

1991

## The effect of outlines, headings and summaries on the recall of informational text

John S. Latham  
*Edith Cowan University*

Follow this and additional works at: [https://ro.ecu.edu.au/theses\\_hons](https://ro.ecu.edu.au/theses_hons)



Part of the [Instructional Media Design Commons](#)

---

### Recommended Citation

Latham, J. S. (1991). *The effect of outlines, headings and summaries on the recall of informational text*.  
[https://ro.ecu.edu.au/theses\\_hons/247](https://ro.ecu.edu.au/theses_hons/247)

This Thesis is posted at Research Online.  
[https://ro.ecu.edu.au/theses\\_hons/247](https://ro.ecu.edu.au/theses_hons/247)

# Edith Cowan University

## Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study.

The University does not authorize you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following:

- Copyright owners are entitled to take legal action against persons who infringe their copyright.
- A reproduction of material that is protected by copyright may be a copyright infringement. Where the reproduction of such material is done without attribution of authorship, with false attribution of authorship or the authorship is treated in a derogatory manner, this may be a breach of the author's moral rights contained in Part IX of the Copyright Act 1968 (Cth).
- Courts have the power to impose a wide range of civil and criminal sanctions for infringement of copyright, infringement of moral rights and other offences under the Copyright Act 1968 (Cth). Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

## USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

**THE EFFECT OF OUTLINES,  
HEADINGS AND SUMMARIES  
ON THE RECALL OF  
INFORMATIONAL TEXT**

BY

JOHN S. LATHAM, Dip. Teach.

**A Thesis Submitted in Partial Fulfilment of the  
Requirements for the Award of  
Bachelor of Education with Honours  
at the  
Faculty of Education  
Edith Cowan University**

Date of Submission: 22 May 1991

## ABSTRACT

The purpose of this study was to investigate various text-based ways of assisting Year Seven readers to enhance their recall of informational texts.

The study was motivated by the awareness that one of the main problems experienced by children moving from the primary school into the secondary school is an inability to recall the content of the large number of informational texts they are required to read.

The theory that was tested in this investigation is that text-based reading aids which secure the activation and rehearsal of relevant form and/or content schemata for written texts will enhance the recall of the content and structure of those texts.

Five conditions of the text, "The Cane Toad " (Puhl, 1989), were investigated: no text-based aids, in-text headings, the text plus a pre-text outline, in-text headings and a pre-text outline, in-text headings plus a pre-text outline and a post-text summary.

To investigate the comparative impact of the five text conditions, 105 Year Seven students from a large primary school in a northern suburb of the Perth Metropolitan Area were ranked on the basis of their reading

comprehension scores. They were systematically assigned to each of the five groups to create five approximately heterogeneous groups thus creating a stratified sample.

The five conditions were randomly distributed among the five groups.

A "control group, treatment, post-test design" was used to test the validity of the theory.

Two separate experiments were conducted. The dependent variable for the first was the recall of content, while for the second, it was the ability to show a knowledge of the text's structure. This was assessed by the re-ordering of a set of jumbled main ideas, each of which represented an important aspect of text structure.

For each experiment, the existence of significant differences among the means obtained by the five groups was established by one-way analysis of variance. The differences between pairs of means was investigated by means of multiple comparison of means.

It was concluded that, for this sample of Year Seven students, the quantity of content recalled was enhanced to about the same significant degree by the use of in-text headings or the use of a pre-text outline when

compared with the "no text-based aids" condition. Further, it was concluded that the use of in-text headings and a pre-text outline enhanced the recall of text content about as well as the use of in-text headings, a pre-text outline and a post-text summary. Both produced significantly enhanced recall when compared with the "no text-based aids" condition, the "in-text headings" condition and the "pre-text outline" condition.

As a result of experiment two, it was concluded that the recall of text structure was not enhanced by the use of in-text headings. It was further concluded that the use of a pre-text outline, the use of a pre-text outline with in-text headings, and the use of a pre-text outline with in-text headings and a post-text summary produced equal scores on the recall of text structure. All three of these conditions produced significantly enhanced recall of text structure when compared with the "no text-based aids" condition and the "in-text headings" condition. Since the pre-text outline was the variable common to all of these conditions, it was concluded that the use of a pre-text outline had a significant, beneficial effect upon the recall of text structure.

It is clear from the findings of this study that the recall of the content and structure of informational texts by Year Seven students, like those in the sample

used in this study, could be significantly enhanced if texts were produced with carefully formulated pre-text outlines and in-text headings.

Thus, one way to help in the successful transition of students from the primary school to the secondary school would be to ensure that the many informational texts they are required to read are produced with pre-text outlines and in-text headings.

Perhaps it is now timely that the findings of this and related experiments should be conveyed to the writers of informational texts for lower secondary students in the hope that these writers can produce more comprehensible texts for students experiencing, for the first time, the extensive reading demands of secondary school education.



## DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

## ACKNOWLEDGMENTS

To my supervisor, Dr Peter Sloan, I extend my sincere thanks for his interest, encouragement and professional assistance. I would like to thank Bill Day and Les Puhl for their interest in various aspects of the study. I wish also to thank my wife, Louise, and my parents, Ross and Mavis Latham, who provided encouragement and support at all stages of the study.

## TABLE OF CONTENTS

	Page
Abstract	i
Declaration	
Acknowledgments	v
Table of Contents	vi
List of Tables	vii
List of Figures	
Chapter	
1    INTRODUCTION	1
Statement of the Problem	1
Purpose of the Study	2
Definition of Terms	3
Overview of the Design of the Study	4
Significance of the Study	5
Limitations of the Study	6
2    LITERATURE REVIEW	8
Within-text Signals	8
Meaningful words and phrases	8
Number signals	9
Underlining	10
Highlighting	11
Headings	11
External Text-related Aids	13
Preview and recall sentences	14
Pretraining and signalling	15
Outlines	15
Schema Theory and Reading	16

	Schema Theory and the Recall of Text	20
3	THE THEORY AND THE DERIVATION OF HYPOTHESES	24
	The Theory	25
	Derivation of hypotheses	26
	Research Question	26
	Hypothesis 1	27
	Hypotheses 2(a) - 2(j)	27
	Hypothesis 3	28
	Hypotheses 4(a) - 4(j)	28
4	THE EXPERIMENTAL DESIGN	29
	The Design of the Study	29
	Sample	29
	Target Population	30
	Materials	30
	Procedure	31
	Data Collection	32
	Scoring of the Completed Test Instruments	33
	The recall of sequence test	33
	The recall of facts test	36
	Analysis of the Data	38
5	FINDINGS AND DISCUSSION	39
	Recall of Content	39
	Hypothesis 1	40
	Comparison Among Group Means on Recall of Content	43
	Hypotheses 2(a) - 2(j)	46
	Summary	49
	Recall of Structure	50
	Hypothesis 3	51

Comparison Among Group Means on Recall of Text Structure	54
Hypotheses 3(a) - 3(j)	57
Summary	60
6 DISCUSSION OF FINDINGS	62
The Theory Tested in this Study	63
Text-based aids and schema activation	64
Discussion	65
Outline and headings used separately	65
Outline and headings used in combination	66
Outline, headings and summary used in combination	66
7 CONCLUSION	68
Limitations of the Interpretations Placed upon the Findings	68
The sample	70
The Text	70
The text-based aids	70
Further Research	71
Implications of the Study	71
REFERENCES	73
APPENDIX A	76
APPENDIX B	79
APPENDIX C	82
APPENDIX D	85
APPENDIX E	89
APPENDIX F	94

## LIST OF TABLES

	Page
Table 1	
Recall-of-structure scores for subjects in each of the test groups	35
Table 2	
Recall-of-facts scores for subjects in each of the test groups	37
Table 3	
Means of the results achieved by the five groups on the recall of content	39
Table 4	
Tukey's Studentized Range (HSD) Test for the variable of recall of content (number of facts)	45
Table 5	
Formats which produced significantly better recall protocols than the format comprised of text only. The associated, rejected null hypotheses are also shown.	47
Table 6	
Formats which produced significantly better recall-of-facts protocols than the format comprised of the text with in-text headings only. The associated, rejected, null hypotheses are also shown.	48
Table 7	
Formats which produced significantly better recall-of-facts protocols than the format comprised of the text with a pre-text outline only. The associated, rejected, null hypotheses are also shown.	49
Table 8	
Means of the results achieved by the five groups on the recall of structure task.	51
Table 9	
Tukey's Studentized Range (HSD) Test for the variable of recall of text structure.	56

	Page
Table 10	
Formats which produced significantly better recall of text structure protocols than the format comprised of text only. The associated, rejected null hypotheses are also shown.	58
Table 11	
Formats which produced significantly better recall-of-text-structure protocols than the format comprised of the text containing in-text headings	59

## LIST OF FIGURES

	Page
Figure 1	
Profiles showing each group's scores on the recall of the content of the experimental text.	41
Figure 2	
Comparative profiles of group's scores on the recall of the content of the experimental text.	42
Figure 3	
Comparisons of all possible pairs of groups on scores obtained on the recall of the content of the experimental text.	44
Figure 4	
Profiles showing each group's scores on the recall of the structure of the experimental text.	52
Figure 5	
Comparative profiles of groups' scores on the recall of the structure of the experimental text.	53
Figure 6	
Comparisons of all possible pairs of groups on scores obtained on the recall of the structure of the experimental text.	55



## CHAPTER 1

### INTRODUCTION

#### Statement of the Problem

One of the main problems experienced by children moving from the primary school into the secondary school is an inability to recall the content of the large number of informational texts they are required to read. A possible reason for this is that the types of texts which primary school children experience and which are used for their instruction in reading are mainly narratives and recounts. This means that the strategies for reading comprehension and recall which children are taught or which they spontaneously learn in the primary school have their most effective application with texts of this type only. This may be one reason why so many children, upon moving into the secondary school, have pronounced difficulties in comprehending and recalling the content of the informational texts related to subjects such as Biology, Physics, Chemistry, Economics, Geography, History, and so on.

The existence of this problem of the recall of the content of informational texts has given rise to an increasing amount of research aimed at discovering ways to improve recall (Krug, George, Hannon and Glover, 1989; George, 1986; Pearson, 1984). Considered broadly,

this research falls into two strands. The first is concerned with investigating the impact on recall of different ways of manipulating reader-based factors, e.g., the work of Pearson (1984); Rigney and Munro (1977); Pichert and Anderson (1977).

The second is concerned with investigating the impact on recall of manipulating various text-based factors, e.g., the work of George (1985); Krug, George, Hannon and Glover (1989); Mannes and Kintsch (1987).

Of particular interest in the context of this study, is the research which investigates the impact on recall of content, of the manipulation of various text-based factors which effect changes in some reader-based factors (Mannes and Kintsch, 1987; Rigney and Munro, 1977). The general thrust of this type of research has been to investigate how certain types of text format might enhance the reader's access to his/her prior knowledge and enhance the structuring of text information as it is converted into the reader's personal in-head information.

It was the aim in this study to investigate the possibility of preparing informational texts in such a way as to enhance readers' recall of the content of these sorts of texts.

### Purpose of the Study

The purpose of this study was to investigate text-based ways of assisting readers enhance their recall of informational texts. Specifically, its purpose was to investigate the impact of text-based aids on the recall of Year Seven students following the reading of a specific informational text.

### Definition of Terms

TEXT:	The group which read the informational text, "The Cane Toad" (Puhl, 1989) without text-based reading aids.
TEXTH:	The group which read "The Cane Toad" with in-text headings.
TEXTO:	The group which read "The Cane Toad" with a pre-text outline.
TEXTHO:	The group which read "The Cane Toad" with in-text headings and a pre-text outline.
TEXTHOS:	The group which read "The Cane Toad" with in-text headings, a pre-text outline, and a post-text summary.
Schema Theory:	The theory that investigates how an individual's stored user knowledge interacts and shapes

incoming information and how that knowledge must be organized to support this interaction (Adams and Collins, 1979).

**Schema:** A mental structure which contains organized knowledge an individual possesses about an aspect of his/her world.

**Syntactic Knowledge:** The knowledge an individual has about the structure of language at the sentence level.

**Semantic Knowledge:** The knowledge an individual has about the world, i.e., experiences, feelings, and so on, organized as schemata.

### Overview of the Design of the Study

The sample of subjects evaluated in this investigation consisted of the 105 Year Seven pupils attending a large primary school in a northern suburb of Perth. The student catchment area of this school covers all socio-economic strata.

The research design employed was a *control group, treatment, post-test design* (Campbell and Stanley, 1966).

The treatment took a variety of forms of text-based aids

which had to be read with a selected text. The control group read the same text without any text-based aids.

The data generated by the control group and the experimental groups were assessed on the quantifiable dimensions of content recalled and knowledge of text form/structure.

One-way analyses of variance were used to establish significant differences among the mean scores of the groups on each of the above variables. A posteriori multiple comparisons of means were used to determine between which pairs of means there were significant differences.

#### **Significance of the Study**

As pointed out in the introductory statements in this document, one of the main problems experienced by children moving from the primary school into the secondary school is an inability to recall adequately the content of the informational texts they are required to read. Although in this study only text-based aids to improving the comprehensibility of informational texts were examined, rather than ways to improve readers' intrinsic ability to process text, it is considered to derive significance from the fact that it has demonstrated that improved levels of text content and text structure recall can be achieved by the judicious

use of such carefully designed aids.

In view of the above claim, the study is also significant because it suggests to the authors and publishers of school texts for upper primary and lower secondary students that the usefulness of such texts can be significantly enhanced by the inclusion of the sorts of text-based aids investigated in the study reported here.

A further significant aspect of this study is that it has strongly reinforced the notion that the schema-theoretic view of reading has considerable explanatory power. Further, there is substantiation for the aspect of schema theory in reading which postulates the importance of the possession of both content and form schemata in the successful reading of informational texts.

#### **Limitations of the Study**

The factors discussed below should be noted as limitations upon the generalizability of the findings reported in this study.

1. It is claimed elsewhere in this report that the 105 Year Seven students who comprised the experimental sample in this study are probably representative of the more general population of Year Seven students

in Western Australian schools. While this may be a valid claim, it has to be conceded that no serious assertions about generalizability to a wider population can be made because accepted, randomized, selection procedures were not followed in the identification of the sample.

2. The dependent variables in the two experiments described in this document were recall of text content and recall of text form. While undoubtedly these variables are close correlates of some aspects of comprehension, it should be noted that the study is not about comprehension. Since reading, in any useful meaning of the word, is the comprehension of written texts, it is a limitation that this study investigates recall only, without the discussion of the role of comprehension in that recall.
3. The test of the dependent variable in the recall of text content in one of the experiments in this study, called on the subjects to produce written texts of their own. It is a limitation on the findings that the analysis of recall was carried out on a correlate of recall, the production of which may have actually obscured the true measure of the material actually recalled.

4. The experiments reported here were conducted with a single piece of quite specialized, informational text - a scientific, animal report. While it may be safe to generalize that similar results should be obtained with similar subjects on the same sorts of texts, it is a limitation that performance on other sorts of texts was not investigated.



## CHAPTER 2

### LITERATURE REVIEW

During the past several decades, extensive research has been conducted in an attempt to identify possible solutions to the general problem of the comprehension and recall of texts. One direction this research has taken is to provide information prior to or within the text which will so direct and hold the attention and processing strategies of the reader that his/her comprehension and recall of the text will be enhanced.

Almost all of the reviewed studies indicate that this work has been conducted with adult subjects (mainly College students) and with narrative texts (Krug, George, Hannon and Glover, 1989). The difficulty of generalising the results of these studies to students in the early years of the secondary school is obvious.

#### Within-text Signals

One interesting strand of research oriented towards text-based solutions to students' problems with comprehension and recall has investigated the facilitating effect of within-text signals on the comprehension and recall of College students (Britton, Glynn, Meyer and Penland, 1982).

Meaningful words and phrases. In one experiment

conducted by Britton, Glynn, Meyer and Penland, an attempt was made to enhance technical text comprehensibility by the inclusion of words and phrases that cued or signalled the important ideas and the relationships which obtain among those ideas. These cues were of the sort discussed by Grimes (1975), Halliday and Hasan (1976), and Meyer (1975), and could be very loosely described as the meaning signalling discourse markers and words or phrases indicating lists, cause and effect, and problem-solution text sequences. For the purposes of this review, the finding of interest is that these text cues and signals did not effect any improvement in recall.

Britton (1986) conducted an experiment similar to that conducted by Britton, Glynn, Meyer and Penland. Britton's experiment produced enhanced recall of the signalled portions of the text but this improved recall was achieved at the expense of the recall of the unsignalled text.

From these two studies, it can be concluded that in-text, meaningful cues and signals do not improve recall.

**Number signals.** Lorch and Chen (1986) undertook a study aimed at gauging the enhancing effect on text processing of the inclusion of in-text numbers. The role of these numbers was to signal specific sentences which were

responsible for the overall structure and organisation of the text. The findings of this study suggest that in-text signals, in the form of numbers highlighting specific sentences, result in the enhanced recall of the numbered sentences only and the depressed recall of the other content in the text. That is, there is no overall improvement in text recall. It seems likely that the reason for this is that the numbers attract the more sharply focussed attention of the reader to the detriment of the other sentences in the text.

**Underlining.** A number of studies investigating the effect of text underlining on recall were conducted by Crouse and Idstein (1972). They found that no improvement in recall was effected in subjects who did their own underlining. It is likely that this occurred because the subjects who did their own underlining were, in effect, no better off than readers who did no underlining at all. This is so because students needing the assistance of underlining are likely to be unable to correctly identify the salient features for underlining. Crouse and Idstein did find an improvement in the recall of underlined text when the questions formulated to assess recall were each included in the text at points immediately following the underlined sections which the questions probed. On the basis of this evidence, it can be concluded that there is no research literature that reveals a clear enhancement in text recall resulting

from selective text underlining without the text modifying insertion of questions adjacent to the salient, underlined portions of the text.

Glynn and DiVesta (1979) also conducted a study which evaluated the enhancement of text processing effected by text underlining. The important finding in terms of the investigation which was conducted here is that underlining without additional support is of limited value. When students are highly motivated by the explicitly stated demand characteristics of the learning situation, as in Orne (1962) and Spiro (1977), expectations are developed about which sections of the text should be afforded most attention for learning and retrieval. Glynn and DiVesta concluded that this sort of assistance may result in improved recall.

**Highlighting.** Another type of in-text signal that has been experimentally investigated is highlighting. Fowler and Barker (1974) investigated the effectiveness of highlighting as an aid to text retention. The findings permit only the tentative conclusion that highlighting is an aid to comprehension and, therefore, to retention. As with the studies on underlining, cited above, the problem is that highlighting is ineffective for most readers because they are inefficient in selecting the sections of the text which need to be emphasised. Fowler and Barker did find some improvement

when the highlighting was effected by another party in whom the reader had marked confidence.

Headings. Numerous studies have investigated the value of in-text headings in improving text comprehension and recall. The results of signals in the form of in-text headings, however, have been inconsistent (George, 1985; Krug, George, Hannon and Glover, 1989). One of the reasons for these varied results is that the lack of clear specification for the term *headings* probably conceals considerable diversity in the type of material included in each heading across the studies reviewed. In the study which was carried out here, the term headings refers to statements used to section a text into smaller units of cohesive and related content. That is, a heading is designed to activate a schema (Bransford and Johnson, 1972) which fully subsumes the sub-schemata that represent the items of content presented by each heading. This means that headings are similar to titles which refer to the content of a passage. That is, the title describes or provides a label or organising concept that captures the content of the entire text. Headings, on the other hand, suggest the content of smaller, relatively self-contained sections of the text. Headings indicate the actual information which the reader should expect to find under each heading.

The research literature on the impact of titles on students' comprehension and recall of text is relatively clear (Bransford and Johnson, 1972; Pichert and Anderson, 1977). Titles help students understand ambiguous texts. They also assist readers in establishing a context to guide the comprehension and retrieval of the material contained in texts. Research into the impact of headings on comprehension and recall has produced contradictory results. Dansereau (1982) conducted two experiments aimed at establishing the facilitating effect on students' reading of biology and geology texts. The first produced a beneficial effect, but the second revealed no difference. Brooks (1981) carried out a study along the same lines as those followed by Dansereau. His finding was that headings do not make any difference to students' reading of texts unless they are first trained in their use. Studies by George (1985) and Swarts (1980) also produced no beneficial effects from the insertion of headings into texts. An important finding produced by Swarts, is that the headings can actually impair the comprehension and recall of texts unless they are constructed very carefully. He did not provide any specifications for the construction of effective headings, however. Hartley (1980), Hartley, Kenely, Owen and Trueman (1980), Hartley and Trueman (1982), and Hartley, Trueman and Brunhill (1980), conducted extensive studies into the facilitating effect of placing headings within

texts. Their results have done little to clarify the findings about headings because the headings they used took the form of questions.

Perhaps the main difficulty with most of the previously conducted research on headings is that, in all but one of the cases, no theoretical explanation was provided for the effect of the use of headings in texts. This superficial approach to the research means that, not only did the investigators not explain why they had investigated the facilitating effect of in-text headings on text recall, it also meant that they had no scientific explanation for the results they did obtain.

#### External Text-related Aids

In addition to the many studies investigating the usefulness of in-text signals for enhancing text recall, there are many studies which have investigated the usefulness of aids external to the text. That is, there are studies which have investigated the facilitating effect on recall of such aids as *preview sentences* and *recall sentences*.

Preview and recall sentences. Preview and recall sentences are sometimes used by the writers of text books to improve inter-chapter transitions by assisting readers to use the knowledge gained in a previously read chapter to understand the information in the following

chapter. Glover, Dinnel, Halpain, McKee, Corkill and Wise (1988) conducted an experiment in which they investigated the impact of preview and recall sentences inserted between the chapters of a text book. They found a clear signalling effect across chapters which resulted in improved overall recall. They concluded that this occurred because preview sentences guide attention during reading and serve as a memory aid in the recall of information. They also concluded that preview sentences are effective in the activation of information in memory which is needed for the understanding of the text to be read and for its integration with material already processed.

The application of preview and recall sentences has been noticed in a recently published text book, Gay (1987). In this book, the motivation appears to be to provide a set of advance organisers (Ausubel, 1968) in the form of *enablers* at the beginning of each chapter and a summary at the end to serve as a recall prompt and a form of rehearsal of the content just processed.

**Pretraining and signalling.** Mayer, Dyck and Cook (1984) were interested in increasing the use of a problem-solving strategy instead of verbatim recall strategies for learning from scientific texts. Their aim was to help students construct mental models of such relationships as cause-effect to assist in the recall of



conceptual material. Students were pretrained on definitions crucial to discerning the relationships in the text and were provided with in-text signals to cause-effect relationships (Meyer, 1975). Mayer, Dyck and Cook (1984) concluded that the joint effect of pretraining and in-text signals did result in improved meaningful recall of concepts.

**Outlines.** Another promising line of research into possible text-based solutions for improving the comprehension and recall of texts has been the use of outlines to precede the reading of the text proper (Glynn and DiVesta, 1977; Mannes and Kintsch, 1987; Krug, George, Hannon and Glover, 1989). In these studies, it was found that students who read an outline of a text prior to reading the text, produced improved levels of recall. Glynn and DiVesta (1977) stated that:

... a structured outline presented prior to reading the text alerts the learner to the inherent organisation of the content as well as the salient topics within the text. It primes the learner for the identification of relevant subsumers under which new material can be located for meaningful storage ... (p.89)

#### **Schema Theory and Reading**

Recent reviews of reading research (Harste, 1985;

Pearson, 1985) indicate that there is now a clear trend for reading researchers to adopt a theory of reading which takes account of the active contribution which must be made by the reader in constructing the meaning of texts. Pearson (1985) distils this point of view in stating, "We now view text as a sort of blueprint for meaning, a set of tracks or clues that the reader uses as he/she builds a model of what the text means." p.726.

This trend means that researchers have moved away from information-transfer theories toward schema-theoretic models of the reading process. According to these theories, the use of background knowledge possessed by the reader is a fundamental factor in comprehension.

A schema is an organised body of knowledge about the world (Sloan and Whitehead, 1986). Schemata may be concerned with information, with linguistic data or affective considerations. An individual possesses a huge number of schemata, all of varying size. Some are large and comprehensive and subsume other schemata within them while others are much smaller with only small amounts of information within them. In reading research, the term schema has been applied to the *organised*, prior knowledge held by the reader (Sloan and Whitehead, 1986).

Schema-theoretic views of reading assert that reading

comprehension is, in fact, essentially the same as general comprehension. Both are products of the same sort of cognitive processing (de Beaugrande, 1981; Neisser, 1976). Each involves schema construction in that the individual comprehends the environment through the construction of schemata appropriate for that sort of interaction. The reader comprehends a text through the comprehension of schemata appropriate for that sort of interaction. These schemata may well be common to both sorts of processing though it is clearly the case that each will make use of schemata construction peculiar to that mode of processing. This point is further explained below.

From the foregoing, it is clear that reading is a constructive act by means of which the reader constructs a cognitive representation of the text on the basis of permanent memory structures which he already holds (Whitney, 1987; Adams, 1982). As already pointed out, there are parallels between reading comprehension and general comprehension in that each involves the activation and/or construction of schemata. The difficulty with reading when compared with general comprehension is that the reader has to deal with an additional variable. This variable is the text itself. This must be taken into account in any adequate explanation of the reading process. The view of Morgan (1983) is useful here. He argues that text acts as a

"blueprint to meaning" from which readers "must actively construct a representation of the text which is harmonious with their sociocultural context, prior experiences, and situational goals" (p.313). This process is further explained below.

During reading, readers draw on their knowledge of the topic (semantics), their knowledge of linguistic structures (syntax) and their knowledge of letter sequences (grapho-phonetic information) to predict or generate hypotheses about meaning. These predictions are then confirmed or rejected on the basis of further processing of the text (Sloan, 1983, Latham and Sloan, 1979). This process of prediction and the confirmation or rejection of predictions involves the activation and/or construction of schemata as referred to above. These schemata are the basis of prediction. In addition, they guide reader response and provide a means for gauging the effectiveness of that response. They act as a framework of understanding and also as a context on the basis of which data are selected for processing. Put more simply, this means that readers use their activated schemata to predict ahead in the text using their knowledge of syntax, letter sequences and their semantic knowledge of the topic covered in the text. These same three domains of knowledge are also used by the reader to confirm or reject the ongoing predictions.

This process can also be viewed in terms of the *lexical tags* described by Quillian (1962, 1967), Collins and Quillian (1972), and Collins and Loftus (1975). That is, the meaning or semantic relationships encoded in the text activate tagged concepts and the relational links among them, i.e., schemata, and, thus, guide the reader in constructing a meaningful representation of the text. This is the sense in which Morgan (1983) referred to the text as the "blueprint to meaning". The meaningful representation thus constructed serves to:

1. provide a framework by which the text can be understood; and,
2. build permanent memory structures, i.e., provide for recall of the text or learned knowledge through reading;

Thus, the essence of schema theory, applied to reading, is the assertion that comprehension is the result of processing text in terms of the reader's own prior knowledge. Print triggers or activates the schemata of the reader which are matched against the text. There are schemata, too, which have an executive role in that they select information from the text which is relevant to making meaning. This means that, in terms of schema theory, reading is cyclic. That is, print triggers schemata which, in turn, select more information from the print. Thus, the process is interactive in nature

in that information is processed from the text upwards and downwards from the brain of the reader.

In a schema-theoretic view of reading, firstly the possession of appropriate schemata for a specific text is vital. Secondly, the activation of relevant schemata is essential for efficient text processing. This means that, in turn, recall of text material following reading is likely to be, at least in part, a function of the activation of relevant schemata.

#### Schema Theory and the Recall of Text

Krug, George, Hannon and Glover (1989) have made use of a schema-theoretic view of reading in the investigation of the facilitating effects of headings and outlines on text processing, that is, the comprehension and recall of text. Following the work of Rigney and Munro (1977), Krug, George, Hannon and Glover proposed that there are two main schema types involved in the comprehension and recall of texts - form and content. The form schemata are more abstract in nature than content schemata in that they deal with the form or structure of things. An example of such schemata would be the frameworks proposed by Latham and Sloan (1989) to facilitate writing and the teaching of writing. The overall framework which controls the production of textbooks, e.g., a table of contents, an introduction, a series of chapters, a concluding chapter and an index, would also

be an example of a form schema.

Content schemata are more concrete than form schemata. The information included in the various stages of text production proposed by Latham and Sloan would make use of content schemata. For example, in a scientific animal report on the Procoptodon, the schemata activated in order to produce the *description* stage of the text would require the activation of content schemata like size, shape, colour and other features. The actual chapter headings of a textbook would represent content schemata.

As stated above, Krug, George, Hannon and Glover (1989) investigated the recall enhancing effect of the reading of an outline prior to the reading of a text. In their theoretical position, they argued that an outline would activate both form and content schemata. They state, "In our perspective, outlines activate knowledge relevant to both content and form of stories." (p.113) Clearly, their position is that form schemata are activated by outlines and, in addition, since outlines must include data derived from the content of the text from which they have been generated, they must also activate content schemata. It is difficult to identify any external, text-related aids, even for informational texts, which could be claimed to activate form schemata separately from content schemata. Thus, if Krug,

George, Hannon and Glover (1989) are right, it would seem likely that the enhanced results which Glynn and DiVesta (1977) and Mannes and Kintsch (1987) secured in their studies, probably resulted from the activation of both form and content schemata.

Krug, George, Hannon and Glover (1989) found that the prefacing of texts with an outline had a facilitating effect on readers' recall. They also found that the use of in-text headings resulted in improved recall. Further, Krug, George, Hannon and Glover (1989) discovered that the use of both pre-text outlines and in-text headings resulted in the best overall levels of recall.

In their discussion of these results, Krug, George, Hannon and Glover (1989) pointed out that the outline condition produced recall protocols characterised by structure closely resembling the structure of the original text as well as improved levels of content recall. Headings, in contrast, had no apparent effect on students' ability to recall the structure of a text but did produce improved levels of recall of the content of the text.

Krug, George, Hannon and Glover (1989), in their discussion of these results, felt that outlines, in activating both form and content schemata provided a



more stable base into which text information could be assimilated. The use of in-text headings without the pre-text outline, activated only content schemata resulting in improved recall of content which was not as well organised as the material recalled by the subjects who had the outline condition. The use of both outlines and in-text headings resulted in the highest levels of recall.

In this review of literature, studies which have investigated the recall-enhancing effect of text-based reading aids have been analysed. These studies have all used College students and adults as their subjects while the majority of them have dealt only with the recall of narrative texts. The studies reviewed can be divided into two groups:

- (i) Those which investigated the effect of within-text signals.
- (ii) Those which evaluated the impact of aids external to the text.

While varied results were obtained, the majority of these studies produced inconclusive findings. One study, that conducted by Krug, George, Hannon and Glover (1989), did produce very promising findings. One reason for the clear superiority of this study over the others is that it was formulated on the basis of a coherent and powerful theory of reading.

The review of these studies and the apparent advantage of formulating a study on the basis of a sound theory of reading suggested the direction for the research reported here.

### CHAPTER 3

#### THE THEORY AND THE DERIVATION OF HYPOTHESES

The explanatory power of the schema-theoretic model of reading warrants its use in the design of further studies aimed at gauging the facilitating effect on recall of text-based aids to reading. The investigation which is reported here is such a study.

In the studies summarised in the foregoing review, two important issues have been neglected:

- (i) no studies have assessed the impact of text-based aids on the reading of primary school children; and,
- (ii) almost all of the studies made use of narrative texts.

Since the transition from primary to secondary school marks a distinct increase in the demands on the recall abilities of readers, especially in relation to the reading of informational texts, there was a clear need for a study which examined ways of enhancing the recall of such readers in their attempts to read informational texts.

This study attempted to investigate the effect of the

activation of form and content schemata on the recall of Year Seven readers. The study was designed to reveal the effect of content schemata separately by the use of in-text headings only. The combined effect of content and form schemata was investigated by the use of outlines read prior to the reading of a text.

The post-reading effect of the rehearsal of the specific data placed in form and content schemata as a result of reading the text was assessed by gauging the impact of the use of summaries following the reading of the text.

Clearly, with the availability of pre-reading outlines, in-text headings and post-reading summaries, various combinations of these conditions were also investigated.

### The Theory

The testable theory which can be formulated on the basis of the foregoing review of literature is that text-based aids which secure the activation and rehearsal of form and content schemata will enhance readers' recall of text content.

Thus, the theory is that, carefully compiled in-text headings will enhance the arousal of appropriate content schemata with resulting improved levels of text recall.

Outlines constructed on the basis of text form and

content and presented prior to text reading will arouse both form and content schemata. The activation of such schemata will result in improved recall protocols on the dimensions of both content and structure.

The use of both pre-text outlines and in-text headings will produce better recall on the variables of content and structure than either used separately.

The use of post-reading summaries will have a rehearsal effect on form and content schemata. Thus, pre-reading outlines and post-reading summaries used in conjunction with in-text headings will produce enhanced recall protocols of content and structure.

In order to identify the most efficacious combination of these text-based aids, the following research hypotheses were investigated.

#### Derivation of Hypotheses

On the basis of the theoretical position outlined in this chapter, a study was planned for the purpose set out in Chapter 1. This purpose was:

to investigate text-based ways of assisting Year Seven readers enhance their recall of informational texts.

**Research Question**

This study was designed to generate empirical information relative to the general questions:

On the dimensions of recall of text content and text structure, will there be significant differences among the recall protocols of Year Seven readers who read an informational text making use of the following conditions:

1. no text-based aids?
2. content-schemata-activating, in-text headings?
3. a pre-text, form-and-content-schemata-activating outline?
4. both in-text headings and a pre-text outline?  
and,
5. in-text headings, a pre-text outline, and a post-text summary?

This general research question was translated into the following hypotheses:

**Hypothesis 1**

On the dimension of recall of text content, there will be no significant difference among the recall protocols of Year Seven readers who have read the informational text, "The Cane Toad" (Puhl, 1989), prepared in the following ways:

1. no text-based aids - TEXT;
2. in-text headings - TEXTH;
3. a pre-text outline - TEXTO;
4. in-text headings and a pre-text outline - TEXTHO; and

5. in-text headings, a pre-text outline, and a post-text summary - TEXTHOS.

Hypotheses 2(a) - 2(j)

On the dimension of recall of text content, there will be no significant comparisons among the following pairs of the recall protocols of Year Seven readers who have read the informational text, "The Cane Toad" (Puhl, 1989):

- a) TEXT compared with TEXTH,
- b) TEXT compared with TEXTO,
- c) TEXT compared with TEXTHO,
- d) TEXT compared with TEXTHOS,
- e) TEXTH compared with TEXTO,
- f) TEXTH compared with TEXTHO,
- g) TEXTH compared with TEXTHOS,
- h) TEXTO compared with TEXTHO,
- i) TEXTO compared with TEXTHOS,
- j) TEXTHO compared with TEXTHOS.

**Hypothesis 3**

On the dimension of recall of text structure, there will be no significant differences among the recall protocols of Year Seven readers who have read the informational text, "The Cane Toad" (Puhl, 1989), prepared in the following ways:

1. no text-based aids - TEXT;
2. in-text headings - TEXTH;
3. a pre-text outline - TEXTO;
4. in-text headings and a pre-text outline - TEXTHO;
5. in-text headings, a pre-text outline, and a post-test summary - TEXTHOS.

**Hypotheses 4(a) - 4(j)**

On the dimension of recall of text structure, there will be no significant comparisons among the following pairs of the recall protocols of Year Seven readers who have read the informational text, "The Cane Toad" (Puhl, 1989):

- a) TEXT compared with TEXTH,
- b) TEXT compared with TEXTO,
- c) TEXT compared with TEXTHO,
- d) TEXT compared with TEXTHOS,
- e) TEXTH compared with TEXTO,
- f) TEXTH compared with TEXTHO,
- g) TEXTH compared with TEXTHOS,
- h) TEXTO compared with TEXTHO,
- i) TEXTO compared with TEXTHOS,
- j) TEXTHO compared with TEXTHOS.



## CHAPTER 4

### THE EXPERIMENTAL DESIGN

This chapter describes the design of the study. It includes a brief description of the sample and the target population, and an account of the test instruments administered. The procedure followed for the collection of the data is outlined and the statistical treatment of the data is also set out.

#### The Design of the Study

The broad aim of this study was to demonstrate the impact of a selection of within-text aids and a number of aids external to the text on the recall of Year Seven readers. Specifically, this study was an attempt to demonstrate that text-based aids which activate and/or rehearse both content and form schemata before, during, and after the reading of an informational text will enhance the recall of text content and structure.

The design used to evaluate these postulates was a *control group, treatment, post-test design* (Campbell and Stanley, 1966; Gay, 1987).

#### Sample

One hundred and five Year Seven students from a large primary school in a northern suburb of the Perth

Metropolitan Area participated as part of their normal classroom reading programme.

### Target Population

It is claimed that these children are representative of a larger population of Year Seven children because all socio-economic levels are represented. Thus, the potential for the generalisation of results to a wider population exists.

### Materials

A 213 word scientific, animal report entitled "The Cane Toad" (Puhl, 1989) was used as the text for this study. This text was constructed according to the text-type report designed by Latham and Sloan (1989). The form of this text is represented by the text components of *classification, description, time/place, dynamics and special interesting features*. The content of the text covers, for example, under the heading of *description*, such topics as size, shape, colour and other features.

The text has a readability level of approximately Year 7. The readability level of the text was established by Puhl by means of repeated trials with a wide range of Year Seven students.

The text was analysed to discover the total number of facts it contains. This analysis was carried out by the

researcher and was checked by another researcher acting independently. It was then verified by an authority in discourse analysis (Dr. R Latham). The form-representing statements were compiled by the experimenter and confirmed by Dr. P. Sloan, an authority in the field. These were jumbled into a random order.

An outline of the text was prepared. It consisted of five, superordinate descriptive phrases with, where necessary, explanatory descriptors attached to each of these. Subordinate facts were placed within and below each of the superordinate phrases or descriptors. This outline was used for the pre-text aid and an abbreviated form of it was used as the post-text summary (see Appendix E).

In-text headings for the text were made up of the superordinate phrases and/or the descriptors used in the outline of the text.

Five versions of this text were prepared for this study:

1. the text on its own (TEXT);
2. the text containing in-text headings (TEXTO);
3. the text prefaced by an outline (TEXTH);
4. the text prefaced by an outline and containing in-text headings (TEXTHO); and,
5. the text prefaced by an outline, containing in-text headings and followed by a short summary (TEXTHOS).

The five versions of the text are presented in the Appendices A to E.

### Procedure

The subjects in the sample were tested and ranked using the raw scores generated by the *Torch Reading Tests* (Ministry of Education, 1985) for upper primary school children. The subjects were then progressively distributed to each of the five groups needed to assess the five conditions under investigation. The order of distribution was reversed after each round. This procedure was adopted in an attempt to create five groups which were equal on the basis of performance on the *Torch Reading Test*.

In order to be certain that the five groups were essentially equal in reading ability as measured by the *Torch Reading Test*, a one-way analysis of variance was carried out using *Torch Reading Test* scores as the dependent variable. This analysis demonstrated that five virtually equal groups had been created ( $F = 0.05$ ,  $df = 4, 100$ ,  $p = .9948$ ) by the procedure described above.

The five conditions were randomly distributed among the five groups comprising the stratified sample.

All data were collected by the experimenter in one

normal reading session. This ensured that each group was subjected to precisely the same test conditions.

### Data Collection

The subjects in each experimental group were required to perform two tasks following the reading of the text:

1. The first task was to re-order a set of jumbled, form-representing statements. This task required the subjects to recall the correct sequence of five main idea statements - see Appendix F.
2. The second task was to produce a written recall of the text. This task required the subjects to write down all the facts they could recall - see Appendix F.

As described above, data collection was effected during one, normal class reading lesson. Following the initial set of instructions issued by the experimenter, the test instruments were completed without interruptions. The test pertaining to the recall of the form of the test was completed first.

### Scoring of the Completed Test Instruments

The tests completed by the subjects in each of the groups in the sample were scored by the experimenter immediately following the data-gathering sessions. The data generated by each of the test instruments were scored in the manner set out below.

The recall-of-structure test. The structure or form of the text recalled was scored by matching each subject's set of responses against the set of correct responses. As can be seen from Appendix F, the test calls for the correct sequencing of five items which together represent the form or structure of the text. Each incorrectly placed item in a subject's response sheet incurred a penalty equivalent to the square of the number of positions by which it was displaced from its correct position. The squaring was included as part of the scoring system to reflect adequately the difference in effectiveness of recall between an item displaced by one place and those items displaced by two or more places. That is, it was considered that an item displaced by two or more places indicated a far more inappropriate level of recall of structure than would have been represented simply by the number of places by which it was displaced from its correct position. To calculate each subject's total score on the test of recall-of-structure the item scores were summed.

Thus, the subject who produced B, A, C, D, E instead of the correct sequence of A, B, C, D, E incurred a penalty of 2, i.e., the square of 1 for the displacement of A by one position plus the square of 1 for the displacement of B. On the other hand, the subject who produced E, A, B, C, D instead of A, B, C, D, E incurred a penalty of 20, i.e., the square of 4 (16) for the displacement of E

by 4 positions plus four times the square of 1 for the displacement of A, B, C, D each by one position.

Table 1 shows the results scored by the subjects in the five groups. Text conditions have been used to designate groups.

It should be noted that the high scores represent poor performances on the recall of text structure and low scores represent good recall of text structure.

Table 1

Recall-of-structure scores for subjects in each of the test groups

GROUPS					
TEXT	TEXTH	TEXTO	TEXTHO	TEXTOS	
2	4	0	0	0	
2	8	0	0	0	
2	10	0	0	0	
2	10	0	0	0	
10	10	0	0	2	
10	10	2	0	2	
10	10	2	0	2	
10	10	2	0	2	
10	10	2	2	2	
10	10	2	2	2	
12	12	2	2	2	
12	12	2	2	2	
12	12	2	6	4	
12	12	2	6	6	
12	12	4	6	6	
12	12	6	6	6	
12	12	6	6	6	
13	16	10	8	6	
13	20	10	8	9	
20	20	12	12	9	
36	36	16	18	15	
Means	11.143	12.762	3.952	4.00	3.952



The recall-of-facts test. The content of the text recalled was scored by counting the number of facts recalled by each subject. Facts were assessed for meaning only. Accurate paraphrases were scored as correct. Incorrect spelling was ignored provided the intended word could be readily identified. Facts were scored as correct regardless of the order in which they were recalled. Each subject's recall protocol was check-scored independently by two members of staff from the school from which the subjects were drawn.

Table 2 shows the results scored by the subjects in the five groups. Again, text conditions have been used to designate groups.

Table 2

Recall-of-facts scores for subjects in each of the test groups

GROUPS					
	TEXT	TEXTH	TEXTO	TEXTHO	TEXTHOS
	7	8	10	20	22
	9	13	10	20	23
	9	13	13	22	25
	9	13	14	22	26
	10	13	15	23	27
	10	15	17	23	27
	10	15	17	24	27
	11	16	17	24	27
	13	20	17	25	28
	13	20	19	26	28
	13	21	19	26	29
	15	22	20	26	29
	15	22	20	26	30
	16	22	21	27	30
	17	24	22	27	31
	17	24	23	28	31
	18	27	23	28	31
	19	27	25	29	31
	20	28	26	29	33
	21	29	32	30	35
	21	36	33	33	35
Means	13.952	20.381	19.667	25.619	28.810

### Analysis of the Data

Four separate data analyses were carried out.

In the first analysis for task one, the dependent variable was recall of the content of the text. A one-way analysis of variance was used to ascertain whether or not significant differences existed among the means generated by the five groups into which the sample had been systematically stratified.

In the second analysis for task one, the dependent variable was also the recall of the content of the text. Tukey HSD a posteriori, multiple comparison tests were carried out to determine if any of the ten, possible, paired comparisons was significant.

In the first analysis for task two, the dependent variable was recall of the text structure. A one-way analysis of variance was again used to determine the existence of significant differences among the means generated by the groups in the sample.

The second analysis for task two used recall of the text structure as the dependent variable. Tukey HSD a posteriori, multiple comparisons were again used to identify the existence of any significant comparisons among the ten sets of paired comparisons carried out.

The findings resulting from the above analyses are set out in Chapter 5.

## CHAPTER 5

## FINDINGS AND DISCUSSION

This chapter provides data on the performance of the subjects in the five groups on the two experimental tasks of recall of text content and recall of text structure (form).

Recall of Content

The results obtained by the five groups on the test of recall of text content are set out in Table 3. This table shows distinct variation across the group means.

Table 3

Means of the results achieved by the five groups on the recall of content test

Group	Number	Mean
TEXT	21	13.952
TEXTH	21	20.381
TEXTO	21	19.667
TEXTHO	21	25.619
TEXTHOS	21	28.810

The one-way analysis of variance conducted on these data revealed a significant statistical difference among the five sets of results ( $F = 27.39$ ;  $df = 4, 100$ ;  $p = .0001$ ).

This analysis was intended to address the general research question outlined in Chapter 3 and the first hypothesis derived from it as set out below:

**Hypothesis 1**

On the dimension of recall of text content, there will be no significant difference among the recall protocols of Year Seven readers who have read the informational text "The Cane Toad", prepared according to the formats for the groups TEXT, TEXTH, TEXTO, TEXTHO, TEXTHOS (see Definitions, Chapter 1 for the descriptions of these groups on the basis of various text formats).

The evidence of the above analysis does not support the hypothesis of no significant difference among the recall of content protocols of the five groups. Thus, Hypothesis 1 is found to be untenable and, therefore, is rejected.

**Comparisons Among Group Means on Recall of Content**

With the five groups in the experimental sample, the following pairs of comparisons were possible:

- a) TEXT and TEXTH,
- b) TEXT and TEXTO,
- c) TEXT and TEXTHO,
- d) TEXT and TEXTHOS,
- e) TEXTH and TEXTO,
- f) TEXTH and TEXTHOS,
- g) TEXTH and TEXTHOS,
- h) TEXTO and TEXTHO,
- i) TEXTO and TEXTHOS,
- j) TEXTHO and TEXTHOS.

The results obtained by the Tukey HSD multiple comparisons are shown in Table 4. This table shows the pairs of means between which there are significant differences.

Table 4

Tukey's Studentized Range (HSD) Test for the variable of recall of content (number of facts)

Tukey Grouping	Mean	Number	Group
A	28.810	21	TEXTHOS
A	25.619	21	TEXTHO
B	20.381	21	TEXTH
B	19.667	21	TEXTO
C	13.952	21	TEXT

**Note:** Means with the same Tukey grouping are not significantly different at  $p < 05$ .

The multiple comparisons conducted on these data revealed significant differences between the following pairs of data sets:

- 1) TEXT compared with TEXTH
- 2) TEXT compared with TEXTO
- 3) TEXT compared with TEXTHO
- 4) TEXT compared with TEXTHOS
- 5) TEXTH compared with TEXTHO
- 6) TEXTH compared with TEXTHOS
- 7) TEXTO compared with TEXTHO
- 8) TEXTO compared with TEXTHOS

Thus, eight of the 10 pairs of comparisons conducted on the data generated by the recall of facts task were significant.

These analyses were intended to address the general research question outlined in Chapter 3 and hypotheses 2a - 2j derived from it as set out below:

**Hypotheses 2a - 2j**

On the dimension of recall of text content, there will be no significant comparisons between the recall protocols of the following pairs of groups:

- a) TEXT and TEXTH,
- b) TEXT and TEXTO,
- c) TEXT and TEXTHO,
- d) TEXT and TEXTHOS,
- e) TEXTH and TEXTO,
- f) TEXTH and TEXTHO,
- g) TEXTH and TEXTHOS,
- h) TEXTO and TEXTHO,
- i) TEXTO and TEXTHOS,
- j) TEXTHO and TEXTHOS.

The findings below are derived from the Tukey HSD comparisons reported above.

Hypotheses 2(a), 2(b), 2(c), 2(d), 2(f), 2(g), 2(h), and 2(i) are found to be without support and are, therefore, rejected.

Hypotheses 2(e) and 2(j) are supported and are, therefore, accepted.

These findings mean that when the children in this sample read "The Cane Toad" with in-text headings; a pre-text outline; in-text headings and a pre-text outline; or, in-text headings, a pre-text outline and a post-text summary, they were able to recall significantly more facts than when they read the same



text without any text-based aids. These data, with their associated hypotheses, are presented in Table 5.

**Table 5**

Formats which produced significantly better recall protocols than the format comprised of text only. The associated, rejected, null hypotheses are also shown.

Superior Format	Mean of Superior Format	Mean of Text Only Format	Rejected Null Hypothesis
Text with Headings (TEXTH)	20.381	13.952	2(a)
Text with Outline (TEXTO)	19.667	13.952	2(b)
Text with Headings and Outline (TEXTHO)	25.619	13.952	2(c)
Text with Headings, Outline and Summary (TEXTHOS)	28.810	13.952	2(d)

These findings also mean that when these children read "The Cane Toad" with in-text headings and a pre-text outline, or with in-text headings, a pre-text outline, and a post-text summary, they recalled significantly more facts than when the same text was read with in-text headings only. These data, with their associated hypotheses, are presented in Table 6.

Table 6

Formats which produced significantly better recall-of-facts protocols than the format comprised of the text with in-text headings only. The associated, rejected, null hypotheses are also shown.

Superior Format	Mean of Superior Format	Mean of In-text Headings Format	Rejected Null Hypothesis
Text with Headings and Outline (TEXTHO)	25.619	20.381	2(f)
Text with Headings, Outline and Summary (TEXTHOS)	28.810	20.381	2(g)

These findings further mean that when "The Cane Toad" was read with in-text headings, a pre-text outline and a post-text summary, more facts were recalled than when the text was preceded only by a pre-text outline. These data, with their associated hypotheses, are presented in Table 7.

Table 7

Formats which produced significantly better recall-of-facts protocols than the format comprised of the text with a pre-text outline only. The associated, rejected, null hypotheses are also shown.

Superior Format	Mean of Superior Format	Mean of Text with outline	Rejected Null Hypothesis
Text with Headings and Outline (TEXTHO)	25.619	19.667	2(h)
Text with Headings, Outline and Summary (TEXTHOS)	28.810	19.667	2(i)

Finally, these findings mean that when these children read "The Cane Toad" with in-text headings, they did not recall significantly more facts than when they read the text with only a pre-text outline ( $M = 20.381$  compared with  $M = 19.667$ ). Also there is no significant difference in the number of facts recalled when the text was read with in-text headings together with a pre-text outline ( $M = 25.619$ ) and when it was read with in-text headings, a pre-text outline and a post-text summary ( $M = 28.810$ ).

### Summary

The findings discussed so far clearly indicate that this group of children, when reading the text "The Cane Toad" under test conditions, were significantly aided in their recall of text content by the following text-based aids:

- \* in-text headings;
- \* a pre-text outline;
- \* in-text headings combined with a pre-text outline;
- \* in-text headings combined with a pre-text outline and a post-test summary.

It is also worthy of note that the recall of the facts following the reading of the experimental text was best when the text contained in-text headings, a pre-text outline and a post-test summary though this format did not produce significantly better results than when the format consisted of in-text headings and an outline.

The text, accompanied by a pre-text outline, produced enhanced recall of facts as did the text containing in-text headings but neither was superior to the other.

The text, accompanied by a pre-text outline and containing in-text headings, produced enhanced recall-of-text content. The text, accompanied by in-text headings also produced superior recall of facts. Neither of these presentation formats produced results which were superior to those produced by the other.

### Recall of Structure

The results obtained by the five groups on the test of recall of structure are set out in Table 8. This table shows considerable variation across the group means.

Table 8

Means of the results achieved by the five groups on the recall of structure task

GROUP	NUMBER	MEAN
TEXT	21	11.143
TEXTH	21	12.762
TEXTO	21	3.952
TEXTHO	21	4.000
TEXTHOS	21	3.952

The one-way analysis of variance conducted on these data revealed a significant statistical difference among the five sets of results derived from the test on the recall of text structure ( $F = 13.53$ ;  $df = 4,100$ ;  $p = .0001$ ).

This analysis was intended to address the general research question outlined in Chapter 3 and the third hypothesis derived from it.

Hypothesis 3

On the dimension of recall of text structure, there will be no significant difference among the recall protocols of Year Seven readers who have read the informational text, "The Cane Toad" prepared according to the formats for groups TEXT, TEXTH, TEXTO, TEXTHO, TEXTHOS (see definitions Chapter 1 for the descriptions of these groups on the basis of various text formats).

The evidence of the above analysis does not support this hypothesis of no significant difference among the recall-of-structure protocols of the five groups. Thus, Hypothesis 3 is found to be untenable and, therefore, is rejected.

#### Comparison Among Group Means on Recall of Text Structure

With the five groups in the experimental sample, the following pairs of comparisons were possible:

- a) TEXT and TEXTH,
- b) TEXT and TEXTO,
- c) TEXT and TEXTHO,
- d) TEXT and TEXTHOS,
- e) TEXTH and TEXTO,
- f) TEXTH and TEXTHO,
- g) TEXTH and TEXTHOS,
- h) TEXTO and TEXTHO,
- i) TEXTO and TEXTHOS,
- j) TEXTHO and TEXTHOS.

The results obtained as a result of the application of the Tukey HSD multiple comparisons are shown in Table 9. This table shows the pairs of means between which there are significant differences.

Table 9

Tukey's Studentized Range (HSD) Test for the variable of recall of text structure

TUKEY GROUPING	MEAN	NUMBER	GROUP
B	3.952	21	TEXTHOS
B	3.952	21	TEXTO
B	4.000	21	TEXTHO
A	11.143	21	TEXT
A	12.762	21	TEXTH

**Note:** Means with the same Tukey grouping are not significantly different at  $p < .05$ .

The multiple comparisons conducted on these data revealed significant differences between the following pairs of data sets:

- 1) TEXT compared with TEXTO
- 2) TEXT compared with TEXTHO
- 3) TEXT compared with TEXTHOS
- 4) TEXTH compared with TEXTO
- 5) TEXTH compared with TEXTHO
- 6) TEXTH compared with TEXTHOS

Thus, six of the 10 pairs of comparisons conducted on the data generated by the-recall-of-structure/form) task were significant.

These analyses were intended to address the general research question outlined in Chapter 3 and hypotheses 3a - 3j derived from it.

#### Hypotheses 3a - 3j

On the dimension of recall of text structure, there will be no significant comparisons between the recall-of-structure protocols of the following pairs of groups:

- a) TEXT and TEXTH,
- b) TEXT and TEXTO,
- c) TEXT and TEXTHO,
- d) TEXT and TEXTHOS,
- e) TEXTH and TEXTO,
- f) TEXTH and TEXTHO,
- g) TEXTH and TEXTHOS,
- h) TEXTO and TEXTHO,
- i) TEXTO and TEXTHOS,
- j) TEXTHO and TEXTHOS.

The findings discussed below are derived from the Tukey HSD comparisons reported above.

Hypotheses 3(b), 3(c), 3(d), 3(e), 3(f), and 3(g) are found to be without support and are, therefore, rejected.

Hypotheses 3(a), 3(h), 3(i), and 3(j) are supported and are, therefore, accepted.

These findings mean that when the children in this sample read "The Cane Toad": accompanied by a pre-text outline; with in-text headings and accompanied by a pre-text outline; or with in-text headings and accompanied by a pre-text outline and a post-text summary, they were able to recall the structure/form of the text better than when they read the same text without any text-based



aids. These data, with their associated hypotheses, are presented in Table 10.

**Table 10**

Formats which produced significantly better recall of text structure protocols than the format comprised of text only. The associated, rejected, null hypotheses are also shown.

Superior Format	Mean of Superior Format	Mean of Text only Format	Rejected Null Hypothesis
Text with Outline (TEXTO)	3.952	11.143	3(b)
Text with Headings and Outline (TEXTHO)	4.000	11.143	3(c)
Text with Headings, Outline and Summary (TEXTHOS)	3.952	11.143	3(d)

These findings also mean that when the children in this sample read "The Cane Toad": accompanied by a pre-text outline; accompanied by a pre-text outline and with in-text headings; or accompanied by a pre-text outline and a post-text summary together with in-text headings, they were able to recall the structure/form of the text better than when they read the same text with in-text headings only. These data, with their associated hypotheses, are presented in Table 11.

Table 11

Formats which produced significantly better recall-of-text-structure protocols than the format comprised of the text containing in-text headings

Superior Format	Mean of Superior Format	Mean of Text with Headings	Rejected Null Hypothesis
Text with Outline (TEXTO)	3.952	12.762	3(e)
Text with Headings and Outline (TEXTHO)	4.000	12.762	3(f)
Text with Headings, Outline and Summary (TEXTHOS)	3.952	12.762	3(g)

Finally, these findings mean that when these children read "The Cane Toad" with in-text headings, they did not recall a significantly better version of the text's structure than when they read the text without text-based aids ( $M = 12.762$  compared with 11.143).

There is also evidence that these readers were unable to recall a significantly superior version of the structure of the text after reading the text accompanied by a pre-text outline ( $M = 3.952$ ) when compared with the version of the structure recalled after reading the version of the text with a pre-text outline and in-text headings.

The data analysed for the recall of text structure task indicate that recall protocols for the text with outline and the text with an outline, headings and a summary were not significantly different.

Likewise, the data analysed for the recall of text structure task show that the recall protocols for the text with headings and an outline and the text with an outline, headings and a summary were not significantly different.

### Summary

The findings discussed in this section on the recall of the structure of the text, clearly demonstrate that, for this group of Year Seven children, reading the text "The Cane Toad" under test conditions, their recall of the structure of the text was significantly enhanced by having the text presented with the following text-based aids when compared with their performance using a text-only condition:

- \* a pre-text outline;
- \* a pre-text outline combined with in-text headings;
- \* a pre-text outline combined with in-text headings and a post-text summary.

From the data displayed in Table 9, it is clear that the causal factor in the enhanced recall of text structure which resulted from the use of the TEXTO (text plus outline), TEXTHO (text plus headings and outline), and TEXTHOS (text plus headings, an outline and a summary) formats, is the use of a carefully compiled outline. As explained in Chapter 4, this outline was "carefully compiled" in the sense that it consisted of five superordinate descriptive phrases. The important point about these descriptive phrases is that they were

closely representative of the schematic text framework according to which the text was originally written. These were designed on the basis of recent work in a text-type or genre approach to the teaching of writing (Latham and Sloan, 1989).

It is significant that the text format which included only in-text headings as a text-based aid did not enhance the recall of structure in any important way. Also, the addition of a post-text summary did not enhance the recall of text structure.

## CHAPTER 6

### DISCUSSION OF FINDINGS

This study was concerned with text-based ways of assisting readers to enhance their recall of the content of informational texts. The specific thrust of the investigation was to examine text-based ways of improving Year Seven readers' recall of the content of informational texts. The study was carried out with children in the final grade of the primary school because this grade marks the end of the formal teaching of reading skills and is followed by the dramatically increased reading of informational texts which characterises the years of secondary schooling.

The study looked at two aspects of the task of the recall of text content. The first task was the recall of facts. The second was the recall of text structure. The second was considered worthy of inclusion because of the very likely facilitating role of a knowledge of text structure on the recall of facts and the organization of the recalled facts into the logical framework originally designed by the text's author. Notwithstanding the importance of the point made above about the recall of text structure, it was considered to be beyond the scope of this study to ascertain whether or not the better performers on the recall of facts were also the better performers on the recall of text structure.

#### The Theory Tested in this Study

This study was based on a schema-theoretic view of reading (Sloan and Whitehead, 1986; Sloan and Latham, 1985; Pearson 1984). The essence of this theory is that comprehension is the result of processing text in terms of the reader's own prior knowledge. Note that, in the context of the present study, the recall of the content of a text is considered to be a valid correlate of reading comprehension. Thus, findings regarding the recall of text content can be inferred to represent findings pertaining to the comprehension of that text. In this way, it is asserted that a theory of reading which accounts for comprehension in terms of the reader's prior knowledge, is an appropriate framework within which to investigate readers' recall of informational texts.

In schema theory, a reader's prior knowledge can be characterised as the schemata which he/she possesses with regard to all aspects of the world and his/her experiences within it. Such experiences include knowledge of events, facts and procedures pertaining to the phenomena of the world and the processes which humans harness in interacting with it. A reader's schemata include his/her knowledge of language and how it works and a knowledge of the strategies required for successful reading, even though this knowledge may be held tacitly or implicitly. Thus, in a somewhat oversimplified way, it is useful to think of the reader activating two different types of schemata. On the one hand are the schemata pertaining to world phenomena which are triggered by the print. On the other hand are

the executive or strategy-oriented schemata which should facilitate the reader's activation and/or generation of schemata appropriate to the text being processed. The theoretical position which is fundamental to the study reported here is that, for the successful recall of an informational text, the reader must be able to activate both content and form schemata. Clearly, most schema activation must be triggered as a result of a reader's interaction with print. An aspect of schema theory in reading which is basic to this study is that a text can be endowed with clear, overt signals which activate content and/or form schemata. Such overt signals include those investigated in this study - in-text headings, pre-text outlines, and post-text summaries.

Text-based aids and schema activation. Following the work of King, George, Hannon and Glover (1989), this investigation was based on three theoretical notions. The first is that a correctly compiled pre-text outline will activate both form and content schemata. The second is that a correctly compiled post-text summary will rehearse and, thus, reinforce both form and content schemata. The final notion is that appropriate in-text headings will activate content schemata.

For this theory, as outlined, to be fully valid, the findings presented in Chapter 5 would need to indicate the following:

- 1) The use of in-text headings enhanced the recall of facts.
- 2) The use of a pre-text outline enhanced the recall of

facts and text structure.

- 3) The use of a pre-text outline and in-text headings enhanced the recall of facts and structure. The recall of facts should be even better than for the use of in-text headings alone because of the claimed recall-enhancing effect of the successful recall of the structure employed to convey the facts.
- 4) The use of a pre-text outline, in-text headings and a post-text summary enhanced the recall of facts and structure. The results for this format enhanced the recall of content and structure because of the rehearsal effect of the post-text summary.

### Discussion

Outline and headings used separately. As reported in Chapter 5, in-text headings had approximately the same enhancing effect on the recall of the content of an informational text as the use of a pre-text outline.

This finding validates the theoretical claim that in-text headings and a pre-text outline both enhance the activation of content schemata.

As also reported in Chapter 5, the use of in-text headings had no discernible impact on the recall of the structure of the text. On the other hand, the use of the pre-text outline significantly enhanced the recall of the text's structure.



This finding validates the theoretical claim that a pre-text outline activates both content and form schemata.

Outline and headings used in combination. The combination of a pre-text outline with in-text headings also resulted in the significantly enhanced recall of the content and the structure of an informational text. It is noteworthy that the recall protocols were significantly superior to those produced by the in-text headings only and the pre-text outline only conditions.

These findings validate the theoretical claim that in-text headings and a pre-text outline improve the recall of text content and structure. They also provide support for the aspect of the theory which suggests that superior recall of text structure itself results in the improved recall of content.

Outline, headings and summary used in combination. The results of the format which provided all three aids together - the outline, the in-text headings, and the summary - improved recall of content and structure. This improvement was of the same order as was achieved with the use of the headings-outline combination for both tasks.

This finding reinforces the theoretical claims about the usefulness of in-text headings and a pre-text outline on the activation of both content and structure schemata. It suggests that there is no support in these data for the theoretical notion that a post-test summary, in

combination with headings and a pre-text outline, will further enhance either type of schemata activation. This does not preclude the possibility that the summary, used separately or in combination with in-text headings might activate both content and form schemata as effectively as an outline in combination with headings. To establish the validity of this conjecture, it would have been necessary to have included the condition of in-text headings and a post-text summary.

## CHAPTER 7

### CONCLUSION

On the basis of the data presented in Chapter 6 and discussed in Chapter 7, it would seem safe to conclude that the theory proposed in Chapter 3 and summarised in Chapter 6 provides an adequate explanation of the effects of in-text headings and pre-text outlines on recall. That is, given that a schema-theoretic view of reading is an adequately powerful explanation of the reading process, and that headings relate to content schemata, and that pre-text outlines relate to both form and content schemata, the results of this study can be satisfactorily explained in theoretical terms instead of as random happenings.

#### Limitations of the Interpretations Placed upon the Findings

In a study such as this, there must be care exercised in the interpretations placed on the findings and the extent to which these are deemed generalizable to all reading situations, the reading of all texts and to all readers.

Another view. Reading is notoriously resistant of direct observation. All researchers, for as long as reading has been the subject of serious research, have been constrained by the fact that deliberations about the reading process on the basis of research findings

have always involved the use of a correlate of the process as the dependent variable rather than the process itself. The present study is no exception. The dependent variable in both tasks involved reading only to the extent that decoding to meaning had to preface retrieval for the writing of recalled facts and structure which were, in fact, the dependent variables. From the findings of these two experiments, it cannot be concluded that the activation of content and form schemata had an impact on reading alone, or the act of retrieval and writing alone. The potential for the confounding of one with the other is clearly present. Since this study was aimed at examining ways of enhancing recall of written texts, it could be claimed that it is of no serious consequence whether the improvement was effected through the enhancement of the reading process or the processes of retrieval and writing. It does matter to the extent that the study was based on a theoretical view of reading rather than other aspects of cognitive processing. It would, of course, be possible to argue that a schema-theoretic view of reading was originally derived from a schema-theoretic view of information processing in general. Thus, if the improvement in the recall of text has resulted from improved retrieval triggered by the activation of appropriate schemata, the findings could be accounted for in terms of a more general schema theory.

**The sample.** In Chapter 4, the claim was made that by using all the Year Seven pupils at a large primary school in the northern suburbs of the Perth Metropolitan Area, a sample was created which covered all socio-economic strata in Western Australia. It is a fact that the specific school draws its population from all socio-economic levels. Since there were no data collected to substantiate this claim, the nature of the sample must limit the generalizability of the findings to the wider population of Year Seven students in Western Australia.

**The text.** Again in Chapter 4, the single text used in this study was described. This text was written according to the clearly delineated framework of writing stages for the production of a scientific report about an animal (Latham and Sloan, 1989). This meant that the text used was probably better organized and more logically developed than other such texts not written according to that paradigm. Caution should, therefore, be exercised in generalizing these findings to all types of informational texts.

**The text-based aids.** Because the outline and the headings used as text-based aids in this study were based on a text written according to a clearly discernible, schematic, text framework, it is possible that their schema-activating potential was greater for this text than outlines and headings derived from and servicing other more loosely written texts might be.

### Further Research

The findings of this research suggest that further research, designed to extend the present project and to overcome the above limitations, should now be undertaken.

No attempt was made in this study to investigate the ways in which good readers may have reacted to the text-based aids when compared with poor readers. To establish the reaction of different types of readers to the use of text-based aids with informational texts would seem to be worthwhile.

### Implications of the Study

In spite of the limitations discussed in this chapter, it is clear from the findings of this study that the recall of the content and structure/form of informational texts by primary school children preparing to move into the heavy informational reading demands of the high school could be significantly enhanced by the use of structured texts accompanied by carefully formulated pre-text outlines and in-text headings. This study suggests that one way to ensure that such text-based aids are carefully formulated is to produce them according to the writing paradigms designed by Latham and Sloan (1989) which take due cognizance of the power of a schema-theoretic view of language processing, especially reading and writing.

Perhaps the increasing reading-for-information demands being placed on children as they move into the secondary school suggest that the findings of this and related studies should be conveyed to the writers of informational texts for upper primary and lower secondary students. In this way, these writers may be persuaded to produce school texts better able to promote comprehension than inhibit it as many currently used texts seem to do.

## REFERENCES

- Adams, M.J. (1982). Models of reading. In W. Kintsch (Ed.) Language and comprehension (pp.193-205). Amsterdam: North-Holland Publishing Company.
- Adams, M.J. & Collins, A. (1979). A schema-theoretic view of reading. In R. Freedle (Ed), New directions in discourse processing. New Jersey: Albex Publishing Corporation.
- Ausubel, DP. (1968). Educational psychology: A cognitive view. New York: Holt, Rinehart and Winston.
- Bransford, J.D., & Johnson, M.K. (1972). Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behaviour, 11, 717-726.
- Britton, B.K. (1986, March). Signalling. Paper presented at the annual meeting of the American Educational Research Association, March, Chicago.
- Britton, B.K., Glynn, S.M., Meyer, B.J.F., & Penland, M.J. (1982). Effects of text structure on use of cognitive capacity during reading. Journal of Educational Psychology, 74, 51-61.
- Brooks, L.W. (1981). Instructing students on the use of headings as aids in processing scientific text. Paper presented at the annual meeting of the American Educational Research Association, Boston.
- Campbell, D.T. & Stanley, J.C. (1966). Experimental and quasi-experimental designs for research. Houghton Mifflin: Dallas.
- Collins, A.M., & Loftus, E.F. (1975). A spreading activation theory of semantic processing. Psychological Review, 82 (6), 407-428.
- Collins, A.M., & Quillian, M.R. (1972). Experiments on semantic memory and language comprehension. In L.W. Gregg (Ed.), Cognition in learning and memory (pp.201-220). New York: Wiley.
- Crouse, J.H. & Edstein, P. (1972). Effects of encoding cues on prose learning. Journal of Educational Psychology, 63, 309-313.
- Dansereau, D.F. (1982). Effects of individual differences, processing instructions and outline and heading characteristics on learning from introductory science text. Washington, DC: National Institute of Education.
- de Beaugrande, R. (1981). Design criteria for process models of reading. Reading Research Quarterly, 26 (2), 261-309.



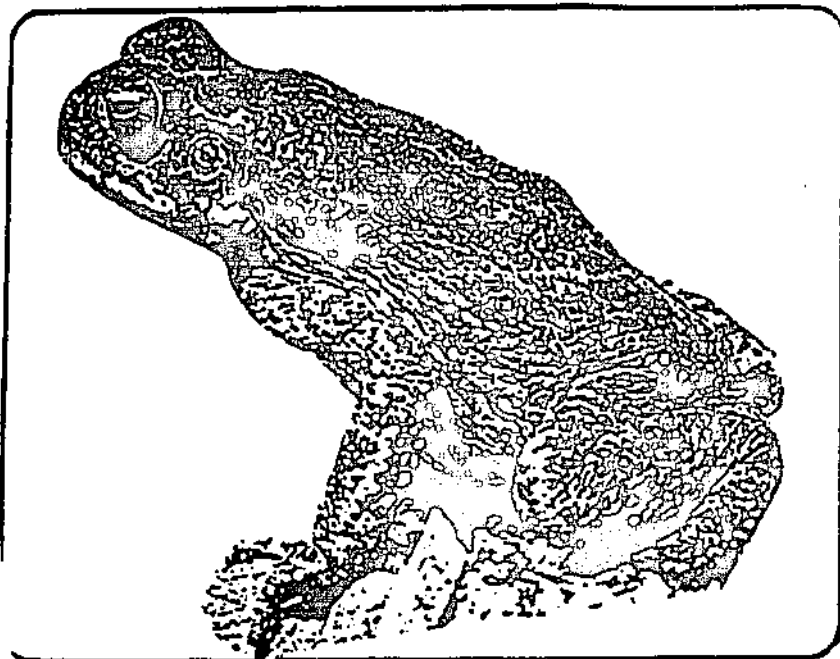
- Fowler, R.L. & Barker, A.S. (1974). The effectiveness of highlighting for retention of text material. Journal of Applied Psychology, 59, 358-364.
- Gay, L.R. (1987). Education research: Competencies for analysis and application. (3rd ed.) Columbus: Merrill Publishing Company.
- George, G. (1985). Preparation for instruction: The effects of a title and a time delay on recall of facts from a paragraph. Dissertation submitted to Howard University, Washington, DC. Cited in Krug, D., George, B., Hannon, S.A., & Glover, J.A. (1989). The effect of outlines and headings on readers' recall of text. Contemporary Educational Psychology, 14, 111-123.
- Glover, J.A., Dinnell, D., Halpain, D., McKee, T., Corkill, A.J., and Wise, S. (1988). The effects of across chapter signals on recall of text. Journal of Educational Psychology, 80, 1-16.
- Glynn, S.M. & DiVesta, F.J. (1977). Control of prose processing via instructional and typographical cues. Journal of Educational Psychology, 71, 593-603.
- Grimes, R.E. (1975). The thread of discourse. The Hague: Mouton.
- Halliday, M.A.K. & Hasan, R. (1976). Cohesion in English. London: Longman.
- Harste, J.C. (1985). Portrait of a new paradigm: Reading comprehension research. In A. Grismore (Ed.), Landscapes: A state-of-the-art assessment of reading comprehension research, 1974-1984, pp1-24, Bloomington: Indiana University, Language Education Department.
- Hartley, J. (1980). The effect of headings on children's recall from prose text. British Journal of Educational Psychology, 50, 304-307.
- Hartley, J., Kenely, J., Owen, G., & Trueman, M. (1980). The effects of headings on children's recall from prose text. British Journal of Educational Technology, 17, 164-174.
- Hartley, J., & Trueman, M. (1982). The effects of summaries on the recall of information from prose: Five experimental studies. Human Learning, 1, 63-82.
- Hartley, J., Trueman, M., & Brunhill, P. (1980). Some observations on producing and measuring readable writing. Programmed Learning and Educational Technology, 6, 124-132.

- Krug, D., George, B., Hannon, S.A., & Glover, J.A. (1989). The effect of outlines and headings on readers' recall of text. Contemporary Educational Psychology, 14, 111-123.
- Latham, R.O.M. & Sloan, P. (1979). A modern view of reading. Melbourne: Thomas Nelson.
- Latham, R.O.M. & Sloan, P. (1989). A text-type approach to the teaching of writing. Perth: Instructional Publishing - West-Ed Enterprises.
- Lorch, R.F. & Chen, A.H. (1986). Effects of number signals on reading and recall. Journal of Educational Psychology, 78, 263-270.
- Mannes, S.M. & Kintsch, W. (1987). Knowledge organisation and text organisation. Cognition and Instruction, 4, 91-115.
- Mayer, R.E., Dyck, S.L., & Cook, L.K. (1984). Techniques that help readers build mental models from scientific text: Definitions, pretraining and signalling. Journal of Educational Psychology, 76, 1089-1105.
- Meyer, B.J.F. (1975). The organisation of prose and its effects on memory. Amsterdam: North-Holland
- Morgan, A.L. (1983). Context: the web of meaning. Language Arts, 60 (3), 305-314.
- Neisser, U. (1976). Cognition and reality. San Francisco: Freeman.
- Orne, M.T. (1962). On the social psychology of the psychological experiment: With particular reference to demand characteristics and their implications. American Psychologist, 17, 776-783.
- Pearson, P.D. (1984). A context for instructional research on reading comprehension. In J.F. Flood (Ed.), Promoting reading comprehension. Newark, Delaware: IRA.
- Pearson, P.D. (1985). Changing the facts of reading comprehension instruction. The Reading Teacher, 38, 724-738.
- Pichert, J.W. & Anderson, R.C. (1977). Taking different perspectives on a story. Journal of Educational Psychology, 69, 309-315.
- Puhl, L. (1989). The cane toad. A text produced for instructional purposes in the unit COM2300: Communications 3. Edith Cowan University, Mount Lawley Campus: Mount Lawley.
- Quillian, M.R. (1962). A revised design for an understanding machine. Mechanical Translation, 7, 17-29.

- Quillian, M.R. (1967). A theory and simulation of some basic semantic capabilities. Behavioral Science, 12, 410-430.
- Rigney, J.W. & Munro, A. (1977). On cognitive strategies for processing text. Technical Report 80, Los Angeles: University of Southern California, Behavioural Technology Laboratories.
- Sloan, P. (1983). Primed and unprimed representational associative semantic memory structures and the reading performance of year seven children. Unpublished doctoral dissertation, Murdoch University, Perth.
- Sloan, P. & Latham, R.O.M. (1985). External study guide for RDG5101: The reading process. Perth: Western Australian College of Advanced Education.
- Sloan, P. & Whitehead, D. (1986). Reading theories explained. Primary English Notes, 55, 1-8.
- Spiro, R.J. (1977). Remembering information from text: The state of the art. In R.C. Anderson, R.J. Spiro, & W.E. Montague (Eds.), Schooling and the acquisition of knowledge.
- Swarts, H. (1980). Headings in documents can mislead readers. Washington, DC: National Institute of Education.
- Whitney, P. (1987). Psychological theories of elaborative inferences: implications for schema-theoretic views of comprehension. Reading Research Quarterly, 22 (3), 299-309.

## A P P E N D I X A

Carefully, read this article about the cane toad. Try to remember as much of it as you can. You will have enough time to read the article several times. When you are told to stop reading, you will be asked to write down all the facts about the cane toad that you can remember.



#### THE CANE TOAD

The cane toad is a member of an ancient class of animals known as Amphibia. It is a true toad belonging to the family Bufonidae. The cane toad's scientific name is *Bufo marinus*.

Growing to over 20cm long, a mature cane toad is large enough to cover a small dinner plate. The Cane Toad has a short snout and a body that looks like that of a common toad. It has a large, protruding, poison gland at the base of each eardrum. Its skin is bumpy and warty, and is either grey or various shades of brown on top and is pale-yellow underneath. The cane toad also has a front-hinged tongue similar to that of the frog.

Originally a native of Central and South America, the cane toad was introduced to Queensland from Brazil in 1935. The cane toad appears to be able to tolerate a wide range of habitats from tropical to arid. Its present distribution extends from Cape York Peninsula to Coffs Harbour in New South Wales. It is steadily moving inland west of the Great Dividing Range.

Cane toads are mainly insectivorous but they also consume some vegetation. They capture insects by wrapping their tongues around them.

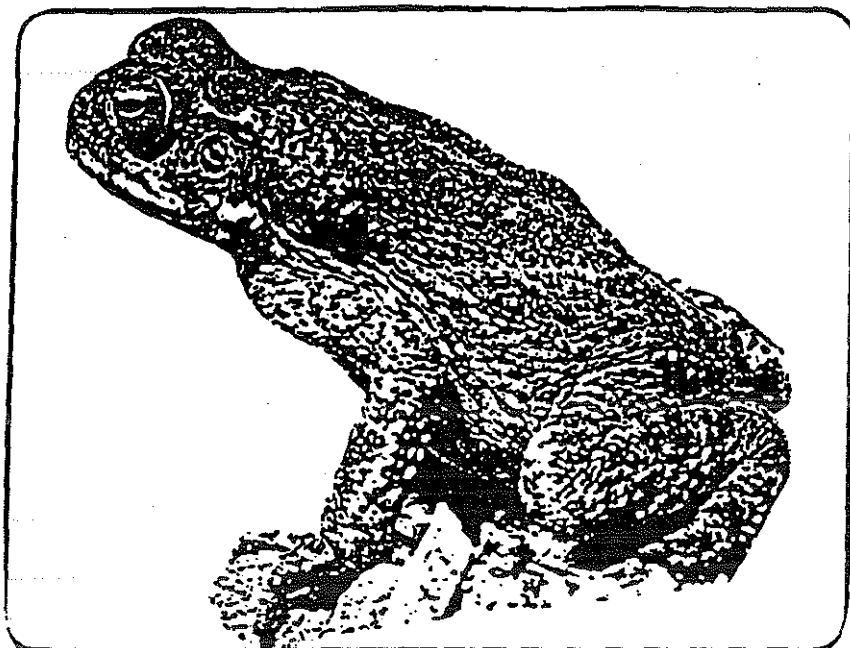
This toad is able to protect itself from natural enemies such as snakes and birds by spraying a lethal poison from its glands.

Like other amphibians, cane toads are able to live on land but they are dependent on the availability of water for breeding. Cane toads breed twice each year and lay thousands of eggs in long chains wherever water is available.

There is now a thriving cane toad industry in Australia. Hundreds of thousands of these animals are used in medical research and in science laboratories. Cargoes of frozen cane toads are also exported overseas as a source of leather.

**A P P E N D I X   B**

Carefully, read this article about the cane toad. Try to remember as much of it as you can. Headings have been placed in the text to help you. You will have enough time to read the article several times. When you are told to stop reading, you will be asked to write down all the facts about the cane toad that you can remember.



### THE CANE TOAD

#### SORT OF ANIMAL

The cane toad is a member of an ancient class of animals known as Amphibia. It is a true toad belonging to the family Bufonidae. The cane toad's scientific name is *Bufo marinus*.

#### DESCRIPTION OF ANIMAL

Growing to over 20cm long, a mature cane toad is large enough to cover a small dinner plate. The cane toad has a short snout and a body that looks like that of a common toad. It has a large, protruding, poison gland at the base of each eardrum. Its skin is bumpy and warty, and is either grey or various shades of brown on top and is pale-yellow underneath. The cane toad also has a front-hinged tongue similar to that of the frog.



#### WHERE THE ANIMAL IS FOUND

Originally a native of Central and South America, the cane toad was introduced to Queensland from Brazil in 1935. The cane toad appears to be able to tolerate a wide range of habitats from tropical to arid. Its present distribution extends from Cape York Peninsula to Coffs Harbour in New South Wales. It is steadily moving inland west of the Great Dividing Range.

#### WHAT THE ANIMAL DOES

Cane toads are mainly insectivorous but they also consume some vegetation. They capture insects by wrapping their tongues around them.

This toad is able to protect itself from natural enemies such as snakes and birds by spraying a lethal poison from its glands.

Like other amphibians, cane toads are able to live on land but they are dependent on the availability of water for breeding. Cane toads breed twice each year and lay thousands of eggs in long chains wherever water is available.

#### OTHER INFORMATION

There is now a thriving cane toad industry in Australia. Hundreds of thousands of these animals are used in medical research and in science laboratories. Cargoes of frozen cane toads are also exported overseas as a source of leather.

**A P P E N D I X   C**

This is an outline of an article called "The Cane Toad". Read it through and then carefully, read the article about the cane toad. Try to remember as much of it as you can. You will have enough time to read the outline and article several times. When you are told to stop reading, you will be asked to write down all the facts about the cane toad that you can remember.

### THE CANE TOAD

#### A. Sort of Animal

1. The cane toad is an amphibian.
2. Belongs to family Bufonidae.
3. Scientific name is Bufo marinus.

#### B. Description of Animal

1. Size
  - a) 20cm long.
  - b) Can cover small dinner plate.
2. Shape
  - a) Body like common toad.
  - b) Short snout.
3. Colour
  - a) Grey or brown on top.
  - b) Pale-yellow underneath.
4. Features
  - a) Bumpy, warty skin.
  - b) Large poison gland sticks out below each ear.
  - c) Front-hinged tongue like a frog's.

#### C. Where the Animal is Found

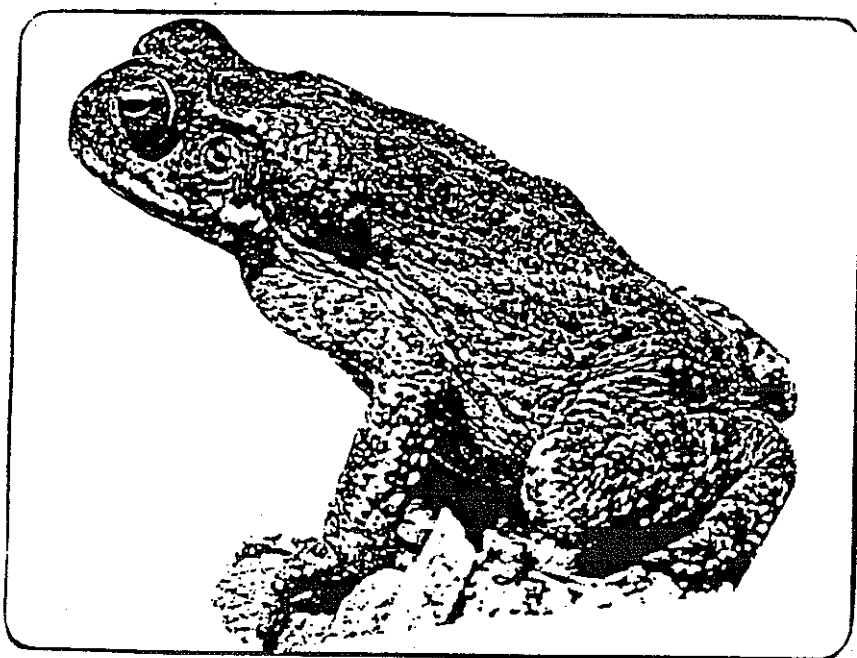
1. Came from Central and South America.
2. Introduced to Queensland from Brazil in 1935.
3. Can live in tropical and arid lands.
4. Now found from Cape York Peninsula to Coffs Harbour in NSW.

D. What the Animal Does

1. Eats.
  - a) Insects.
  - b) Some vegetation.
2. How kills.
  - a) Wraps tongue around insect.
3. How protects itself.
  - a) Sprays deadly poison from glands.
4. Reproduction.
  - a) Lives in water to breed.
  - b) Breeds twice per year.
  - c) Lays thousands of eggs in long chains.

E. Other Information

1. There is now a cane toad industry.
  - a) Thousands of cane toads used in medical research.
  - b) Thousands of cane toads used in science laboratories.
  - c) Exported overseas for leather.



**A P P E N D I X   D**

This is an outline of an article called "The Cane Toad". Read it through and then carefully, read the article about the cane toad. Try to remember as much of it as you can. Headings have also been placed in the text to help you. You will have enough time to read the outline, and the article several times. When you are told to stop reading, you will be asked to write down all the facts about the cane toad that you can remember.

#### OUTLINE OF THE CANE TOAD

##### A. Sort of Animal

1. The cane toad is an amphibian.
2. Belongs to family Bufonidae.
3. Scientific name is Bufo marinus.

##### B. Description of Animal

1. Size
  - a) 20cm long.
  - b) Can cover small dinner plate.
2. Shape
  - a) Body like common toad.
  - b) Short snout.
3. Colour
  - a) Grey or brown on top.
  - b) Pale-yellow underneath.
4. Features
  - a) Bumpy, warty skin.
  - b) Large poison gland sticks out below each ear.
  - c) Front-hinged tongue like a frog's.

##### C. Where the Animal is Found

1. Came from Central and South America.
2. Introduced to Queensland from Brazil in 1935.
3. Can live in tropical and arid lands.
4. Now found from Cape York Peninsula to Coffs Harbour in NSW.

5. Moving inland west of the Great Dividing Range.

D. What the Animal Does

1. Eats.

- a) Insects.
- b) Some vegetation.

2. How kills.

- a) Wraps tongue around insect.

3. How protects itself.

- a) Sprays deadly poison from glands.

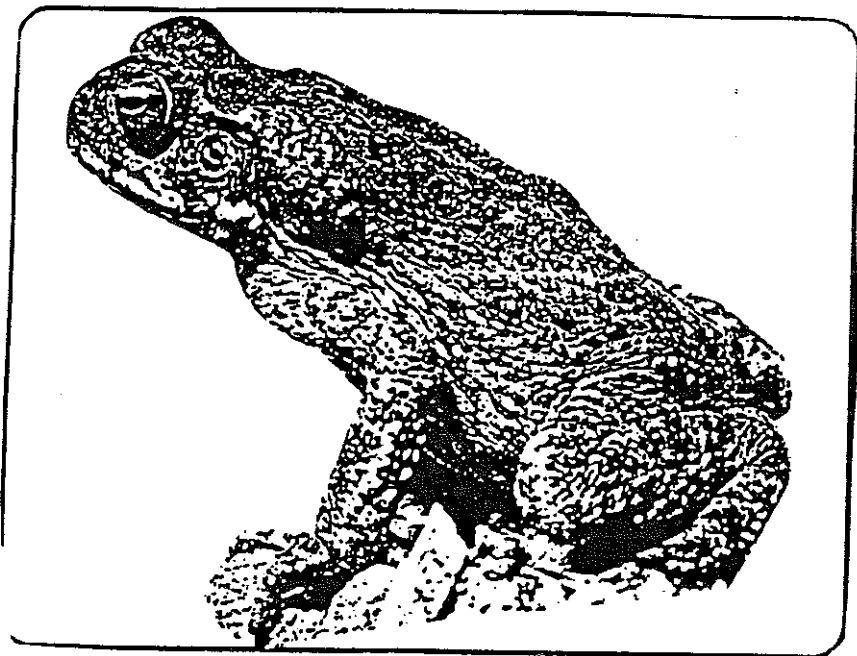
4. Reproduction.

- a) Lives in water to breed.
- b) Breeds twice per year.
- c) Lays thousands of eggs in long chains.

E. Other Information

1. There is now a cane toad industry.

- a) Thousands of cane toads used in medical research.
- b) Thousands of cane toads used in science laboratories.
- c) Exported overseas for leather.



## THE CANE TOAD

### SORT OF ANIMAL

The cane toad is a member of an ancient class of animals known as Amphibia. It is a true toad belonging to the family Bufonidae. The cane toad's scientific name is *Bufo marinus*.

### DESCRIPTION OF ANIMAL

Growing to over 20cm long, a mature cane toad is large enough to cover a small dinner plate. The cane toad has a short snout and a body that looks like that of a common toad. It has a large, protruding, poison gland at the base of each eardrum. Its skin is bumpy and warty, and is either grey or various shades of brown on top and is pale-yellow underneath. The cane toad also has a front-hinged tongue similar to that of the frog.

### WHERE THE ANIMAL IS FOUND

Originally a native of Central and South America, the cane toad was introduced to Queensland from Brazil in 1935. The cane toad appears to be able to tolerate a wide range of habitats from tropical to arid. Its present distribution extends from Cape York Peninsula to Coffs Harbour in New South Wales. It is steadily moving inland west of the Great Dividing Range.

Cane toads are mainly insectivorous but they also consume some vegetation. They capture insects by wrapping their tongues around them.

### WHAT THE ANIMAL DOES

This toad is able to protect itself from natural enemies such as snakes and birds by spraying a lethal poison from its glands.

Like other amphibians, cane toads are able to live on land but they are dependent on the availability of water for breeding. Cane toads breed twice each year and lay thousands of eggs in long chains wherever water is available.

### OTHER INFORMATION

There is now a thriving cane toad industry in Australia. Hundreds of thousands of these animals are used in medical research and in science laboratories. Cargoes of frozen cane toads are also exported overseas as a source of leather.



**A P P E N D I X   E**

READING TO REMEMBER *version 5*

This is an outline of an article called "The Cane Toad". Read it through and then carefully, read the article about the cane toad. Try to remember as much of it as you can. Headings have also been placed in the text to help you. A Summary of the text has been placed at the end to help you remember. You will have enough time to read the outline, the article and the summary several times. When you are told to stop reading, you will be asked to write down all the facts about the cane toad that you can remember.

## OUTLINE OF THE CANE TOAD

## A. Sort of Animal

1. The cane toad is an amphibian.
2. Belongs to family Bufonidae.
3. Scientific name is *Bufo marinus*.

## B. Description of Animal

1. Size
  - a) 20cm long.
  - b) Can cover small dinner plate.
2. Shape
  - a) Body like common toad.
  - b) Short snout.
3. Colour
  - a) Grey or brown on top.
  - b) Pale-yellow underneath.
4. Features
  - a) Bumpy, warty skin.
  - b) Large poison gland sticks out below each ear.
  - c) Front-hinged tongue like a frog's.

## C. Where the Animal is Found

1. Came from Central and South America.
2. Introduced to Queensland from Brazil in 1935.
3. Can live in tropical and arid lands.

4. Now found from Cape York Peninsula to Coffs Harbour in NSW.

5. Moving inland west of the Great Dividing Range.

**D. What the Animal Does**

1. Eats.

a) Insects.

b) Some vegetation.

2. How kills.

a) Wraps tongue around insect.

3. How protects itself.

a) Sprays deadly poison from glands.

4. Reproduction.

a) Lives in water to breed.

b) Breeds twice per year.

c) Lays thousands of eggs in long chains.

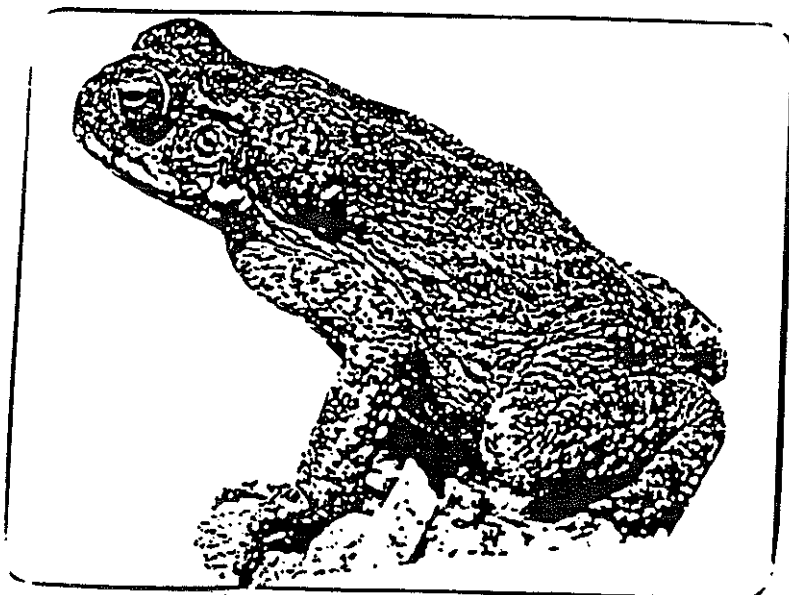
**E. Other Information**

1. There is now a cane toad industry.

a) Thousands of cane toads used in medical research.

b) Thousands of cane toads used in science laboratories.

c) Exported overseas for leather.



## THE CANE TOAD

### **SORT OF ANIMAL**

The cane toad is a member of an ancient class of animals known as Amphibia. It is a true toad belonging to the family Bufonidae. The cane toad's scientific name is *Bufo marinus*.

### **DESCRIPTION OF ANIMAL**

Growing to over 20cm long, a mature cane toad is large enough to cover a small dinner plate. The cane toad has a short snout and a body that looks like that of a common toad. It has a large, protruding, poison gland at the base of each eardrum. Its skin is bumpy and warty, and is either grey or various shades of brown on top and is pale-yellow underneath. The cane toad also has a front-hinged tongue similar to that of the frog.

### **WHERE THE ANIMAL IS FOUND**

Originally a native of Central and South America, the cane toad was introduced to Queensland from Brazil in 1935. The cane toad appears to be able to tolerate a wide range of habitats from tropical to arid. Its present distribution extends from Cape York Peninsula to Coffs Harbour in New South Wales. It is steadily moving inland west of the Great Dividing Range.

Cane toads are mainly insectivorous but they also consume some vegetation. They capture insects by wrapping their tongues around them.

### **WHAT THE ANIMAL DOES**

This toad is able to protect itself from natural enemies such as snakes and birds by spraying a lethal poison from its glands.

Like other amphibians, cane toads are able to live on land but they are dependent on the availability of water for breeding. Cane toads breed twice each year and lay thousands of eggs in long chains wherever water is available.

### **OTHER INFORMATION**

There is now a thriving cane toad industry in Australia. Hundreds of thousands of these animals are used in medical research and in science laboratories. Cargoes of frozen cane toads are also exported overseas as a source of leather.

*The summary of The Cane Toad is on the next page.*

### SUMMARY OF THE CANE TOAD

**Sort of Animal:** The cane toad is an amphibian.

**Description of Animal:** The cane toad is like a huge common toad. It is grey or brown above and a pale yellow underneath. It has poison glands and a forked tongue.

**Where the Animal is Found:** The cane toad comes from Central and South America. It is found along the north-east coast of Australia and is spreading inland.

**What the Animal Does:** The cane toad eats insects and vegetation. It kills insects by wrapping them in its tongue. It protects itself by spraying a deadly poison. The cane toad breeds in water twice each year.

**Other information:** The cane toad is used in medical and scientific research and to make leather.

**A P P E N D I X F**

**READING TO REMEMBER**

Name.....School.....Grade....

**UNJUMBLE**

These sentences are from "The Cane Toad". They are in the wrong order. Place them in the correct order by putting "1" in the box next to the sentence which should be first, "2" in the box next to the sentence which should be second, and so on up to "5".

- A. The cane toad comes from Central and South America and is found along the north-east coast of Australia.
- B. The cane toad is used in medical and scientific research and to make leather.
- C. The cane toad looks like a huge, common toad.
- D. The cane toad is an amphibian.
- E. The cane toad eats insects and vegetables.

Now, on the sheets of paper provided, write down everything you can remember about the cane toad. Just write down the facts. Don't worry about writing sentences. You do not have to have the facts in the correct order. Just write down every fact you can think of.

**TAKE A NEW LINE FOR EACH FACT.**