship. I remembered that I was then how to the other end
of the March, to a cave hill, and at a shore and set there, no longer
looking our one ship, but rehearsing a story explanation. But no
matter how much I rehearsed it, how I remembered it, I could never
convince even myself that I had done was anything other
than strange. In the end, as it turned out, it was Kensuke who
explained it then.

We had just gone to bed one night when Tomodeachi came to
the mouth of the cave and squatted there. She had done this
once or twice lately, stayed for just a few minutes, peeked it us
and gone off again. Kensuke spoke up in the darkness. She
left Kikudo against the cave. She always leave her baby, Kikudo.
very lacked baby. She run off a lot. He make Tomodeachi very sad
mother. He clapped his hands after her, shouting her away. Kikudo
her comfort more than anything else. I had worked before with
the change agent, now they would often come to Kensuke when
they were upset or frightened, just to be near him. After a while
Tomodeachi run off and the night one left us alone again, with
the dim of the corner and the silence between us.
Phar Lap, the champion

The 1930s was a time of unemployment and gloom, and Phar Lap was a ray of light to Australians.

One morning, two criminals tried to shoot Phar Lap from their car. Tommy shielded the horse with his body, and fortunately the shots missed. They went into hiding until Melbourne Cup day, then, despite a huge weight, the big horse raced away to win. By the end of the season Phar Lap had won prize money worth nearly $1,000,000.

Some people thought Phar Lap was a freak. The Victorian Racing Club gave him such impossible weights in the 1931 Cup that he ran eighth. Disgusted, Harry and Davis sent Phar Lap out of Australia to the richest race in the world, the Agua Caliente Handicap in Mexico. Tommy went along as his trainer. Travel-weary and with a bleeding head, Phar Lap started the big race slowly, but unexpectedly he lifted his head and thundered to the front. This win made headlines all over America and the world.

Tommy took Phar Lap to recover on a ranch in California. Two weeks later he wrote that “Bobby was doing fine.” The very next day, the horse was in great pain with a swollen stomach. The vets tried everything but without success. Suddenly Phar Lap screamed, and, bleeding terribly, he collapsed and died.

Two vets examined the horse’s body and found traces of arsenic. How it got there, no one knew. Some thought Phar Lap’s special feedbags had been poisoned. Others claimed insect spray had drifted into his grazing paddock; if so, no other horses had become ill. Throughout the racing world flags were lowered and people grieved. American criminals were accused of killing Phar Lap, but nothing was ever proved.

The body of Phar Lap was carefully preserved and brought home to Australia. In a time of hardship, the big red horse had stood for beauty, strength and courage.
Photograph of Phar Lap to accompany the grade S & G comprehension test (facsimile text)

As this photograph is now in the public domain, no copyright was required.
Appendix C:

Copyright Request (ICAS)

The Copywriting Team

Assessments @unswglobal.unsw.edu.au

31st May, 2018

Dear Copywriting Team,

I am the Assistant Principal at Malvern Primary School, in Victoria. Students at our school have been completing ICAS tests for many years, and continue to do so. Although we now have a user pay system, and families choose to enrol their children, a number of years ago when our school was smaller, the tests were paid for by the school, and all students completed them. This system provided us with class sets of ICAS test magazines which are used from time to time in classrooms, as resources for reading comprehension purposes. However, none of the test booklets used in my research had been used in classrooms programs, as I had retained many sets of booklets in a cupboard in my office that no one knew about. The only reason I had them hidden away was that I thought they would be useful for my research in the future.

I am currently completing a PhD in inferential reading comprehension at the University of Melbourne. I am basing part of my research on results of questions completed by students from a range of ICAS English test papers 2007-2009, that the school has retained.

In my research I have acknowledged in the Present Study section of my thesis, that the school where the tests were administered had purchased the ICAS test booklets used for the comprehension component of my research. I have also acknowledged in the Methodology section of my thesis that the following ICAS English test papers were used.
Five test papers have been created by me based on the factual and narrative extracts from the ICAS test papers 2007-2009, noted above. For the purpose of these tests a number of multiple-choice questions were taken directly from the ICAS test papers as well. I have been acknowledged both the individual ICAS questions used and the accompanying extracts, on both the test papers and individual questions in the following way “(ICAS material is owned by UNSW Global Pty Limited).

The remaining questions for each of the tests based on the four ICAS papers used, were created by my supervisor from Melbourne University. They have been acknowledged as new questions based on whichever the test paper (as above), was used as the source of the question.

All of above ICAS tests I have used in my thesis have the accompanying graphics (photo/illustration), from the ICAS test used. I noted that permission to use these graphics/photos have been noted on the back of each of the ICAS test booklets. Do I need to photocopy these back pages of the relevant booklets, and include them in my bibliography, or is there something I need to do? Can you provide guidance please.

Please find below details of the ICAS tests, and individual questions from these tests that I have used in my research.

1. **Monkey Chain: (2008) paper A- questions used from this test**
   I have used 4 ICAS questions and accompanying multiple choice answers directly from this test paper. Six new questions and multiple-choice answers based on the Monkey Chain text were made up by my supervisor from Melbourne University

2. **The Potato People: (2007), paper A- questions used from this test**
   I have used 4 ICAS questions and accompanying multiple choice answers directly from this test paper. Six new questions and multiple-choice answers based on the Monkey Chain text were made up by my supervisor from Melbourne University
3. **That Magnetic Dog: (2009), paper B- questions used from this test**
   I have used 4 ICAS questions and accompanying multiple choice answers directly from this test paper. Six new questions and multiple-choice answers based on the Monkey Chain text were made up by my supervisor from Melbourne University.

4. **Jungle Boy: (2008), paper B- question used from this test**
   I have used 2 ICAS questions and accompanying multiple choice answers directly from this test paper. Eight new questions and multiple-choice answers based on the Monkey Chain text were made up by my supervisor from Melbourne University.

5. **Kensuke: (2008), paper D- questions used from this test**
   I have used 2 ICAS questions and accompanying multiple choice answers directly from this test paper. Eight new questions and multiple-choice answers based on the Monkey Chain text were made up by my supervisor from Melbourne University.

If you require further clarification for copywriting purposes, I am happy to provide this information. My mobile number is *(mobile number provided)*, if you need to speak to me personally.

Yours sincerely,

Judy Carter
Assistant Principal
Malvern Primary School
17 Tooronga Rd
Malvern 3145
Copyright Approval (ICAS)

Use of ICAS materials
2 messages

Judy Carter <carterjudy85@gmail.com> Thu, Jun 14, 2018 at 3:46 PM
To: AdminAR@unswglobal.unsw.edu.au

I'm wondering if you have received the email re use of ICAS English tests in my PhD. I sent the query with attached document a couple of weeks ago explaining in detail what I have used. As I am on a tight timeline I'm wondering if you could give me an idea of how long a response might take.

Kindest regards
Judy Carter

Melissa Hanes <M.Hanes@unswglobal.unsw.edu.au> Thu, Jun 14, 2018 at 4:34 PM
To: Judy Carter <carterjudy85@gmail.com>, Admin Assessment and Research <AdminAR@unswglobal.unsw.edu.au>
Cc: Alyce Arcas <A.Arcas@unswglobal.unsw.edu.au>

Hi Judy

Thank you for your enquiry and apologies for the delay.

Please use the following acknowledgement for the use of our material "ICAS material is owned by UNSW Global Pty Limited"

Please let me know if you have any further questions.

Many thanks

Melissa Hanes
Copyright Coordinator
UNSW Global Pty Limited

T: +61 2 8936 2264 I W: www.unswglobal.unsw.edu.au/assessments
12-22 Rothschild Avenue Rosebery NSW 2018 Australia I PO Box 6020 Alexandria NSW 1435 Australia UNSW

UNSW Global Assessments is a business group of UNSW Global Pty Limited ABN 62 086 418 582, a not-for-profit provider of education, assessment and training services and a wholly owned enterprise of the University of New South Wales.

---

From: Judy Carter [mailto:carterjudy85@gmail.com]
Sent: Thursday, 14 June 2018 3:47 PM
To: Admin Assessment and Research <AdminAR@unswglobal.unsw.edu.au>
Subject: Use of ICAS materials

https://mail.google.com/mail/u/0?ik=61e01903ed&oi=sqim&itl=en&sa=1&source=mail&start=1&search=hl=en&slide=0&spc=2471974e7
Copyright request (Macmillan)

Re: Permission to use extract from book

Carter, Judith M
Sent: Tuesday, 18 February 2014 2:24 PM
To: Liz.keneally@macmillan.com.au

Hi Liz,

I am seeking permission to use an extract (1 page) from a book published by Macmillan, as part of my research into children’s reading comprehension. I am completing my PhD at Melbourne University. My supervisor is Dr John Munro. The extract will be used for students to read before answering questions from the passage.

The book is titled “Legendary Animals”
The authors are Diane Chase & Valerie Krantz
The page I wish to use is page 29. It is titled ‘Phar Lap the Champion’
The book was published in 1995.

Please let me know if there are further details you need to know.

Kindest regards

Judy Carter
Assistant Principal
Malvern Primary School
17 Tooronga Rd
Malvern 3145

https://www.edumail.vic.gov.au/owa/?ac=Item&i=IPM.Note&id=RgAAABcwxQ8r... 18/02/2014
License to use copyright material (Macmillan)

From: Liz Kenneally [Liz.Kenneally@macmillan.com.au]
Sent: Monday, 24 March 2014 9:30 AM
To: Carter, Judith M
Subject: RE: Permission to use extract from book

Hi Liz,

Thanks for confirming. Permission is granted for you to include the extract in the handout for your PhD research, as outlined in your email and in the attached licence.

Apologies again for the time this took to finalise.

Kind regards,

Liz Kenneally
Media and Permissions Manager
p: 03 9825 1134
e: Liz.Kenneally@macmillan.com.au
w: www.macmillan.com.au

Office hours: Monday, Tuesday, Wednesday and Friday, 8:30am - 4:30pm

Macmillan Education Australia
Level 1, 15-19 Claremont Street, South Yarra VIC 3141
main +61 3 9825 1000, fax +61 3 9825 1010

Please consider the environment before printing this email.

From: Carter, Judith M [mailto:carter.judith.m@edumail.vic.gov.au]
Sent: Thursday, 20 March 2014 9:00 AM
To: Liz Kenneally
Subject: RE: Permission to use extract from book

Hi Liz,

No I am only using the text not the image.

Kindest regards,

Judy

Sent: Wednesday, 19 March 2014 4:20 PM
To: Carter, Judith M
Subject: RE: Permission to use extract from book

Hi Judy,
NON-EXCLUSIVE LICENCE TO USE COPYRIGHT MATERIAL

24 March 2014

Judith Carter
Assistant Principal
Malvern Primary School
17 Tooronga Rd
Malvern
VIC 3145
Tel: 03 9571 6281
Email: carter.judith.m@edumail.vic.gov.au

Dear Judith,


Your publication details: Question and answer handouts, to be provided to children as part of PhD research, Melbourne University, 2014.

The licensor agrees to grant a non-exclusive licence for use of the material solely and specifically as detailed herein subject to the following terms and conditions:

a) There is no fee required. This licence is effective for use of the Licensed Material in your publication, as specified above. In the case of reprints a further request for permission is to be gained.

b) That full copyright acknowledgement shall be made including title of the work, author/editor/translator/illustrator, date and place of publication, page references, copyright line, and the notice: 'Reproduced by permission of Macmillan Education Australia.'
c) You must obtain authorisation from the original source to use any material that appears in our work with a credit to another source.

d) That no deletions from, additions to, or other changes in the material shall be made without written consent.

e) That should any details change from those outlined in the request, the licensor must be advised prior to any use of the material as some recalculation of the fee may be necessary and a new licence will be issued.

f) That the duration of the licence shall be for one use only in the English language; it does not include the right to include the material in another format or language or other publisher’s imprint.

g) The publisher will be entitled to terminate this licence for any reason whatsoever and all rights will revert automatically.

h) Any CAL payments generated from any use under the licence will be 100% owned by the publisher.

Yours sincerely,

Liz Kenneally  
Media and Permissions Manager  
Macmillan Education Australia
Paraphrasing Task (Group Administration)

John Munro

In this task we are going to be reading and writing sentences. This is not a spelling test. If you are not sure of how to spell a word, just write down how you think it is spell. In this task it doesn’t matter if you write words incorrectly.

Look at the first sentence. I will read it and I want you to read it to yourself with me. Then I will try saying it another way. After that I will ask you to try.

Read the sentence. Then say I will try saying it another way. I will change as many words as I can but still say the same thing. This person who makes toys moved to a new town. Now you have a go at saying the sentence another way. Change as many words as you can. When you have thought of another way of saying it, write down your sentence in the space. Remember you don’t need to spell all the words correctly.

Now you have a go at the second sentence. Read it to yourself. Now have a go at saying it another way. Change as many words as you could. Write down your sentence. Remember you don’t have to spell all the words correctly. Ask some students to share their responses with the class and provide useful corrective feedback. Now listen to how I say it. It says “He wanted to find a place to live.” I could say “He needed to get a house to stay”. Write down what I have said in the space.

Now you have a go at the third sentence. Read it to yourself. Now have a go at saying it another way. Change as many words as you could. Write down your sentence. Remember you don’t have to spell all the words correctly. Ask some students to share their responses with the class and provide useful corrective feedback. Now listen to how I say it. It says “He needs to get to know the city.” I could say “He wants to find out where things are in the big town.” Write down what I have said in the space.

Tell the children that you may not be able to change every word in a sentence. Sometimes you will have to say some of the words that are in the starting sentence.

Now you have a go at the fourth sentence. Read it to yourself. Now have a go at saying it another way. Change as many words as you could. Write down your sentence. Remember you don’t have to spell all the words correctly. Ask some students to share their responses with the class and provide useful corrective feedback. Now listen to how I say it. It says “After he bought a map he looked for a bus.” I could say “First he got himself a map. Then he searched for a bus stop.” Write down what I have said in the space.

<table>
<thead>
<tr>
<th>Sentence read</th>
<th>Teacher</th>
<th>Your try</th>
</tr>
</thead>
<tbody>
<tr>
<td>A toy maker went to live in another city.</td>
<td>This person who makes toys moved to a new town.</td>
<td></td>
</tr>
<tr>
<td>He wanted to find a place to live.</td>
<td>He needed to get a house to stay.</td>
<td></td>
</tr>
<tr>
<td>He needs to get to know the city.</td>
<td>He wants to find out where things are in the town.</td>
<td></td>
</tr>
<tr>
<td>After he bought a map he looked for a bus.</td>
<td>First he got himself a map. Then he searched for a bus stop.</td>
<td></td>
</tr>
</tbody>
</table>
# Paraphrasing Task (Student worksheet)

## Paraphrasing task: Group administration

**Student worksheet**

<table>
<thead>
<tr>
<th>Student name</th>
<th>Grade</th>
<th>Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Teacher</th>
<th>Your try</th>
</tr>
</thead>
<tbody>
<tr>
<td>A toy maker went to live in another city</td>
<td>This person who makes toys moved to a new town.</td>
<td></td>
</tr>
<tr>
<td>He wanted to find a place to live.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>He needs to get to know the city.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After he bought a map he looked for a bus.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.

<table>
<thead>
<tr>
<th>Sentences</th>
<th>Your sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The young man and his friend rode on the bike.</td>
<td></td>
</tr>
<tr>
<td>2 They were enjoying themselves.</td>
<td></td>
</tr>
<tr>
<td>3 The birds were singing in the trees.</td>
<td></td>
</tr>
<tr>
<td>4 The two friends chatted. They were not paying attention to anything.</td>
<td></td>
</tr>
<tr>
<td>5 They were supposed to watch where they were going.</td>
<td></td>
</tr>
<tr>
<td>6 The track became narrow and twisted.</td>
<td></td>
</tr>
<tr>
<td>7 Suddenly it began to slope down and the bike sped up.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>8</td>
<td>People in the park watched and gasped as it went faster and faster.</td>
</tr>
<tr>
<td>9</td>
<td>The two riders weren’t smiling and chatting any longer.</td>
</tr>
<tr>
<td>10</td>
<td>Now they were gripping the bike as tightly as they could, showing fear on their faces.</td>
</tr>
<tr>
<td>11</td>
<td>People in the park had stopped what they were doing and started to yell “Stop” or “Be careful”.</td>
</tr>
<tr>
<td>12</td>
<td>All of a sudden the path goes around a sharp curve.</td>
</tr>
<tr>
<td>13</td>
<td>Ahead they see in the middle of the path, a huge stone.</td>
</tr>
<tr>
<td>14</td>
<td>The closer they get to it, the more enormous it becomes.</td>
</tr>
<tr>
<td>15</td>
<td>As they fly towards it, their hearts are beating louder and louder and they try to take avoidance action.</td>
</tr>
<tr>
<td>16</td>
<td>There is loud thud, the front wheel crumples and the young couple is airborne, flying over the obstacle to the grass on the side of the path.</td>
</tr>
</tbody>
</table>
Paraphrasing Task (Guidelines for scoring)

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Key words/phrases</th>
<th>Sentence</th>
<th>Key words/phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The young men and his friend rode on the bike.</td>
<td>9</td>
<td>The two riders weren't smiling and chatting any longer.</td>
</tr>
<tr>
<td></td>
<td>young men</td>
<td></td>
<td>riders</td>
</tr>
<tr>
<td></td>
<td>friend</td>
<td></td>
<td>smiling</td>
</tr>
<tr>
<td></td>
<td>rode</td>
<td></td>
<td>chatting</td>
</tr>
<tr>
<td></td>
<td>bike</td>
<td></td>
<td>age/longer</td>
</tr>
<tr>
<td>2</td>
<td>They were enjoying themselves.</td>
<td>10</td>
<td>Now they were gripping the bike as tightly as they could showing fear on their faces.</td>
</tr>
<tr>
<td></td>
<td>they</td>
<td></td>
<td>gripping</td>
</tr>
<tr>
<td></td>
<td>enjoying themselves</td>
<td></td>
<td>bike</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>tightly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>showing fear</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>on their faces</td>
</tr>
<tr>
<td>3</td>
<td>The birds were singing in the trees.</td>
<td>11</td>
<td>People in the park had stopped what they were doing and started to yell &quot;Stop&quot; or &quot;Be careful&quot;.</td>
</tr>
<tr>
<td></td>
<td>birds</td>
<td></td>
<td>people</td>
</tr>
<tr>
<td></td>
<td>singing</td>
<td></td>
<td>park</td>
</tr>
<tr>
<td></td>
<td>In the trees</td>
<td></td>
<td>stopped</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>what they were doing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>started to yell</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>'stop'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>'be careful'</td>
</tr>
<tr>
<td>4</td>
<td>The two friends chatted. They were not paying attention to anything.</td>
<td>12</td>
<td>All of a sudden the path goes around a sharp curve.</td>
</tr>
<tr>
<td></td>
<td>two friends</td>
<td></td>
<td>all of a sudden</td>
</tr>
<tr>
<td></td>
<td>chatted</td>
<td></td>
<td>the path</td>
</tr>
<tr>
<td></td>
<td>not paying attention to anything</td>
<td></td>
<td>goes around</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sharp curve</td>
</tr>
<tr>
<td>5</td>
<td>They were supposed to watch where they were going</td>
<td>13</td>
<td>Ahead they see in the middle of the path a huge stone.</td>
</tr>
<tr>
<td></td>
<td>They</td>
<td></td>
<td>ahead</td>
</tr>
<tr>
<td></td>
<td>supposed to</td>
<td></td>
<td>they see</td>
</tr>
<tr>
<td></td>
<td>watch</td>
<td></td>
<td>in the middle</td>
</tr>
<tr>
<td></td>
<td>where they were going</td>
<td></td>
<td>of the path</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>huge stone</td>
</tr>
<tr>
<td>6</td>
<td>The track became narrow and twisted.</td>
<td>14</td>
<td>The closer they get to it the more enormous it becomes</td>
</tr>
<tr>
<td></td>
<td>track</td>
<td></td>
<td>the closer</td>
</tr>
<tr>
<td></td>
<td>narrow</td>
<td></td>
<td>they get to it</td>
</tr>
<tr>
<td></td>
<td>twisted</td>
<td></td>
<td>the more enormous</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>it becomes</td>
</tr>
<tr>
<td>7</td>
<td>Suddenly it began to slope down and the bike sped up.</td>
<td>15</td>
<td>As they fly towards it, their hearts are beating louder and louder and they try to take avoidance action.</td>
</tr>
<tr>
<td></td>
<td>suddenly</td>
<td></td>
<td>Fly</td>
</tr>
<tr>
<td></td>
<td>track</td>
<td></td>
<td>towards it</td>
</tr>
<tr>
<td></td>
<td>sloped down</td>
<td></td>
<td>hearts beating louder</td>
</tr>
<tr>
<td></td>
<td>bike</td>
<td></td>
<td>and louder</td>
</tr>
<tr>
<td></td>
<td>sped up</td>
<td></td>
<td>try to take</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>avoidance action</td>
</tr>
<tr>
<td>8</td>
<td>People in the park watched and gasped as it went faster and faster.</td>
<td>16</td>
<td>There is a loud thud, the front wheel crumples and the young couple is airborne, flying over the obstacle to the grass on the side of the path.</td>
</tr>
<tr>
<td></td>
<td>people</td>
<td></td>
<td>loud thud</td>
</tr>
<tr>
<td></td>
<td>park</td>
<td></td>
<td>front wheel crumples</td>
</tr>
<tr>
<td></td>
<td>watched</td>
<td></td>
<td>young couple</td>
</tr>
<tr>
<td></td>
<td>gasped</td>
<td></td>
<td>airborne</td>
</tr>
<tr>
<td></td>
<td>faster and faster</td>
<td></td>
<td>Flying</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>over the obstacle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grass</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>on the side</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>of the path</td>
</tr>
</tbody>
</table>
**SCORING FOR PARAPHRASING TASK**

- Changed more than 50% of words and retained meaning: 2
- Changed more than 50% of words but did not retain meaning: 0
- Changed less than 50% of words but retained meaning: 1
- Changed less than 50% of words but did not retain meaning: 0
- No response: 0

<table>
<thead>
<tr>
<th>Student Names</th>
<th>Grade</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
QUESTIONING TASK: Group administration

John Munro

In this task we are going to be reading sentences and writing questions. This is not a spelling test. If you are not sure of how to spell a word, just write down how you think it is spelled. In this task it doesn’t matter if you write words incorrectly.

Look at the first sentence. I will read it and I want you to try and read it to yourself with me. Then I will try making up a question which is answered by the sentence I have just read.

Read the sentence. Then say I will try making up a question which is answered by the sentence I have just read. My question could be “Where did the toymaker go?” Write down my question in the ‘Teacher’ space. Now you have a go at thinking of a question. When you have thought of a question which is answered by the sentence, write it down in ‘Your try’ space. Remember you don’t need to spell all the words correctly.

Now you have a go at the second sentence. Read it to yourself. Now have a go at thinking of a question that can be answered by the sentence you have just read. Write down your question in the ‘My try’ space. Remember you don’t have to spell all the words correctly. Ask some students to share their questions with the class and provide useful corrective feedback. Now listen to me read the sentence. It says “He wanted to find a place to live.” My question could be “What did he want to find?” Write down what I have said in the ‘Teacher space’.

Now have a go at the third sentence. Read it to yourself. Now have a go at thinking of a question which is answered by the sentence you have just read. Write down your question in the ‘Your try’ space. Remember you don’t need to spell all the words correctly. Ask some students to share their responses with the group and provide useful corrective feedback. Now listen to me read the sentence. It says ‘He needs to get to know the city’. My question could be “What does he need to get to know?” Write down what I have said in the ‘Teacher space’.

Now have a go at the fourth sentence. Read it to yourself. Now have a go at thinking of a question which is answered by the sentence. Write your question in the ‘Your try’ space. Remember you don’t have to spell all the words correctly. Ask some students to share their responses with the group and provide useful corrective feedback. Now listen to me read the sentence. It says ‘After he bought a map he looked for a bus’. My question could be ‘What did he buy?’ or ‘What did he do after he bought a map?’ Write down one of the questions I have said in the ‘Teacher space’.

<table>
<thead>
<tr>
<th>Sentence read</th>
<th>Teacher</th>
<th>Your try</th>
</tr>
</thead>
<tbody>
<tr>
<td>A toy maker went to live in another city.</td>
<td>Where did the toy maker go?</td>
<td></td>
</tr>
<tr>
<td>He wanted to find a place to live.</td>
<td>What did he want to find?</td>
<td></td>
</tr>
<tr>
<td>He needs to get to know the city.</td>
<td>What did he need to get to know?</td>
<td></td>
</tr>
<tr>
<td>After he bought a map he looked for a bus.</td>
<td>What did he buy?</td>
<td>What did he do after he bought a map?</td>
</tr>
</tbody>
</table>
John Munro
QUESTIONING TASK: Group administration
Student Worksheet

Student name: ........................................ Grade: .................... Date: .................

Introduce the set of target sentences. Give the students the following instructions: Read each sentence to yourself. Then write a question for each sentence which is answered by the sentence. Remember you don’t need to spell all the words correctly. Your ideas for questions might be different from other people in the group.

<table>
<thead>
<tr>
<th>Sentences</th>
<th>Your questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The young man and his friend rode on the bike.</td>
<td></td>
</tr>
<tr>
<td>2. They were enjoying themselves.</td>
<td></td>
</tr>
<tr>
<td>3. The birds were singing in the trees.</td>
<td></td>
</tr>
<tr>
<td>4. The two friends chatted. They were not paying attention to anything.</td>
<td></td>
</tr>
<tr>
<td>5. They were supposed to watch where they were going.</td>
<td></td>
</tr>
<tr>
<td>6. The track became narrow and twisted.</td>
<td></td>
</tr>
<tr>
<td>7. Suddenly it began to slope down and the bike sped up.</td>
<td></td>
</tr>
<tr>
<td>8. People in the park watched and gasped as it went faster and faster.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>The two riders weren’t smiling and chatting any longer.</td>
</tr>
<tr>
<td>10</td>
<td>Now they were gripping the bike as tightly as they could, showing fear on their faces.</td>
</tr>
<tr>
<td>11</td>
<td>People in the park had stopped what they were doing and started to yell “Stop” or “Be careful”.</td>
</tr>
<tr>
<td>12</td>
<td>All of sudden the path goes around a sharp curve.</td>
</tr>
<tr>
<td>13</td>
<td>Ahead they see in the middle of the path, a huge stone.</td>
</tr>
<tr>
<td>14</td>
<td>The closer they get to it, the more enormous it becomes.</td>
</tr>
<tr>
<td>15</td>
<td>As they fly towards it, their hearts are beating louder and louder and they try to take avoidance action.</td>
</tr>
<tr>
<td>16</td>
<td>There is a loud thud, the front wheel crumples and the young couple is airborne, flying over the obstacle to the grass on the side of the path.</td>
</tr>
</tbody>
</table>
Information for Primary Principals

The acquisition of inferential reading comprehension by primary school students

Department of Learning and Educational Development

Principal

For Privacy reasons, address of school and name of Principal have been blocked out.

Dear Principal,

I am the principal investigator of the above research project 'The acquisition of inferential reading comprehension by primary school students'. This study has been approved by the Human Research Ethics Committee of the University of Melbourne and the Education Policy and Research Division, Data, Outcomes and Evaluation Division of the Department of Education and Early Childhood Development.

A key aspect of reading comprehension involves being able to make links with ideas that are not mentioned specifically in the text that is read. This is commonly referred to as 'inferential comprehension'. Many primary school students find this level of comprehension more difficult than comprehending what the text says directly.

The current research on the inferring mechanism suggests the involvement of various processes; making links with the propositions already known to the reader, assessing the reader's vocabulary, knowledge of text structure and ability to maintain the propositions assembled during reading in short term memory. The proposed study intends to explicitly investigate these suggestions.

The study is expected to lead to increased knowledge of inferential comprehension and its implications for improved teaching. Data from this study will provide teachers with much-needed knowledge in understanding the developmental acquisition of inferential reading comprehension, the various psycholinguistic and cognitive factors that influence its acquisition, and how to apply this knowledge to classroom practice.

Yours sincerely,

Judy Carter
Principal Researcher
Parent Consent Form (Participation in Study)

Consent Form

The acquisition of inferential reading comprehension in primary school students

Department of Learning and Educational Development

A key aspect of reading comprehension involves being able to make links with ideas that are not mentioned specifically in the text that is read. This is called 'inferential comprehension'. We, Mrs Judy Carter and Dr John Munro are researching some of the learning factors that influence how well students achieve inferential comprehension. Mrs Carter is planning to use the data as part of her Ph D thesis at Melbourne Graduate School of Education at the University of Melbourne.

The factors we are investigating include how much information a reader can remember for a brief period, the reader’s ability to put pictures in order to tell a story, the reader’s ability to compose questions answered by a written text and the reader’s ability to paraphrase the text. If you agree to your child being involved, they will be asked to do short tasks in these areas. It will take about 1.5 hours spread over several days and they would not miss any teaching to do this. We would also like your child to read some texts and answer some comprehension tasks about them.

Your child’s participation is voluntary. Children will be free to withdraw at any time and you can withdraw any unprocessed data supplied. All tasks they do and the scores they get will be handled in the strictest confidence.

The scores on the task will not be used by your child’s teacher or school. Your child will not be identified under any circumstances during the course of the investigation or in any written material following it. All data will be destroyed after the minimum period of 5 years.

Once this consent form is signed and returned, it will be retained by the researcher.

Dr John Munro  
Ph. 83440953

Mrs Judy Carter  
95716281

I give permission for my child to be part of this research. I have read the details above and understand that my child is free to withdraw at any time.

Name of child: .................................. Grade: ..............

Signature of parent or guardian: ..................................

Date: ........................................
Consent Form: Primary Principal

The acquisition of inferential reading comprehension in primary school students

Department of Learning and Educational Development

Principal Investigator: Judy Carter

1. I consent to allow teachers, parents and children from this primary school to be invited to participate in this research project. The details of the research project have been fully explained to me in the Plain Language Statement. I have been given my own copy of this statement.

2. I authorize the principal investigator in this research project to implement the procedures outlined in the Plain Language Statement.

3. I acknowledge that:
   a) The possible uses of the information arising from the study have been explained to me to my satisfaction
   b) I have been informed that I am free to withdraw my consent for participation any time and to withdraw any identifiable unprocessed data previously supplied
   c) The project is for research and development purposes only
   d) I have been informed that the confidentiality of the information provided in the study will be safeguarded in the following ways:
      - No names or personal details of individual participants will be revealed in any report of the study
      - Only the researchers, Judy Carter and Dr. John Munro from the University of Melbourne will have access to the data collected in this study
      - Data collected will be stored securely in a locked facility in the Melbourne Graduate School of Education for a minimum of five years from the date of completion of this study
   e) Once signed and returned, a copy of this consent form will be retained by the principal researcher.

Name of School: __________________________

Name of Principal: __________________________

Principal’s signature: __________________________

Date: __________________________
Plain Language Statement

The acquisition of inferential reading comprehension by primary school students

Department of Learning and Educational Development

A key aspect of reading comprehension involves being able to make links with ideas that are not mentioned specifically in the text that is read. This is called 'inferential comprehension'. Many primary school students find it harder than comprehending what the text says directly. We, Mrs Judy Carter and Dr John Munro are researching some of the learning factors that influence how well students achieve this. Mrs Carter is planning to use the data as part of her PhD thesis at Melbourne Graduate School of Education at The University of Melbourne.

The factors we are investigating include how much information a reader can remember for a brief period, the reader's ability to put pictures in order to tell a story, the reader's ability to compose questions answered by a written text and the reader's ability to paraphrase the text. If you agree to your child being involved, they will be asked to do short tasks in these areas. It will take about 1.5 hours spread over several days and they would not miss any teaching to do this. We would also like your child to read some texts and answer comprehension tasks about them.

Students who have answered these types of tasks in the past have found they help them know more about how they learn.

Your child's participation is voluntary. Children will be free to withdraw at any time and you can withdraw any unprocessed data supplied. All tasks they do and the scores they get will be handled in the strictest confidence.

The scores on the task will not be used in any assessments by your child's teacher or school. Your child will not be identified under any circumstances during the course of the investigation or in any written material following it. All data will be destroyed after the minimum period of 5 years.

If you have any concerns about the conduct of this project contact can be made with the Executive Officer, Human Research Ethics, The University of Melbourne. Ph. 8344 7507 or FAX 9347 6739.

Dr John Munro
Ph. 8344 0953

Mrs Judy Carter
95716281