USE OF THESES

REVISION IN WRITING: COGNITIVE AND LINGUISTIC ASPECTS

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A thesis submitted for the degree of

Doctor of Philosophy of the

Australian National University

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A.N.U., Canberra

December, 1989

ACKNOWLEDGEMENTS

Originality of thesis

Except where otherwise acknowledged,

this thesis is my own original work.

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ABSTRACT

Despite its importance to good writing, revision has been only recently researched and is still poorly understood. Studies on the topic have tended to focus either on text-specific knowledge or on general cognitive factors as possible foundations of effective revision. Perhaps this tendency to focus on one of these aspects, to the exclusion of the other, contributes to our current confusion when faced with explaining revision, predicting revision performance or instructing students in ways of revising their written work.

The study reported in this thesis paid due regard to each of the two foci of enquiry outlined above. It comprised both an investigation of the relationship between revision and text-related knowledge (Part I of the thesis) and an investigation of the relationship between revision and selected cognitive abilities (Part II), in three age samples from a secondary school population.

In the research reported in Part I (Chapters 3-5) an error identification paradigm was used in conjunction with two theoretical frameworks, one specifying the major subprocesses of revision, the other delineating criteria for good writing. The principal findings from this research were i) that there were increases with age in the range of criteria to which the students adhered, tacitly or explicitly, and ii) that, while tacit acknowledgement of the importance of a criterion generally implied that it could also be applied explicitly, the former did not always entail the latter.

Part II (Chapters 6-8) of the thesis was concerned with the general cognitive skills underpinning revision. These skills were initially derived from an analysis of the component processes of revision. The analysis resulted in the postulation of five skills as being particularly pertinent. All five were found to be significantly correlated with revision performance in bivariate correlational analyses, and three were found to remain so in multivariate analyses.

Following Part II of the thesis. a final chapter (Chapter 9) reviews the results of both parts in terms of their theoretical, assessment and instructional implications.

CONTENTS

PART I

PART II

CHAPTER 1

ESSENCE OF THE PROBLEM

Writing is based on language capabilities shared by most people. However, writing is not speech written down. Writing and speech differ in both functional and structural properties (Rubin, 1987). Thus, stylistic differences between speech and writing are a result of both contextual factors and production parameters. Speech has a self-expressive or social function while writing is concerned primarily with expressing logical or propositional content (Olson & Torrance, 1981). An audience is present in speech and this provides feedback which directs the flow. Written communication involves a remote audience and the need to produce text autonomously (Bereiter & Scardamalia, 1981). Time constraints are different for speech and writing. Finally, speech occurs in real time while writing, typically, is produced over a longer time span, allowing for reflection. However, the distinction is not entirely clear cut. Some ways of writing, like narrative, are close to speech and they make use of oral language competence and skills while formal speeches may be similar to a written piece.

Bereiter and Scardamalia (1987) propose that there are basically two different models which can be followed when composing written text. They are the *knowledge telling* and the *knowledge transforming* models. Use of the knowledge telling model is a way of solving the problem of how to generate content when there is no conversational partner. The use of a particular discourse schema like narrative and of cues from the text already written help the writer retrieve related content from memory. There is little more planning or goal setting than in

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conversation. The knowledge transforming model, on the other hand, involves the ability to reorganise one's knowledge and to shape a piece of writing to achieve an intended effect. This way of writing involves reflective thought. Language is a tool for thinking; some theorists (e.g. Bruner, 1966) would regard writing as the ultimate tool. As C. Day Lewis put it: "We do not write in order to be understood, we write in order to understand" (cited in Murray, 1978).

Writing in a knowledge transforming mode promotes thinking and learning by enhancing opportunities for planning and by allowing reflection and reviewing (Britton, Burgess, Martin, McLeod & Rosen, 1975; Bruner, 1966; Vygotsky, 1978). Reorganizing and reshaping knowledge is a cognitive process which distinguishes writing from speech. It contributes to the greater cognitive and linguistic demands of writing. Writing to find out what one wants to say has been termed *re-vision* or *reseeing* (Murray, 1978). Revision has been viewed as a central process of writing, partly because, in the process, a writer's knowledge can be restructured (Freedman, 1985; Sommers, 1980) and partly because it may enable better writing (Ash, 1983; Bridwell, 1980).

Revision has not always been viewed as reorganizing and reshaping knowledge. The shifts in perspective regarding revision reflect more general changes in thinking about writing. Until recently the dominance of quantitative, experimental research and the absence of alternative methodologies tended to steer researchers towards the study of written products (Humes, 1983). Similarly, instructional practices like literary appreciation have emphasized product, while textbooks have taken a reductionist view, stressing correct, well styled sentences and treating revision as localized polishing of text (Witte, 1985). In this context,

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the word *revision* applied specifically to changes made to a piece of text already produced (e.g. *retranscribing*, Nold, 1981, p.68). Linear or stage models were described which represented revision as an end process of tidying up, or editing (e.g. Britton, Burgess, Martin, McLeod & Rosen, 1975; Rohman & Wlecke, 1964; Rohman, 1965).

Until recently, this conceptualization of revision as editing completed text directed research efforts. For example, researchers attempted to identify the point in the writing process at which written text is altered, the number, and kinds of alterations writers make and the variation in the nature of such alterations across writers of different ages and abilities (Humes, 1983; Witte, 1983).

However, contemporary researchers increasingly view revision as a process which is broader than editorial changes made to written text. Hayes and Flower (1980a, 1980b; Flower & Hayes, 1981a) have constructed an hierarchical model of writing in which the revision process can be contained within other processes. Revision is conceptualized as a thought process which can occur at any time and which can be applied to ideas and plans as well as to produced text (Beach, 1984; Collins & Genter, 1980; Flower & Hayes, 1981a, 1981b; Flower, Hayes, Carey, Shriver & Stratman, 1986; Scardamalia & Bereiter, 1983a). This conception of revision has been supported by converging evidence from studies which suggest that writers revise mentally during planning or as they translate ideas into written form, leaving no written trace (Berkenkotter, 1983) and from studies which show changes occurring between what students say they are about to write and what they actually do write (de Beaugrande, 1984; Scardamalia, Bereiter & Goelman, 1982). Therefore, it appears to make little sense to regard changes made to text

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before it is written any differently from changes made after the words are on the page (cf. Scardamalia & Bereiter, 1986a).

Research methodologies, discussed in Chapter 2, have now begun to take account of the broader conception of revision outlined above. Methods like participant observation, thinking-aloud protocols and experimenter intervention have been used to investigate the mental process of revision. However, Fitzgerald concludes a recent (1987) review of research on revision by pointing out that evidence concerning its cognitive aspects is still sparse. Thus, despite methodological improvements, there is still a lack of data which would allow the explanation and/or prediction of either the frequency or the degree of success with which revision is attempted. Such data are needed not only to promote a theoretical understanding of revision but also to inform instruction aimed at improving writing skill.

Lack of definitive data on revision might be attributed to two separate types of research deficiency. One deficiency is failure to delineate the individual component processes which merit investigation. The other is insufficient comprehensiveness in the approach to investigating revision. As a consequence of either (or both) of these deficiencies, many of the findings in the literature on revision are rather global and lacking in cross-linkages and explanatory power.

Take, for example, the apparent developmental pattern in the relationship between revision and writing quality whereby older, more mature writers make alterations which tend to be associated with better quality texts (Bridwell, 1980), while the alterations of younger writers bear either no

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relationship or a negative relationship to writing quality (Bracewell, Scardamalia & Bereiter, 1978). It is not quantity of revision per se which affects the quality of writing (Bridwell, 1980; Perl, 1979), since some expert writers engage in little observable alteration (Berkenkotter, 1983). Competent writers have been found to make more substantive and meaning-based changes (Faigley & Witte, 1981). A post hoc integration of these findings suggests that the relationship between revision and writing quality is mediated by the types of change which are made. This idea needs amplification with a more comprehensive approach, comprehensive in the sense of considering the sources of developmental and individual differences which may help to explain the relationship between revision and writing quality.

With regard to the likely factors involved in variation in revision performance, the research reported in this thesis was guided by a model of revision that is simultaneously fine-grained and comprehensive. The basis of the present approach was a model of writing proposed by Hayes and Flower (1980a, 1980b; Flower & Hayes, 1981a). These researchers suggest that both specific linguistic knowledge and more general cognitive skills operate in writing. The constituent components of these two factors have not been delineated. Research is needed which attempts to specify what it is that a writer must do to revise. Similarly, the relationship between cognitive skills and writing proficiency is unresolved. "At present it is uncertain whether we can appropriately think of children's writing as limited by general cognitive characteristics (such as capacity) which increase with age or, rather, as reflecting children's increasing knowledge of language structures and efficiency in using them" (Frederiksen & Dominic, 1981, p.3).

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The research reported in this thesis considered the composition and contribution of two likely sources of differences in the ability to revise successfully, linguistic knowledge and cognitive skills. The research is divided into two parts. The emphasis in Part I of the thesis is on linguistic, specifically text-related, knowledge and this part of the thesis reports an investigation of the dimensions of language which are available to writers of different ages for the various tasks involved in revision.

Part II of the thesis reports an attempt to delineate the cognitive skills involved in revision and, subsequently, an investigation of their contribution to revising ability. To date there has only been consideration of the relationship of a few specific cognitive skills, notably social perspective taking, to communication ability, for example tailoring a message to an audience. There has been no research attempting to consider a range of cognitive skills as likely sources of individual differences in revising ability, nor to consider the relative contribution of such skills to performance.

Thus, the research addresses in a comprehensive manner the composition of linguistic and cognitive sources of difference in the ability to revise successfully.

CHAPTER 2

METHODOLOGICAL CONCOMITANTS OF THE CHANGING CONCEPTION OF REVISION: IMPLICATIONS FOR THE PRESENT RESEARCH

THE TERM REVISION

The term *revision* has been used to describe the focus of research in a number of studies of written composition. However, as was noted in the previous chapter, the referent of this term has not remained constant. Research methods have both reflected the differing definitions of revision and contributed to their formulation. When revision was regarded as observable editing of completed text, methodological emphasis was primarily quantitative. Thus, frequency of editing and the number and/or type of actually observed changes were typical variables considered for their relationship to the quality of the written text. Research guided by this conception of revision has yielded anomalous results. The most implausible of these results was reported in the National Assessment of Educational Progress (NAEP) (1977) study, where it appeared that thirteen-year-olds were more able to revise than seventeen-year-olds. The younger students certainly made more overt changes than the older children, but it is likely that the latter made more covert alterations pre-textually, that is before committing the words to paper (Nold, 1981).

Research emphasis with respect to making changes to text is no longer restricted to overt editing behaviour. Mental transformations applied to planned, as

opposed to actual, text are now recognized as important facets of the composing process. With this expansion of the focus of research, usage of the term *revision* has become somewhat inconsistent. Some researchers retain its earlier usage, referring to actual changes made to text, and employ other terms to acknowledge the broadening of the research focus (e.g. *reprocessing* Scardamalia & Bereiter, 1986a; and *reviewing*, Flower & Hayes, 1981a; Hayes & Flower, 1983). Others (e.g. Fitzgerald, 1987) have broadened the meaning of the term *revision* to include covert processes as well as overt editing.

In this thesis, the term *revision* is used in the latter, more inclusive way, in keeping with the idea that it makes little sense to treat the process of changing the prospective words any differently from that of changing those actually committed to paper (Scardamalia & Bereiter, 1986). Used as a generic or an umbrella term, *revision* includes reference to both process and product.

The broadening of the conception of revision to include covert as well as overt activity has been accompanied by an expansion of the range of research methods employed to investigate it. The expansion has invoked not only additions to the techniques for examining aspects of the revision process itself, but also the introduction of studies of individual differences. Although the latter method has not, to date, been applied to revision, a few studies have introduced the idea of individual differences in general cognitive abilities which might reasonably be involved in the explanation of differential efficiency in writing. Since both these types of advance on the standard techniques were adopted in the research reported in this thesis, they are discussed below.

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METHODS FOR EXAMINING THE PROCESS OF REVISION

Ethnographic techniques, such as naturalistic and participant observation, have been used in an attempt to subsume the range of processes- overt and covert- involved in revision. Although the detailed data generated by the employment of this type of technique have served as the basis for descriptions of the development of patterns of revision in young writers (Calkins, 1979, 1980, 1982; Gentry, 1980; Graves, 1979, 1983; Graves & Murray, 1980), the technique itself is not without problems. Pure observation, in the absence of an explicit theoretical framework to guide it, lacks explanatory and predictive power. Detailed observation also poses a difficulty in generating an appropriate sample size from which generalizations can be made.

Allied *process-tracing* methods (Fitzgerald, 1987) have led to descriptions of writing and revision other than developmental descriptions. These methods include thinking-aloud-protocols (Gould, 1980; Hayes & Flower, 1980a, 1980b, 1983; Flower & Hayes, 1981a; Perl, 1979), interviews (Sommers, 1980; Stallard, 1974) questionnaires (Beach, 1979; Beach & Eaton, 1984), taped self-evaluations (Beach, 1976) and video-taped studies of temporal aspects of writing (Matsuhashi, 1982, 1987). However, these techniques are also problematical, since processes underlying written composition, in common with other higher cognitive processes, are not directly available for introspection (Matsuhashi, 1982; Nisbett & Wilson, 1977; Smith, 1982). Material available in short-term memory does not usually include information about process (Ericson & Simon, 1980). As a result, thinking aloud may introduce distortions (Frederiksen & Dominic, 1981; Gould, 1980; Kowal & O'Connell, 1987), transforming the process of writing into a hybrid of speaking and

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writing (Humes, 1983). Requests for retrospective reporting, even when cued by video and text, might encourage the invention of answers if structures constructed specifically to solve a problem have been below the level of awareness or have been forgotten.

Another class of technique focuses on the written product. Some recent researchers using this method have countered the criticism that assumptions about the process of revision cannot be made by quantifying details of the written product. They have drawn on theoretical constructs to link process to product in an explanatory manner. Using research in discourse analysis as a theoretical framework, these researchers attempt to explain and predict aspects observed in the product. For example, Frederiksen, Frederiksen and Bracewell (1987) linked cognitive processes in composing to conceptual or text structures produced or manipulated. Faigley and Witte (1981, 1984) devised a taxonomy which could account for revisions related to the semantic structure of text. Similarly, Witte (1983) used topical structure analysis in an attempt to specify both the textual cues which may prompt revision and the effects of revision.

Within the broad ambit of research on the written product, a recent method introduced into the investigation of revision is the *error identification* method. It involves determination of writers' ability to detect and resolve problems either in their own written text or in texts specially devised by investigators. The latter method has a potential advantage in terms of control of input; the researcher can manipulate the features of the text. But the use of the error identification method, to date, has not been supported by a theoretical framework. Writers have been asked open questions about problems in text, rather than

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theoretically guided, fixed-response questions (e.g. Hull, 1984; Scardamalia & Bereiter, 1983a). The responses to such open-ended questions have proved intractable from the viewpoint of their classification and so have failed to give rise to a data pattern capable of elucidating what students at different ages are able to do with respect to the process of revising text.

The present study employed the error identification method for examining linguistic aspects of the process of revision but introduced both an extension of and refinements to previous studies using the paradigm. The paradigm was employed in conjunction with theoretical frameworks which specified both (i) the relevant subprocesses of revision and, (ii) the criteria for effective written communication which, when violated, constitute problems requiring remediation.

Subprocesses of revision

Probably the most influential global approach to writing in the contemporary literature segments the writing process into planning, transcribing and reviewing (Hayes & Flower, 1980a, 1980b, Flower & Hayes, 1981a). In terms of Hayes and Flower, the reviewing process comprises evaluating and revising and requires the writer to detect a problem, diagnose it and select a strategy before engaging in revision. In other words revision involves executing the decisions from the previous acts of evaluation and diagnosis (Flower, Hayes, Carey, Shriver & Stratman, 1986). Despite some confusion caused by differences in labelling, there is consensus as to the types of subprocess involved in revision, most current models apparently having evolved from the model of Hayes and Flower (e.g. Beach, 1984; Bereiter & Scardamalia, 1987; Scardamalia & Bereiter, 1983a).

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Flower and Hayes do not attempt to specify factors which might explain differential efficiency in executing their postulated subprocesses but merely suggest that each is involved in the revision of text or pre-text. For this reason Scardamalia and Bereiter (1986a) have labelled the model of Hayes and Flower a *protomodel* (cf. Kosslyn, 1980), by which they mean an heuristic conceptual scaffolding whose function is not so much to explain as to provide a framework to be amplified or altered by future research.

The protomodel outlined above was used to guide the research reported in Part I of this thesis. The research examined the revision subprocesses of evaluation, recognition of the nature of deficits and remediation, using a variant of the error identification paradigm, and in conjunction with a further theoretical framework which specifies the criteria whose violation constitutes significant errors to be identified in an evaluation, recognition or remediation task.

Further discussion of the method used in the research will be suspended until these criteria are enumerated.

Criteria whose violation constitutes problems in written text

Nold (1982) has suggested that there are three general aspects of writing to which writers must attend if they are to communicate successfully. These aspects she terms *conventional*, *intentional* and *mixed*. In the present research they have been used as a basis for deriving criteria of effective writing.

The conventional aspect refers to accepted rules of the written signal system. Most prominent amongst these rules are those relating to spelling and

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punctuation. Adherence to such conventions is essential to effective written communication.

The intentional aspect of writing involves writers' objectives, which may be of two kinds. First, writers have thoughts and ideas about a topic itself which they wish to explore and record. In addition, writers often wish to express these thoughts and ideas in a manner which will produce a desired effect on the reader.

Nold's mixed category, as its name suggests, includes facets which involve both generally accepted conventions of written communication and intentions of the individual writer. Instances of this category are organization of material to form a comprehensible sequence, adherence to grammatical rules when producing strings of words, and choice of vocabulary appropriate to the meaning intended.

The classification of aspects (or sub-tasks) of writing proposed by Nold (1981, 1982) can be seen to embody certain criteria which should be met in the production of written text, namely:

(i) adherence to generally prescribed mechanics with respect to spelling and punctuation (embodied in Nold's conventional category);

(ii) the adoption of a genre and tone which is appropriate to both the topic and the target reader(s), that is the adoption of a suitable rhetorical stance (intentional category);

(iii) a) the logical structuring of information b) the observance of syntactical considerations, and, c) a choice of words suitable for the meaning intended (mixed category).

It was the observance, or otherwise, of these criteria which was examined in relation to the evaluation, recognition and remediation processes, outlined in the previous section.

A new framework for examining the revision process

Part I of this thesis reports an investigation of the processes of revision. The study employed a novel variant of the error identification technique. This variation comprised an eclectic mix of the approach of Nold (1981, 1982) and that of Hayes and Flower (1980a, 1980b; Flower & Hayes, 1981a). Secondary school subjects from three different age groups were presented with an acceptable text, and five degraded texts, each of which represented a particular type of error, specifically, a violation of one of the criteria suggested by Nold. They were required, variously, to evaluate each text, to specify from a list of errors provided by the experimenter, those present in each degraded text, and to attempt to remediate, in writing, each degraded text. These three tasks were derived from Hayes and Flower's work suggesting the subprocesses of revision (Hayes & Flower, 1980a, 1980b; Flower & Hayes, 1981a; Flower, Hayes, Carey, Shriver & Stratman, 1986).

This technique permitted the examination of significant facets of revision, while simultaneously surmounting the problems of classifying subject's responses which have dogged previous, less structured studies employing error identification and related techniques.

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RELATIONSHIPS BETWEEN INDIVIDUAL DIFFERENCES IN SELECTED COGNITIVE SKILLS AND VARIATION IN THE EFFICIENCY OF REVISION

Findings of cognitive correlates of revision are sparse (Fitzgerald, 1987). There have been attempts to link globally-defined stages of cognitive development (as cognitive variables) with aspects of written composition (e.g. Britton, Burgess, Martin, McLeod & Rosen, 1975; Moffett, 1968) and to examine writing for evidence of attainment in areas of cognitive, moral, stylistic and affective development (Wilkinson, Barnsley, Hanna & Swan, 1983). These models, with the exception of that of Wilkinson et al, lack diagnostic and, hence, explanatory power.

A few investigators have attempted a more molecular analysis of the cognitive factors involved in successful writing in general, and effective revision, in particular.

The relationship of a cognitive process, memory, to aspects of writing performance has been examined. Scardamalia (1981) showed how working memory constraints affected the level of coordination achieved in writing. Daiute (1982, 1984) explained the location of errors in production and revision in terms of the limits of short term memory.

In similar vein, there has been an attempt to relate to writing the finding of a relationship between reading ability (or verbal score on the Scholastic Aptitude Test) and the efficiency with which verbal information can be manipulated (Hunt, Frost & Lunneborg, 1973; Hunt, Lunneborg & Lewis, 1975; Hunt, 1978). Benton, Kraft, Glover and Plake (1984) and Benton and Kiewra (1986)

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explored the idea that of elementary information processing contributes to variation in writing ability.

Two aspects emerge as problematical from such approaches. First, there are strong arguments that writing involves more than the implementation of elementary information-processing programs (Perfetti, 1983). Such simple processes may be too far removed from the act of writing to be useful for explanation, diagnosis or prediction. Composition appears to involve a number of complex verbal abilities which cannot be reduced to elementary information processing programs. Thus, it is unlikely that variation in aspects of writing ability will have a univariate explanation.

To recapitulate: previous studies of cognitive correlates have been either global or excessively molecular (unidimensional) in their approach. This study, in Part II, attempted to explain differential success in revision by variations in performance on a number of its constituent cognitive components. The approach involved determining the likely cognitive processes or skills involved in revision. The protomodel of Hayes and Flower (1980a, 1980b, Flower & Hayes, 1981a) provided a gross description for further analysis in an attempt to establish the more detailed cognitive processes. Such an undertaking is not without difficulty, as there is little research to assist identifying these processes.

Tasks were devised to measure the cognitive skills hypothesized as being involved in revision. Performance in revision was defined as the total score for the remediation task, obtained from Part I of the research. Explanations for differences in remediation were sought from performance on the cognitive tasks.

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GENERAL OVERVIEW OF THE PRESENT STUDY

Research investigating linguistic aspects of writing has shown a developmental progression in the use of language features like cohesive devices and in the complexity of sentence structure (e.g. Loban, 1976; McCutchen & Perfetti, 1982) while descriptions of foci of attention in revision similarly suggest developmental trends (Calkins, 1980, 1982; Graves, 1983). From a theoretical and pedagogical point of view a developmental account of linguistic knowledge- in terms of the criteria for effective written communication- available for the subprocesses of revision was indicated. On the other hand, studies of cognitive factors in reading, for example, employ an individual difference approach in an attempt to explain differential reading performance. This study adopted both of these approaches.

As outlined above, the present study comprised two parts. In the first part subjects evaluated texts on aspects of writing specified by Nold (1981, 1982), detected the nature of the problem in, and remediated, texts. In the second part the same subjects completed tasks designed to measure the cognitive skills involved in the revision subprocesses. An investigation was made of how individual differences in these components contributed to remediation score differences.

The subjects were from three different age groups in two secondary school populations. The study of two broad component aspects of revision, namely

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linguistic knowledge and cognitive skill suggested the employment of a developmental and individual difference approach, respectively.

PART I: CRITERIA FOR EFFECTIVE WRITING AND THE SUBPROCESSES OF REVISION: EXPERIMENTS WITH WRITTEN TEXTS

CHAPTER 3

THEORETICAL FRAMEWORKS OF CRITERIA FOR
EFFECTIVE WRITING AND THE SUBPROCESSES
OF REVISION

OVERVIEW

The previous chapter presented theoretical frameworks both for segmenting revision into its major component subprocesses and for establishing criteria which should be met in order to produce effective written communication. These frameworks guided the development of a novel variant of the error identification paradigm for use in the present research. While it is novel for a single empirical study to focus on both the subprocesses or stages of revision and the criteria of effective writing which can be applied at each stage, the literature contains studies which have examined each of these aspects separately. Such studies are reviewed below. Findings which assist in amplifying some of Nold's criteria are discussed in the first section. Then research bearing on each of the subprocesses of revision is presented.

PSYCHOLOGICAL FEATURES RELATING TO THE CRITERIA FOR EFFECTIVE WRITTEN COMMUNICATION

As outlined previously, the language characteristics associated with five criteria for effective communication were used as dimensions along which to degrade a text. Three of the criteria are straightforward, in the sense that they require no empirical clarification. These criteria concern aspects of conventions, syntax and lexis. Their nature is already defined by a combination of rules from established authorities and by common usage. Although the remaining two criteria, structure and rhetorical stance, are vital considerations in effective communication, the critical features of each are not so circumscribed. An operational definition of good structure or of rhetorical concerns is not immediately obvious. For this reason research has been conducted to delineate those features of structure which facilitate understanding of written text and to suggest what constitutes the rhetorical situation. This research is reviewed below.

Structure

There has been much research on how text structure operates to affect understanding. Basically, a distinction is drawn in the literature between high level organization (the macro or whole text level) and the level concerning relations between individual sentences and referents (micro or local level) (e.g. Kieras, 1978). Text analysis systems (e.g. the macrostructure of Kintsch & van Dijk, 1978; the story grammars of Stein & Glenn, 1979; Mandler & Johnson, 1977; the top level structure of Meyer, 1975) all attempt to represent some aspect of coherence.

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Coherence defines those underlying semantic relations that allow a text to be understood and used (Mosenthal & Tierney, 1984).

At a micro level, the way several sentences relate is a source of coherent discourse and coherence is maintained when a sentence is, in some way, anticipated by what precedes it (McCutchen & Perfetti, 1982). Underlying this progression is the concept of the given-new contract (e.g. Clark & Halivand, 1977) which is the implicit agreement between communicator and comprehender, whereby the writer anticipates readers' knowledge and fulfills their expectations. Sentences that proceed from given to new information are easier to recognise in a subsequent memory test (Glatt, 1982).

The global organization of these local microstructures has been termed the *macrostructure* (van Dijk, 1980). While processing a text on a local level of individual propositions, the reader is also constructing the broader picture, by storing important information from cycles that connect with and refer to incoming information.

Macro-level plans ensure that resources like memory and attention are deployed to advantage. Work in story grammars has shown that readers have an abstract knowledge of the discourse elements which comprise a story of a particular genre and that they use this knowledge to organize incoming information (e.g. Stein, 1983). Readers remember information which is logically organized with a topical plan better than information which is presented in a random fashion (Meyer, 1982). Some topical plans carry information more successfully than others. It has been found, for instance, that information organized in terms of comparison,

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contrast or causation is better remembered than a list of descriptions (Meyer, 1984).

Plans for text also have a highlighting function which helps the writer show the reader that some ideas are of more importance than others. Plans serve an informing function to help the writer present new information while keeping readers aware of the old. Concepts high in an hierarchy should be presented first. Findings from prose memory research, concerning the levels effect, shows that importance, as measured by the level of a proposition in an hierarchical representation, determines speed and accuracy of verification (McCoon, 1977). Presenting the main ideas first, rather than later, leads to better reader comprehension, as indexed, variously, by choice of best title, reading time and accuracy of recall (Kieras, 1978).

The findings outlined above suggest that hallmarks of effective structure include (i) local-level coherence- proceeding from given to new- in order to ensure the flow of information from sentence to sentence (ii) use of topical plans to help structure incoming information and, (iii) highlighting ideas by presenting them high in an hierarchy.

The following chapter will describe how these hallmarks of effective structure were applied to the structural degrading of a text for experimental purposes.

Rhetorical concerns

The rhetorical aspect of writing subsumes different choices and decisions a writer makes which, in turn, are determined by the purpose of a communication and by the anticipated audience. Written text might be intended to inform, persuade or serve as a vehicle for language manipulation for its own sake (Kinneavy, 1971). Writers' choices are also influenced by the relation of author, topic and audience (Moffett, 1968). These relations include writers' own goals concerning how they want to affect a reader and how they want to project themselves (Swarts, Flower & Hayes, 1984).

The rhetorical situation is generally analysed, at least briefly, before writers begin to compose. Research shows that good writers add to their image of the audience or assignment, creating a complex image of the reader which guides their planning, generating and revising (Flower & Hayes, 1980). Expert writers react to both topic and audience, while novices generate most ideas in response to the topic (Flower & Hayes, 1981b). Goals are self-made and the way writers choose to define a problem can be "inclusive and exploratory or narrow; sensitive to the audience or chained to the topic; based on rhetorical savvy or focussed on producing correct prose" (Flower & Hayes, 1981b, p.379).

Important elements in the rhetorical situation which need to be elaborated to ensure effective communication include (i) the intention of a communication, including the writer's own goals with respect to the message, audience and the projected image of the writer and (ii) a determination of the audience's knowledge, values and their prejudices about the topic and writer.

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Summary

The research reviewed above suggests elements of the rhetorical situation which a writer needs to elaborate, as well as hallmarks of effective structure. These aspects form the basis for degrading texts on these dimensions. Degrading of texts on conventional, syntactical and lexical dimensions was, as mentioned before, rule-based.

THE SUBPROCESSES OF REVISION

As noted previously, Nold's (1981, 1982) criteria could be applied within each of the subprocesses of revision specified in this research, namely, evaluation of text, recognition of criteria employed in evaluation, and remediation of violations of the relevant criteria. Research pertinent to each of the subprocesses is reviewed below.

Evaluating text

Evaluation is defined as a form of reading which is specialized for the comparison of text (written or prospective) with an internalized set of criteria. In the first of the present studies using degraded texts, the aim was to provide a developmental delineation of criteria by which written discourse is judged acceptable or unacceptable. The research literature, particularly that dealing with younger writers, implies a developmental progression in the use of criteria for evaluating writing, although details of the progression in the application of these criteria remain unclear. Most of the data pertaining to this issue have been gleaned from participant observation studies with small samples of younger writers. The implication to be drawn from the results is that young writers (up to Grade 6) evaluate appropriately with the help of feedback (Graves, 1983) and that they use several evaluative criteria.

Research with older writers, paradoxically, presents a different picture, namely, one of a limited focus when revising (Pianko, 1979; Sommers, 1980). These data have been gathered largely from interviews about concerns when revising. These two literatures will be briefly outlined in turn.

Observational work from Calkins (1982) suggests that, for young children, the field of concern in revision generally moves from a narrow focus on information and convention, to a much broader focus, including consideration of action, tone, organisation, sequence, audience, ending and detail. Graves (1983) presents case-study evidence, more specific to evaluation, which suggests why primary-school children choose one of their writings as better than another. At

first the criterion is neatness, then the appeal of the topic and later the action
and feeling in the writing as children begin to solve the problems of audience.

Investigating the application of critical standards with young writers
(Grades 4-8), Newkirk (1982) outlines a progression which he characterises as
developing from *protocritical* judgements, to critical judgements. Protocritical
judgements are based on a reaction to the experience described in the text and on
superficial elements of the text, like handwriting. Critical judgements occur when
writers perceive that the form of written expression is distinct from the content
or experience depicted.

The "liking response", analogous to Newkirk's protocritical judgements,
was a factor also reported by Hilgers (1984, 1986) as being important in young
children's evaluation of writing. Closely related to liking was first hand positive
experience of the things described in the stories the children were asked to judge.

Like Newkirk, Hilgers (1984) found that there seemed to be a changing
concern in evaluation from focus on the content per se to concern for the mode of
expressing it. Subsequently, there was concern for the text-as-read, like making
sense. Later emerged the craftsman element where the evaluation seemed to take
account of the writer as a craftsman who selects, arranges and revises to
accomplish a particular purpose with an audience. The final criterion to emerge
concerned the intention of a piece of writing and the extent to which it was
realised.

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Development seems to be a case of utilizing more of these concerns. The older children in Hilger's (1984) study used more criteria to justify choices and some children who changed their minds seemed to be employing multiple criteria and juggling the weights they assigned to various criteria.

There are several areas of concern in the findings reviewed. The first is the manner in which the evaluative criteria have been derived. In Hilgers' (1984) work, for example, he notes that children tend to generalise every evaluation but claims success for his method of working from the child's global evaluation to the molecular level as a result of interaction with the experimenter. This, purportedly, allowed the children's open-ended statements about pieces of writing to be grouped into meaningful categories (seemingly only about 10% were problems to classify). The reliability of such a method remains to be established.

Another concern has already been noted, namely the small sample sizes. This calls into question the reliability of the taxonomy resulting from the classifications. Evidence for the utilization of some criteria, for example, "considering the intention of a piece" (Hilgers, 1984), appears minimal.

A third concern relates to the idea that there is a regular developmental sequence in the employment of criteria used to judge writing quality. Graves (1983), Newkirk (1982) and Hilgers (1984) all imply that the criteria children use in evaluating writing change systematically over time. Changes in criteria are related to changes in language and writing performance. This hypothesis is basically in keeping with psychological studies of cognitive development.

However, in his 1986 article, Hilgers revised his initial views of the application of evaluative criteria stating that "the surface expressions of evaluative behaviour do not emerge in a uniform manner across individuals" (p.48) and he now concludes that his data offered no clear support for the existence of stages of evaluative development.

The research reviewed above has concentrated on younger writers. By Grade 6 it is suggested that their evaluative statements contain elements of response to craftsmanship and aesthetic qualities and even responses to the value of a piece of writing (Hilgers, 1984). These results seem at variance with those from studies of older writers where evaluative criteria are tapped indirectly.

From interview data obtained from college student writers, Sommers (1980) constructed a "scale of concerns in revision". The predominant concern which emerged from student's definitions of revision was vocabulary - "a thesaurus philosophy of revision", Sommers (1980, p.381) terms it.

A similar focus emerged from Pianko's (1979) interviews with college first year writers, 23% of whom claimed to be concerned with mechanics and usage, while a similar percentage claimed to be concerned with using correct words. These percentages regarding mechanics and word choice were considerably higher for remedial writers in the study.

Interview data suggest the concerns which a writer claims to have in revision and which, presumably, are the basis of evaluative criteria. Another indirect means of making inferences regarding evaluative criteria is the study of

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reading styles. Reading-to-evaluate might simply involve an extension of the criteria used for comprehension (Flower, Hayes, Carey, Shriver & Stratman, 1986). From a study designed to investigate the psychological processes that characterise "reading like a writer", Church and Bereiter (1983) suggest that there may be different reading styles. They postulate three modes of attending, in order of prevalence: attending to content; attending to style and a holistic mode incorporating both content and style. The latter, holistic approach may be the necessary foundation on which "reading like a writer" is built (p.474).

Readers with an holistic approach might well be in the minority, as several researchers suggest that traditional marks of quality in writing like coherence and insightfulness have little bearing on writers' evaluative judgements (Miller, 1982; Sommers, 1980). This is supported by Pianko (1979) who, in post-writing interviews with college first years, found that 47% did not consider elements of style while writing. Further, 59% did not take into consideration a purpose for the writing.

The findings from the studies of younger, primary-school writers and older, college writers regarding what constitutes evaluative criteria and which criteria are utilized by writers at different stages, are not in agreement. On the one hand primary school writers are reported to be able to use several evaluative criteria, while, on the other hand, college writers are seen to focus narrowly on mechanics. There is a need to clarify the observed patterns in the nature of evaluative criteria used, employing both larger samples and an age range linking young and college writers. There is also a need to ensure that evaluative criteria are not simply an artifact of the type of writing typically produced at certain

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developmental stages. In Part I of this research, Experiment 1 is designed to establish i) the dimensions, represented in degraded text, to which students are sensitive and which, thus, are likely to form the basis of their "inner voice" (Freedman & Sperling, 1985) for evaluation and, ii) ages at which various criteria are used in evaluation.

Recognizing problems in text

For purposes of evaluation of text it is sufficient that an assessor have only an awareness that something is wrong. This has been described as dissonance (e.g. Della-Piana, 1978; Faigley & Skinner, 1982; Perl, 1980; Sommers, 1980). Recognition, on the other hand, involves specification of the nature of a problem. It is possible for a writer to be aware that something is wrong without being able to articulate the difficulty. In an experiment investigating how various cognitive processes interact during evaluation and revision, Scardamalia and Bereiter (1983a) concluded that there was a mismatch between evaluation and detection performance. But the mismatch did not suggest faulty evaluation. Subjects chose appropriate evaluation statements to describe the piece of text they were currently writing, but were unable to explain the choice. They could not describe the source of the problems they had supposedly perceived.

Research has suggested several explanations. Writers might not explicitly recognize the nature of a problem they have implicitly acknowledged in evaluation because they have an inadequately formulated plan, in the form of limited goals or a limited set of criteria for good writing (Flower, Hayes, Carey, Schriver & Stratman, 1986).

Another explanation for the discrepancy between evaluation performance and recognizing the nature of the problem is a lack of appropriate knowledge. Less able writers, in a study by Perl (1979), were observed asking themselves at appropriate junctures if a sentence or feature they had produced were correct. But, Perl points out, the simple set of editing rules at the disposal of these writers was often inappropriate for the types of complicated structures they produced. Consequently, they were prone to misapply what they knew and either hypercorrected or degraded the text. Similarly, Shaughnessy (1977) showed that error can often be traced to erroneous or incomplete rules.

A third explanation for the failure to recognize the nature of a problem in text is that the writer might have an inadequate representation of the text (Flower et al, 1986). Two explanations have been advanced as to why representation is inadequate. One is that the limits of short term memory act as a constraint in the detection of errors (Daiute, 1982, 1984). The second is that representation of the text may be affected by whether the text is one's own or that of another. It may be that inadequate representation of the text stems from privileged knowledge, making it difficult for writers to detect certain faults in their own texts (Bartlett, 1982, Bartlett & Scribner, 1981). Hull (1987) found that writers detected and corrected more errors on essays written by others than on self-written ones. The hypothesis that writers' knowledge of texts makes it difficult for them to detect faults was supported in a study by Hayes, Schriver, Spilka and Blaustein (1986, cited in Hayes & Flower, 1987). Prior knowledge of the text was manipulated. On average, revisers with no prior knowledge of the text discovered 50% more problems in unclear text than those with previous exposure to the text.

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Other factors might inhibit the recognition of problems in text, for example, students' reliance on teachers' comments to provide plans for revision. Such reliance could well delay the autonomous development of diagnostic skills. Further, teachers' comments are often generalities and abstract commands rather than specific pointers to revision strategies. The comments also often fail to direct attention to the text as a whole, or to provide an inherent reason for revising structure and meaning (Sommers,1982).

Thus, appropriate knowledge, representation of text and plans, and teacher feedback appear to influence the recognition process. Studies have suggested that student writers are poor at detecting errors in text (e.g. Rubin, 1982) and that there is an apparent discrepancy between evaluation of text and explicit specification of problems implicitly acknowledged. The nature of the problems student writers are able to specify remains unclear, as does the relationship between these problems and evaluation.

The aims of the second text experiment were i) to establish what types of problems in text students at different ages could recognize and (ii) to relate the ability to recognize the nature of a problem and the utilization of that language dimension as a criterion for evaluation.

Remediation of text

Remediation concerns the action taken to rectify problems in text. The depth at which a problem is recognized can affect the type of remediation attempted (Hayes & Flower, 1986). Imprecise recognition of a problem could well

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limit the options for making changes to text. If, for example, students are parroting formulaic evaluation judgements or diagnostic statements, without understanding how they relate to their text, then it is difficult for them to devise an effective strategy for revision. One outcome of recognition of this nature is to leave the text unaltered. Writers do not always attempt to change problems they note; for instance first year college students in a study by Beach and Eaton (1984) attempted to change only 52% of the problems they noted.

Another choice, when a writer has a feeling something is wrong but when a specific diagnosis is lacking, is to redraft, more or less at random. Often an attempt to strike out and rewrite results in only a minor word change, a paraphrase or a presentation of the same information in slightly different form. Striking out and rewriting was the remediation technique favoured by fourteen-year-olds in a study by Scardamalia and Bereiter (1983a).

The tactic described above can lead to new or different texts, although they might not be better than the original. According to the NAEP (1977), 85% of those in the 9 and 13 year-old age groups who revised had end products which were no different in quality from the first draft. Similarly, in Scardamalia and Bereiter's (1983a) study, students' rewriting did not improve the overall quality of the composition although the majority of individual changes which they made were positively rated. Other studies (e.g. Bracewell, Scardamalia & Bereiter, 1978) suggest that attempts to change often result in an inferior product. Further, novice college writers retained errors and added new ones when rewriting to fix problems (Hayes, Flower, Schriver, Stratman & Carey, 1986, cited in Flower, Hayes, Carey, Schriver & Stratman, 1986).

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A more detailed specification of the nature of a problem involves categorizing the problem and focusing on the features that matter (Flower et al, 1986). Such a process generates more information than mere detection and even contains an implied strategy for correction. The implication is that a more detailed recognition of the problem will lead to more successful remediation.

Changes made to text have been considered from the viewpoint of observed behavioural changes, at the level of both product and process, and from the viewpoint of the effect of such changes on the quality of text. These perspectives will be outlined, in turn.

The types of change made to text by primary-age children seem to vary with developmental stage. Calkins (1980, 1982) identified four stages of revising, namely, (i) random drafting, where writers do not reread or reconsider what they have written (ii) refining, which includes neatening, changing spellings etc. (iii) transition, in which revisers show characteristics of both previous stages but, unlike refiners, are discontented with earlier drafts and, (iv) interaction, where the writer rereads and interacts with the draft, internalised audience and evolving subject. According to Calkins, writers at each of these stages exhibited a different level of time and space flexibility, suggesting that there may be cognitive-developmental underpinnings to the revising styles. Random drafters, for example, may not have attained reversibility and decentration, in the Piagetian sense, and, therefore, cannot replay a process, consider several classifications at once, or take a viewpoint other than their own.

Attempts to describe changes to text in more detail have resulted in several taxonomic descriptions. Some researchers have identified the linguistic level of operation like word, clause sentence or whole text (e.g. Bridwell, 1980); others have identified the operation such as add, delete, substitute or rearrange (e.g. Sommers, 1980). A different approach was taken by Faigley and Witte (1981). They distinguished between revisions that affected the meaning of the text and surface changes which did not. Findings from research using the different taxonomies are complementary.

The findings based on these different taxonomies suggest that students generally make word and phrase level changes with the emphasis on mechanics (Bridwell, 1980; Faigley & Witte, 1981; Freedman & Pringle, 1980; Scardamalia & Bereiter, 1986a; Sommers, 1980). Surface and word level revisions have been found to account for over half the revisions made by a sample of high school students and by a sample of college students who were inexperienced writers (Bridwell, 1980). Adults appear to make more sentence and whole-text changes. Experienced adults not only make changes at all levels but also use all revision operations (Sommers, 1980). Reordering and addition are two operations which students frequently fail to use (Sommers, 1980).

There appears to be a developmental trend from simple, mechanical and word-level changes toward more complex revisions (Butler-Nalin, 1984; Crowhurst, 1983; NAEP, 1977; Sommers, 1980). Under Faigley and Witte's (1981) classification, inexperienced writers made largely cosmetic changes (88% of the time), whereas 24% of advanced student revisions and 34% of expert adult revisions were text-level changes which altered the meaning of a piece. These text-level changes were even

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more apparent when expert writers were given a mediocre student text to revise. They produced a high percentage of changes at whole-text level by concentrating on addition, consolidation and distribution.

Descriptions and categorizations of behaviour, such as those outlined above, are one aspect of research concerned with remediation. As noted previously, another aspect in considering remediation concerns its effect on the quality of the text. Findings for school-age subjects have not been in agreement. Some researchers, notably Donald Graves and associates (Calkins, 1979, 1980, 1982; Graves, 1978, 1979, 1983; Graves & Murray, 1980), provide evidence that even quite young children can make substantial and effective changes. But most researchers subscribe to the view that, for less skilled and younger writers, attempts to remediate result in no change to the overall quality of the text (e.g. NAEP, 1977; Scardamalia & Bereiter, 1983a). There is even a suggestion that, for certain age groups, these attempts may lower judged quality (Bracewell, Scardamalia & Bereiter, 1978; Perl, 1979).

For the most part, the assessment of quality of writing (or change in the quality of writing) has been by means of a global rating, that is, an overall impression and a single mark. That there are major problems with this procedure is evidenced by the generally low inter-rater reliabilities reported in the literature. In summing up a review of reliability between two judges (the most common number used), Marsh and Ireland (1987) conclude that these reliabilities vary between .3 and .8, with the modal value at the lower end of the range.

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Low levels of inter-rater agreement are probably due to the fact that, with global ratings, raters can differ with respect to the dimensions to which they attend and the weight they assign to each (Freedman, 1979).

In an attempt to overcome the problem of individual differences among raters due to allocation of weightings, procedures have been devised to allow the evaluation of specific dimensions thought to contribute to writing effectiveness (e.g. analytic scoring, Diederich, 1974; primary trait scoring, Lloyd-Jones, 1977). However, there remains a problem in that content, focus, organization etc. are often intermeshed and the whole can be better or worse than the sum of its parts (Mullis, 1984). Studies show that ratings on specific components are highly intercorrelated, suggesting that a general factor influences the rating of specific components (Moss, Cole & Khampalikit, 1982; Quellmalz, Capell & Chou, 1982).

Even recent studies (e.g. Scardamalia & Bereiter, 1983a; Scardamalia & Paris, 1985) which have employed a simple scoring scheme, namely the number of changes judged to be for the better, minus the number judged to be for the worse, report low inter-rater reliability.

In the present research, remediation was defined in terms of the ability to make changes which altered the quality of texts, each of which was degraded on only one dimension. Thus explicit cognisance was taken of previous problems associated with assessing the effect of remediation on the quality of text. Assessors' concentration on only one dimension at a time militated against inter-rater unreliability due to differences between raters in the weightings assigned to varying dimensions on which remediation might be attempted. (Degrading on only

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one dimension also served to diminish possible problems for the subjects, resulting from the overextension of attentional capacity by the requirement that they focus on several dimensions simultaneously.)

With this refinement to promote reliability, the third text experiment was designed (i) to determine the types of error which students of different ages attempt to remediate and, (ii) to establish whether or not the attempts which are made affect the judged quality of text.

SUMMARY

Although studies have been conducted on each of the three revision subprocesses which are of interest in this thesis, the resulting findings have contributed relatively little to a general understanding of revision, for two reasons.

First, there have been few investigations which have simultaneously considered all three subprocesses. Thus, an overall perspective on revision has generally been lacking. Secondly, even investigations of individual subprocesses have produced results which are less than definitive with respect to the subprocess in question.

Empirical investigations of the criteria used in evaluation have had a number of methodological problems, for example, i) sample sizes too small to permit credible generalisation; ii) a tendency to use open-ended responses, which

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are difficult to classify in a consistent, reliable manner; and iii) claims to the contrary notwithstanding, a failure to demonstrate an invariant developmental pattern in the application of criteria of evaluation.

Investigators focusing on explicit recognition of problems in written text have produced a number of potential explanatory factors. However, these factors are quite disparate: they range from writers' own short-term memory limitations to inadequate feedback on written work from school teachers. How -or if- the factors relate in affecting problem recognition remains unclear.

Studies of remediation vary in the extent of the contribution to an understanding of the subprocesses. On the one hand, studies of the types of change made converge to suggest that with increases in age and/or experience in writing, there is progress from mechanical and local-level concerns in remediation (e.g. concerns with the spelling or semantic appropriateness of single words) to concerns with the text as a whole, both as a coherent piece of writing and as a vehicle for communicating with a larger audience. On the other hand, studies of the effects of remediation attempts have produced results suggesting that such attempts result in, variously, increments, decrements or no change in the quality of the original piece of writing.

The experiments in this part of the thesis were designed to attempt to overcome the problems outlined above. The same subjects performed tasks designed to tap each of the three subprocesses. In addition, cognisance was taken of problems present in previous studies of individual subprocesses and, where possible, attempts were made to obviate such difficulties. For example, the present research

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was a cross-sectional developmental study with reasonable sample sizes. Specially constructed texts were employed in the evaluation, recognition and remediation tasks, with fixed choice responses for the recognition task. The fixed choice responses were designed to overcome the problems associated with open-ended questions, while specially constructed texts, degraded on a single dimension at a time, addressed the dual problems of unreliability of ratings due to differential attention to criteria and of possible performance masking due to limited information processing capacity of subjects. These features are further dealt with in the following chapter.

CHAPTER 4

TEXT EXPERIMENTS I: METHOD FOR THE STUDY OF
EVALUATION, RECOGNITION AND REMEDIATION

INTRODUCTION

As has been described previously, in the present study, the act of
revision was divided into the subprocesses of evaluation, recognition and
remediation. Further, a theoretical framework suggested by Nold (1981, 1982) was
used to derive criteria whose violation constituted a problem in written text. The
observance, or otherwise, of these criteria was examined for each of the
subprocesses of revision in a variant of the error identification method. Subjects
executed all three of the revision subprocesses using specially constructed (rigged)
texts, each of which represented violations of one of the criteria suggested by
Nold.

The use of artificial manipulations, like rigged texts, has sometimes been
subjected to criticism on the grounds of their lack of ecological validity (Bridwell,
1980; Emig, 1982; Graves, 1978). Bereiter and Scardamalia (1981) counter this type
of criticism by pointing out that it is unlikely that people employ one set of
processes for research situations and a quite different set in everyday writing
tasks. Given that this is a valid premise, there are distinct methodological
advantages in employing rigged texts in investigations of revision.

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A major advantage is that a series of rigged texts, each degraded on one defined dimension, allows for control of input and, consequently, inference concerning the textual cues that prompt the revision subprocesses. Another advantage, stemming from control of input, is that a rigged text provides the same starting point for all subjects, thus controlling for possible covert revisions, made before committing words to paper. This is necessary as the amount and nature of overt revision, even among experienced writers, has been shown to vary enormously (e.g. Berkenkotter, 1983). But, when given the same starting point, namely a lacklustre draft to revise, there was a similarity to the alterations experienced writers made (Faigley & Witte, 1981).

A further advantage of the method whereby criteria are considered one at a time, is that it addresses the problem that performance is masked by one criterion's capturing attention to the exclusion of others, which, in other circumstances, might be attended (Hayes & Flower, 1986). This problem is especially pertinent where attentional capacity is limited. The focus-of- attention problem has also been shown to operate in judges' assessment of written text. In the case of holistic scoring one dimension may dominate (Freedman, 1979) or, conversely, in rating specific dimensions, a general factor may exert influence. Texts, each degraded on a single dimension, provide a clearer indication of what remediation is needed and raters are able to consider changes to quality, dimension by dimension, according to defined criteria. Thus, the design addresses rater agreement discrepancies associated with holistic ratings and the problem of a general factor influencing the rating of specific dimensions.

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Finally, the use of rigged texts and allied fixed choice statements solves the problem of difficult to categorize answers to open-ended experimenter questions.

SUBJECTS

Three groups of school-age children were tested on their evaluation of the prepared texts and on the recognition and remediation of deficiencies present in each. They were chosen from Years 7 and 9 of a Canberra high school and Years 11/12 of two Canberra secondary colleges. The mean ages of the groups were, respectively: Year 7, 12 years 6 months (range 11 years 6 months to 13 years 6 months); Year 9, 14 years 7 months (range 13 years 11 months to 15 years 3 months), and Year 11, 17 years (range 16 years to 18 years 10 months). The two younger groups ($N=40$ for each) were selected randomly, with a sex balance, from the rolls of a large representative Canberra high school. The oldest group, who were considered representative because of the very high retention rate in the Australian Capital Territory, comprised 123 students studying English or Psychology at two Canberra secondary colleges.

An adult group was used to validate the specially constructed texts. This group, numbering 40, consisted of persons who had completed some form of tertiary training.

MATERIALS

The previous chapters outlined Nold's (1981, 1982) classification of
writing subtasks and explained that the broad categories of *conventional,
intentional* and *mixed* were used to define criteria whose violation constituted a
problem in written text. To recapitulate, the criteria were conventional,
syntactical, lexical, structural and rhetorical. The characteristics of language
associated with these criteria were employed to construct a series of rigged texts.
The same set of texts was used for examining each of the revision processes of
evaluation, recognition and remediation. The set comprised six texts, an unflawed
original and five degraded variants.

The original was a short general article on our use of energy, written to
inform and convince 12 to 14 year olds. The writer was purportedly a high school
student who, while sympathizing with the conservationists, did not want to seem
too biased.

The conventional degrade of the original text was constructed by
violating accepted rules of spelling and punctuation. The syntactical degrade
featured ungrammatical sentences and unsuitable methods of embedding. For the
lexical degrade, words were chosen which either were inappropriate to represent
the meaning intended or were idioms suitable for spoken rather than written
expression. The structural degrade was bereft of arrangements which have been
shown to facilitate the processing of text, at both the micro and macro level. The
original topical plan of compare and contrast was destroyed. Likewise coherence,

the way local connections relate across several sentences, was degraded by removing forms of highlighting relationships like topic sentences of paragraphs and by violating the new-old contract (see Chapter 3). The rhetorical degrade employed a tone inappropriate for the stipulated audience; it was pompous and the language overly complex. This use of language, coupled with the stance taken, was designed to express a point of view, the validity of which the audience could not readily accept. Also, the one-sided nature of the arguments presented in this degrade was not congruent with the expressed aims of the writer.

The original and the five degraded texts appear in Appendix A.1.

For presentation, the texts were arranged in a booklet in a randomized order so that every text had an equal opportunity of appearing in each of six positions. They were identified by colour names only. As noted previously, the subjects' tasks were to evaluate, recognize the nature of deficiency in and make changes to improve the quality of each text.

In addition to the texts, which were used in all three experiments, there were materials, including an instruction sheet, which were specific to each individual experiment. For the evaluation experiment there was a sheet on which to record marks (contained in Appendix A.2). For the recognition experiment a list of 11 statements was provided. These statements comprised one applicable to the original and two applicable to each degrade. They encapsulated the features respectively used to degrade the original (see Appendix A.3). Additional paper was available for the remediation task.

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VALIDATION OF THE DEGRADES: ADULT SAMPLES

Two stages were involved in the validation. The first stage was a study to aid in the construction of texts and the accurate description of errors in each, while the second stage involved a validation of the texts, once constructed.

In the first stage a group of 20 educated adults had to match the description of the alterations made with the appropriate text. Verbal and written comments from adults were utilised and the resulting texts were determined to be . worse than the original with respect to the particular degraded dimension in question.

In the second stage a different adult group ($N=40$) evaluated the texts, assessing their quality by awarding a mark out of 20 to each. The results are shown in Table 4.1.

Table 4.1

Mean Evaluation Scores (max. 20): Adults

(standard deviations in parentheses)

Text Type	Score
Original	17.84 (1.73)
Rhetorical	11.95 (3.61)
Structural	12.54 (3.11)
Lexical	13.04 (2.87)
Syntactical	12.89 (2.55)
Conventional	12.93 (2.45)
	$N=40$

A repeated measures one-way analysis of variance on the adult evaluation marks showed that they did not regard the texts as equivalent, $F(5,195)=$ 34.62, $p<.001$. Comparison of the original or control text with the degrades, using a Dunnett's test, confirmed that the adults saw each of the degrades as significantly different from (worse than) the original, $d'(5,195) =1.61$, $p<.01$ ($MS_{error}=4.54$).

In the second stage adult subjects also attempted to recognize deficiencies in the texts by matching the statements describing aspects of the degrades with the relevant text. The adults' success rate for recognition of errors associated with each degrade was generally high. It was above 80% for all except

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the structural degrade and one aspect of the rhetorical degrade. But success was still above 70% for these.

Finally, the second adult sample was also asked to rate how obvious the deficiencies which they recognised as describing a degrade, were to them. For this purpose a five point scale was provided, with descriptors ranging from *very subtle* (1) to *very obvious* (5). The mean for all 10 statements exceeded 3.5 and 8 were greater than 4 (*obvious*). This suggests that the deficiencies were indeed salient to the adult sample.

PILOT STUDY: SECONDARY STUDENTS

A pilot study with 12 Year 9 and 12 Year 7 students was undertaken after the completion of the adult two-stage validation study. This was simply to provide a check that the materials and instructions were clear and comprehensible to this age group and to ascertain the likely time which would be required for completion of the evaluation, recognition and remediation tasks.

PROCEDURE

The materials having been constructed and validated with adults, and piloted with young high school students, the main study was conducted using secondary school students.

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The subjects were tested in small groups (less than 10 for Years 7 and 9 and averaging 20 for Years 11/12). Instructions were given orally. The oral instructions were simply a reiteration of written instructions provided with the test booklet (attached Appendix A.4), which told the subject that the texts were several attempts by a high school student to write an assignment. Subjects were informed of the nature of the task given the student writer, namely that the assignment was to write a short, general article about our use of energy for an audience of young high school readers (aged 12 to 14). In addition, subjects were given some clues concerning the writer's aims. After these general instructions, each experiment had specific instructions.

Subjects were informed that in Experiment 1 they were to read and evaluate the six supposed attempts by giving a mark out of 20 to each. They were further asked to reflect the magnitude of quality differences between the texts in the marks accorded them. Subjects were encouraged to compare by looking forward or backward through the booklet which contained the six texts.

On completion of the evaluation of each of the six texts, subjects handed in their mark sheets, retaining their copy of the six texts for use in Experiment 2. Here they were told that the task was to suggest to the student writer what, if anything, was needed to improve each version, by circling the statement or statements which they felt applied to the designated version.

After a suitable interval (of 2 or 3 days) subjects completed Experiment 3 with the degraded texts. They were given each degraded text, one at a time, and asked to make any changes which they thought would improve the quality of the

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piece of writing. Subjects were told that they could write on the version and were given extra paper on which to rewrite portions or to make changes by line or paragraph.

If students, when reading the texts, requested assistance with the meaning of a word, the experimenter tried to offer legitimate aid while not supplying specific alternatives. Without such help some of the youngest students may not have even attempted to alter the text, not because they considered it suitable but because they were unsure of the meaning so could not even begin to generate alternatives.

All subjects completed the evaluation and recognition experiments in one session. The remediation task was completed in one session with the oldest group, but for Years 7 and 9 two sessions were held. There was no time limit for the completion of any of the tasks.

SCORING

Experiment 1: Evaluation

In Experiment 1, the evaluation task, subjects awarded a mark to the original and each degrade (max.=20 in each case). To overcome the obvious problem of idiosyncratic use of a scale and because relativity to the standard original version was of primary interest, a difference score of each degrade from the original was calculated.

Experiment 2: Recognition

The subjects' task in Experiment 2 was to select from the list of statements those suggesting what was needed to improve each version of the text. A total of 11 comments served as suggestions. One comment, namely, *basically all right with no major changes needed*, applied to the original version while two comments applied to each of the other five degraded versions. The recognition of the problems in text was scored according to the number of suggestions correct per version. So that each score was out of two, the score for the original text was doubled.

Experiment 3: Remediation

In Experiment 3 subjects made to each degraded version changes which, they deemed, would make it a better quality piece of writing. The subjects' efforts were retyped in order to facilitate the task of the rater and to preclude negative effect on scores from extraneous variables such as poor handwriting or the use of crossings out or arrows to indicate changes.

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Performance in remediation was judged by the extent of change in the quality of the text. As discussed in Chapter 3, findings as to the effect of changes on the quality of text have been mixed, perhaps because of the measures employed. In this research raters assessed the extent to which the subject had improved each degraded version. Raters were provided with specific criteria to use to assess each version. These criteria were those by which the original had been degraded on that dimension. The criteria are contained in Appendix A.5. Performance was measured on a five-point scale ranging from *no discernible difference* (1) to *a vast improvement* (5). There was a separate three point scale to allow for subjects who managed to make the degraded version worse with their attempted revisions. The scale is shown in Appendix A.6.

For the purposes of estimating rater agreement, an additional rater (an experienced teacher) assessed a random sample of 25% of texts. The measure of agreement selected was the agreement coefficient suggested by Robinson (1957) which, rather than measuring the degree to which the marks given the same text remediation are proportional, measures the degree to which they are identical. In the case of two variables the intraclass correlation is a simple linear function of the coefficient of agreement. The intraclass correlation was .68.

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CHAPTER 5

TEXT EXPERIMENTS II: RESULTS AND DISCUSSION

GENERAL AIMS FOR ANALYSES

The aim of this part of the study was to investigate patterns within each of the subprocesses of revising text, namely evaluation, recognition of deficiency and remediation, and to explore the relationship between the subprocesses. In considering the results of each of the three text experiments, the approach was to analyse the data in terms of the pattern for each age group, then to examine how this pattern changes with age. Accordingly, for each experiment, the effects of age and treatment (type of text) were examined by performing a split-plot repeated measures analysis of variance, the data having met the assumptions concerning population treatment variances and covariances.

Each analysis included a between-subjects factor, namely, age group, as determined by year at school (Year 7, 9 or 11), and a within-subjects factor, namely type of text (the original text and the versions of it degraded on rhetorical, structural, lexical, syntactical and conventional dimensions). Where a significant interaction was found, a simple main effects analysis was performed. The family-wise error rate for the set of simple main effects was .05. An appropriate multiple comparison procedure was employed where indicated.

EXPERIMENT 1: EVALUATION OF TEXTS

In Experiment 1 subjects evaluated six texts, an unflawed original and five different degrades, by awarding a mark out of 20 to each. The evaluation data were considered in an attempt to establish what dimensions of text students at different ages utilize as criteria for evaluation.

Results

The mean evaluation scores (maximum 20), classified by age and type of text, are shown in Table 5.1.

There is a difficulty in comparing age groups, given the differing values allocated by each group to the original text, which was the assumed anchor point. Table 5.1 shows that Year 11 subjects marked the original lower than did the other two groups. If absolute scores were used in an analysis of variance, age and interaction effects could possibly be due simply to variability attributable to between-age differences in the mark awarded the standard.

Table 5.1

Mean Evaluation Scores (max. 20) by Text and

Age (standard deviations in parentheses)

Text Type	Age Group		
	Year 7	Year 9	Year 11
Original	16.26 (2.29)	16.43 (1.72)	15.64 (2.07)
Rhetorical	14.94 (3.48)	15.18 (3.09)	12.57 (3.20)
Structural	15.69 (2.31)	15.31 (2.16)	14.46 (2.90)
Lexical	15.78 (2.82)	16.96 (1.97)	14.56 (2.34)
Syntactical	15.73 (2.80)	16.41 (1.64)	15.31 (2.45)
Conventional	13.09 (3.46)	14.31 (2.65)	13.18 (2.55)
	$N=40$	$N=40$	$N=123$

To discount this possibility, scores were controlled against a baseline, this being the mark awarded the original text. Difference scores were obtained by taking the mark for each degrade from that accorded the original. In order to determine the dimensions to which students of different ages attend when evaluating text, a split-plot repeated measures analysis of variance was performed on these difference scores.

The age effect failed to reach significance. There was a significant effect of type of text degrade, $F(5,1000)=29.35$, $p<.001$. However, this main effect was qualified by an interaction with age, $F(10,1000)=3.34$, $p<.001$. The interaction is depicted graphically in Figure 5.1. The Analysis of Variance: Evaluation table is contained in Appendix B.1.

The age x text interaction supports a comparison of the effects of text at each age group, allowing examination of the central question of this evaluation experiment, namely, degree of differentiation of each degrade from the original version. For each age group the difference score for each of the five degrades was tested to see whether it differed significantly from zero (i.e. the unflawed original). A Dunn's multiple comparison procedure was used to make the five comparisons. The tests were two-tailed and the mean square error adopted was the text x subjects within-groups term (i.e. 5.5).
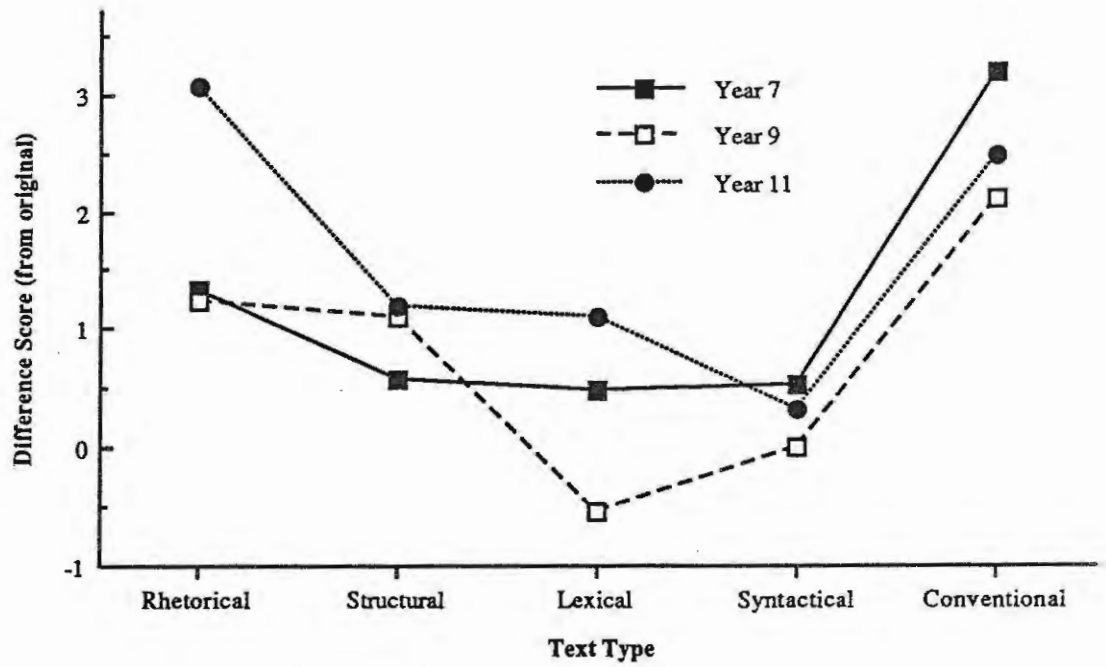
Figure 5.1

Mean Difference scores by text and age in Experiment 1.

The results show that Year 7 and Year 9 regarded the text degraded on conventions (namely spelling and punctuation) as significantly worse than the original (d=1.66, p<.01). The oldest group, Year 11, rated the rhetorical, structural, lexical and conventional degrades significantly lower than the original (d=0.94, p<.01).[1]

In short, students assessed the texts differentially and the number of criteria utilized for evaluation increased with age.

Discussion

Younger high school students were not very successful in differentiating degrades from the original. Certainly the two younger age groups of students in the present study used only the dimension concerned with mechanical aspects, like spelling and punctuation, as a criterion for evaluation. This finding is consistent with the product-based analyses of revision which show that less mature and less able writers revise at a low level of structure (e.g. Bridwell, 1980; Crowley, 1977; Faigley & Witte, 1981; Perl, 1979). However, the oldest group in the present study evaluated using structural and rhetorical dimensions as well as low-level concerns. Pianko (1979) and Sommers (1980) did not find such concerns expressed as foci in revision in their subjects of comparable age. Perhaps the knowledge of these

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[1] Given the largely null findings for the younger groups, it is prudent to verify the preceding pattern of results with an unprotected t-test. The pattern for Years 7 and 11 is identical to the respective patterns reported above. For Year 9, in addition to the conventional, the rhetorical and structural degrades are marked lower than the original (t(2,39)=-2.24 and t(2,39)=-2.96, respectively, p<.05).

criteria is not sufficiently explicit for college-age students to articulate them as important in revision when interviewed after writing.

Text-level features, which operate outside the confines of a single sentence, do not appear to be available spontaneously as evaluative criteria for younger high school students. Thus, attention to structure of the argument and appropriateness for the audience was not evident in their evaluation. In a discussion of Hilger's (1984, 1986) work in Chapter 3, it was noted that the empirical support for certain of his evaluative categories appeared problematical. These were the evaluative categories of *text as understood* and *craftsmanship* which were apparently ignored by the two younger age groups in this study. The young high school students in the present study appeared able to tolerate poorly constructed, oddly worded, inappropriate and grammatically incorrect texts.

Perhaps, as Church and Bereiter (1983) imply, the vast majority of younger high school students read simply to comprehend and, if they extract some sense from the piece of writing, notice little else even when asked to comment on style. Subjects in Church and Bereiter's study, were most successful at noting concrete, word level features and least successful with abstract, structural characteristics.

In addition to low-level concerns (spelling and punctuation), the oldest group of students perceived audience needs and, to a lesser extent, structure and word choice as relevant concerns. But, paradoxically, it appears they were still unable to perceive relatively low-level syntactical flaws. The data from this experiment alone do not permit an explanation for this failure. Older students

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might have noted such errors but discounted them as unimportant- either absolutely or relatively- when considering the overall quality of the piece. Alternatively, syntactical concerns might be automatized and hence not readily available for conscious reflection (Bracewell, 1980).

The present finding for younger high school students suggests that there is an alternative explanation for low-level revisions other than the hypothesis that revision at this level is a response to heavy information-processing demands (cf. Bereiter & Scardamalia, 1984b). The method employed in this experiment permitted indirect examination of the processing load hypothesis. Subjects examined only one degrade at a time, thus obviating problems of capacity overload and relative criterion saliency. With these aspects controlled, an alternative reason for low-level revisions emerged. This alternative explanation is that the younger groups of high school students lack an appropriate range of internalized criteria by which to evaluate text.

A likely reason for the impoverishment of their evaluative criteria is that less experienced writers internalize what others around them appear to value most (Graves, 1982; Hilgers, 1984; Matsuhashi & Gordon, 1985). These values might be communicated through teacher feedback. Teachers' comments may be one source of information that less mature writers use to form ideas about good writing. According to Sommers (1982), teachers, in their comments, often take students' attention away from their own original purpose and "appropriate" the text. This happens particularly when teachers identify errors in usage, diction and style in the first draft when they should be encouraging development of the piece, not local editing. Such comments, maintains Sommers, overstress the importance of

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mechanical errors and, further, offer the writer no scale of the relative importance of writing deficiencies.

The older students in this study, however, were able to identify all but one degrade (syntactical) as worse than the original. They utilized several dimensions of language as criteria for good writing. If the explanation for the younger groups evaluative performance is accepted, then either teachers differentially comment on written text, across age groups, or, alternatively, older writers become less influenced by external sources as they have formed their own idea of the relative importance of writing deficiencies.

EXPERIMENT 2: RECOGNITION OF DEFICIENCIES IN TEXTS

This experiment was designed to address the question of the types of deficiency subjects could recognize in text. They selected from a list those statements which described the nature of the problems in each degraded text.

Results

Table 5.2 shows the mean number of correct suggestions chosen per text for each age group. These means are graphed in Figure 5.2. The figure shows a general tendency for subjects to recognize errors increasingly with age. There appears to be a differential recognition across texts, with list statements pertaining to the original text and the conventional degrade most frequently chosen correctly. For all age groups error recognition performance exceeds 50% for conventional errors and, for Year 11, also for rhetorical problems.

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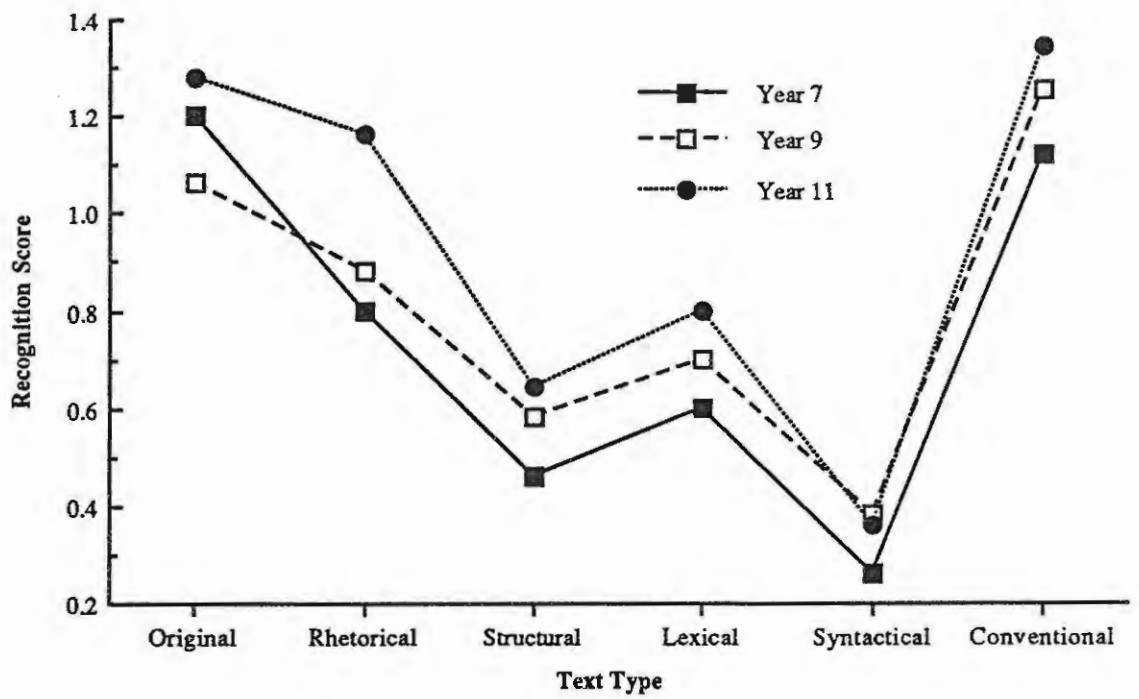
Figure 5.2

Mean recognition score by text and age in Experiment 2.

A split-plot repeated measures analysis of variance confirmed that subjects were recognizing errors differentially in the texts. There was a significant effect of age, $F(2,200)=4.72$, $p<.01$, indicating a difference between groups in recognizing problems in the texts. Also, there was an effect of text. Subjects were better able to recognize problems in some texts than in others, $F(5,1000)=53.79$, $p<.001$. The interaction was small and non-significant. Appendix B.2 contains the Analysis of Variance: Recognition table.

Table 5.2

Mean Recognition Scores (max. 2) by Text and

Age (standard deviations in parentheses)

Text Type	Age Group		
	Yr 7	Yr 9	Yr 11
Original	1.2 (0.99)	1.06 (1.01)	1.28 (0.96)
Rhetorical	0.80 (0.56)	0.88 (0.61)	1.16 (0.54)
Structural	0.46 (0.55)	0.58 (0.81)	0.64 (0.79)
Lexical	0.60 (0.67)	0.70 (0.72)	0.80 (0.71)
Syntactical	0.26 (0.54)	0.38 (0.70)	0.36 (0.62)
Conventional	1.12 (0.65)	1.25 (0.60)	1.34 (0.62)
	$N=40$	$N=40$	$N=119$

As the pattern of results was maintained for all age groups, the mean recognition scores for each text were collapsed across age and a post hoc comparison procedure applied to the resulting means. The results of a Tukey test for all 15 possible comparisons ($q=.23$, $p<.05$ $MS_{error}=0.46$) are shown in Table 5.3.

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Table 5.3

Results of Post hoc Comparisons Between Mean Difference Scores[#] for Recognition of Degrade Criteria

	Rhet.	Struct.	Lex.	Synt.	Conv.
Original	0.23*	0.62*	0.48*	0.85*	-0.06
Rhetorical		0.39*	0.25*	0.62*	-0.29*
Structural			0.14	0.23*	-0.68*
Lexical				0.37*	-0.54*
Syntactical					-0.91*

$* p < .05$

[#]Note: Differences shown are row minus column

Subjects' performance in recognizing that the original was acceptable was equal to that in recognizing the nature of problems in the conventional degrade. They were better at recognizing the latter than any other type of problem. After conventional, rhetorical problems were most readily recognized and the score for the rhetorical criterion was better than those for the structural, lexical or syntactical dimensions. Finally, lexical deficiencies were more noticeable than syntactical errors.

Discussion

In this experiment there were main effects for age and text; subjects' performance at recognizing deficiencies in text improved with age and they were better able to recognize deficiencies in some degraded texts than in others. The pattern of results was the same for all ages, namely, that errors concerned with spelling and punctuation were the easiest to recognize, followed, in decreasing order of likelihood of recognition, by rhetorical, lexical, structural and syntactical errors.

The lack of recognition of relatively low-level, local syntactical errors is interesting. When cued by the recognition task, even the oldest students did not recognize syntactical errors. This lack of recognition of syntactical errors suggests that subjects were not simply discounting such errors in the evaluation task. Rather, two alternative reasons can be suggested. Subjects might have been deficient in grammatical knowledge so that there was no suitable knowledge base for the recognition statements to activate. Alternatively, they might have failed to perceive syntactical errors because they were attending to meaning to the extent of excluding form.

The overall pattern of results from the recognition experiment is consistent with the results from the previous evaluation experiment in which all age groups viewed the conventional degrade as worse than the original, while the oldest age group also evaluated rhetorical, lexical and structural as of lesser quality than the original. Although this age group marked down the structural and lexical degraded texts in the evaluation experiment, they were frequently unable to recognize statements of deficiency describing these degraded texts. In fact, they matched

appropriate statements to the structural and lexical less than 50% of the time (see Table 5.2). It could be that the statements describing the nature of these degrades did not accord with the subjects' idea of the deficiency, or it could be that the older subjects' knowledge with respect to the structural and lexical degrade is tacit rather than explicit.

Scardamalia and Bereiter (1983a) found that school students performed like adults in selecting appropriate statements to describe their writing but were unable to diagnose the nature of any perceived problems. Initially, it appears that the discrepancy between evaluation and diagnostic performance in Scardamalia and Bereiter's experiment could be explained methodologically, by virtue of the different nature of the tasks: cued evaluation statements versus open-ended diagnostic questions. But discrepant performance between evaluation and recognition need not be an artifact of the different methods Scardamalia and Bereiter used. The results of the evaluation and recognition experiments in this study suggest that prompting does not assist performance in diagnosing the nature of a problem in text; it did not assist in matching the set of rules available to the subjects with the nature of the problem in the text.

EXPERIMENT 3: REMEDIATION OF TEXTS

The task in this experiment was to improve the quality of each of the five degraded texts. These attempts were rated, by a judge, on a five-point scale, the numbers 1 through 5 representing increasing degrees of improvement of a degraded text.

Results

The mean remediation scores (maximum five) for different text degrades obtained by each age group are shown in Table 5.4.

Table 5.4

Mean Remediation Scores (max. 5) by Text and Age

(standard deviations in parentheses)

Text Type	Age Group		
	Year 7	Year 9	Year 11
Rhetorical	0.44 (0.74)	1.60 (1.48)	2.10 (1.36)
Structural	0.19 (0.45)	0.79 (1.07)	0.75 (1.08)
Lexical	0.40 (0.71)	0.81 (0.88)	1.44 (1.03)
Syntactical	0.29 (0.75)	0.95 (1.09)	1.26 (1.14)
Conventional	1.93 (1.37)	2.88 (1.13)	3.26 (1.09)
	$N=40$	$N=40$	$N=79$

Once again the data were analysed to consider changes with age and to determine the pattern within each age group. There was a main effect for age, indicating increasing ability to remediate the texts with age, $F(2,157)=26.54$, $p<.001$. There was also a main effect for text, $F(4,627)=173.73$, $p<.001$. In addition, there was an age by text interaction, $F(8,628)=3.84$, $p<.001$, which is illustrated in Figure 5.3. Appendix B.3 contains the Analysis of Variance: Remediation table.
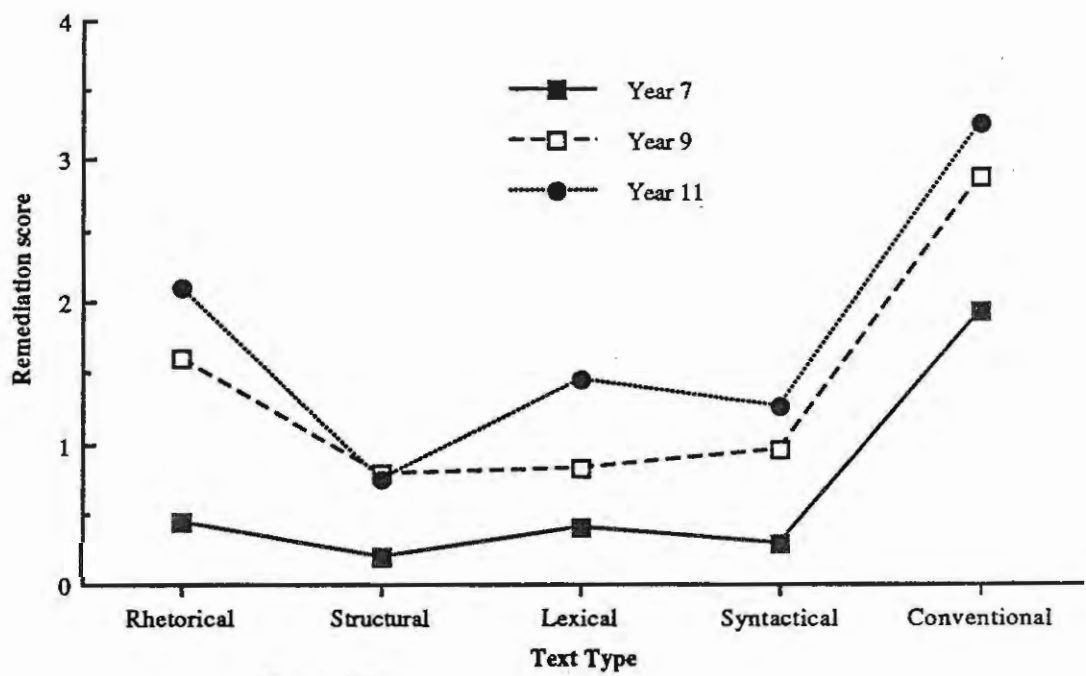
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Figure 5.3

Mean Remediation scores by text and age
in Experiment 3.

As in the evaluation experiment, the major question here was which degraded texts the subjects at each age group could improve. It is apparent from the graphed means in Figure 5.3 that the older two groups were much better than the youngest group at improving the quality of each. As explained in Chapter 4, the attempt to improve each degraded text was rated with 0 on the scale corresponding to *no discernible difference*, while 1 indicated a *barely discernible difference*, usually a single spelling change or equivalent. It was decided to test whether the mean improvement scores for each age group were significantly different from 1. Dunn's multiple comparison procedure was used (MS_{error}=0.80, the text x subjects within-groups error term). On this criterion the youngest age group, Year 7, was able to improve only the text degraded on conventions. Year 9 improved the rhetorical degrade as well as the conventional (d=0.53, p<.05). The Year 11 students, like their Year 9 counterparts, improved the conventional and rhetorical degrades. In addition they were able to effect an improvement to the lexical degrade (d=0.38, p<.05).[2]

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[2] The pattern of results with an unprotected t-test is identical to that reported above for both Year 7 and Year 9. For Year 11, the above pattern similarly held and, in addition, improvement to the syntactical degrade just reached significance (t=-2.06, p<.05).

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Discussion

The remediation experiment showed a main effect for age and for text, qualified by an interaction. The older groups (Years 9 and 11) were better than the younger at improving all degraded texts. All age groups significantly improved the text degraded on conventions. Years 9 and 11 also made significant improvements to the rhetorical degrade and, in addition, Year 11 were successful with the lexical degrade.

These results are consistent with previous research which finds that student writers tend to make predominantly low-level, mechanical changes to their writing (e.g. Bridwell, 1979; Sommers, 1980). Changes to the conventional and lexical degrades could be accomplished largely at the word or phrase level. Even the rhetorical degrade could be improved by tackling the obvious problem of inappropriate language, treating it as a lexical problem. Most subjects who effected an improvement to the rhetorical degrade tackled the obviously unsuitable language with the well-known strategy of replacing words and phrases.

There was a general lack of improvement to the aspect of the rhetorical degrade requiring whole text changes, namely, the inconsistency between the bias of the argument and the writer's stated aims. It may be noted that there were very few major rewrites of the rhetorical degrade.

The most obvious deficit in remediation revealed by this experiment is the inability to make any changes which would improve the structural degrade. Subjects could not even reorder paragraphs, let alone provide linkages between ideas or an appropriate focus for a paragraph in the form, for example, of a topic sentence.

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This inability to handle the secondary problems of focus and cohesion may contribute to school writers' apparent failure to perform major revisions (Champagne, Scardamalia, Bereiter & Fine, n.d.).

The pattern of results in this experiment was generally similar to that for the evaluation experiment although there were some differences. Year 9 subjects were able to improve a text (the rhetorical degrade) that they did not see as significantly different from the standard in the earlier experiment. Contrary to this pattern, Year 11 was unable to improve the structural dimension which did figure as an evaluative criterion. Hilgers (1986) speculates that older students and adults may be able to evaluate and articulate something which they cannot produce.

GENERAL DISCUSSION

In the present series of experiments, the revision subprocesses were simulated by tasks involving evaluation, recognition of deficiencies and remediation of text. Generalisations can be made from a consideration of the results of each discrete experiment and, in addition, from a consideration of all three.

The results of the evaluation experiment with degraded texts suggest a reason why revision is seldom an effective and integral part of the writing process. Younger high school students may have too few internalised criteria against which to effect a judgement of quality. These students appear not to consider whole-text, lexical or syntactical concerns spontaneously. Perhaps, as Nold (1981) suggests, evaluation is bounded by the depth of the planning process. Writers cannot match text against intentions if they have not elaborated these intentions.

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Therefore, if writers do not create a complex image of their readers or consider their own goals with respect to the message, audience and their own projected image, then they could be expected to evaluate only against the conventions of written English which are held in memory.

In the second experiment, which concerned recognition of deficiencies in text, students were cued with statements describing the problems in each of the degraded texts. Cueing did not appear to facilitate performance, which was still relatively poor for recognition of all problems save those in the conventional degrade. Cues seemed not to connect with the necessary knowledge base. The same pattern of results held for all age groups and subjects' performance simply improved with age.

When these results are considered in conjunction with those from the previous experiment it seems that, in this instance, one plausible explanation for the lack of recognition of deficiencies is an inadequate representation of the text in terms of intentions, in this case the internal representation of what constitutes effective writing.

Remediation, the task of the third experiment, was, for the younger age groups, dominated by low-level changes to words and phrases. Considered in concert with the findings from the previous experiments, there is support for the idea that rhetorical knowledge, for example that gained from reading, is biased towards discrete elements of language and content (Bereiter & Scardamalia, 1984a).

In the present series of experiments two of the criteria for effective communication, namely, structure and syntax, appear to present particular problems. Lack of appreciation of structural aspects of written text has been noted elsewhere (cf. Champagne, Scardamalia, Bereiter & Fine, n.d.; Englert, Hiebert & Stewart, 1988). In the present study, only the oldest students utilised structural considerations in evaluation, all groups were poor at recognising the nature of structural deficiencies, and none could effect improvement to the structural degrade. The specialised re-reading of revision obviously needs to concentrate on form, in the sense of coherence, not simply on semantic content. But even if structural considerations are implicitly acknowledged, this does not mean that such concerns can be articulated or employed in remediation.

Aside from the structural dimension, all ages experienced difficulty with the syntactical degrade. This lack of knowledge is surprising considering such concerns are well represented in workbook activities, although such decontextualised activities might not generalise well. Alternatively, it might be, as Bracewell (1983) has noted, that students have conscious control of only some grammatical production processes, while others are executed automatically and are not readily available for conscious reflection.

A consideration of all three experiments suggests, not surprisingly, that the pattern is one of increasing performance with age. That is, the subjects attended to and utilised an increasing range of criteria of effective writing with age. What is surprising is that the ability to utilise language dimensions effectively in the subprocesses of revision, is a relatively late developing phenomenon.

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More interesting is to examine the general trend of performance, within an age group, across the subprocesses of revision. With the low level concerns (i.e. conventional and syntactical) implicit utilisation of a criterion in evaluation is accompanied by explicit acknowledgement of it in recognition and remediation. This finding also applies to lexical concerns for the younger groups. However, the pattern for the higher level concerns (structural and rhetorical) is less clear-cut.

There is a suggestion that implicit knowledge of criteria may precede more explicit use when the evaluation performance of adults and the oldest students is compared. The evaluation performance of the oldest group of students was not very different from that of the adults in the pilot study, designed to validate the texts, except that the latter evaluated using the syntactical dimension. But the recognition-of-error performance of Year 11 did not approach that of the 70-80% success rate obtained for the adults. This, and the fact that the the oldest students were able to utilise structure as a criterion in evaluation but were unable to recognise structural deficiencies, or effect a suitable change to a text degraded on this dimension, suggests that an implicit utilisation of a criterion may precede its articulation and use. Lexical concerns exhibited a slightly different pattern. The oldest students implicitly recognised them in evaluation and, although only modestly successful in recognising the nature of the problem, could effect an improvement to the lexical degrade.

The other high-level concern, the rhetorical dimension, suggested another pattern of utilisation across subprocesses. Year 9 subjects could recognise that the language in the rhetorical degrade was inappropriate for the audience and could effect a positive change, but consideration of audience needs was not

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spontaneously employed in evaluation. In this case the ability to apply the criterion in remediation preceded its incorporation as a criterion of effective writing against which to judge text.

The rather unparsimonious conclusion is that while low-level criteria for effective writing appear to be available simultaneously across the three subprocesses of revision, higher level concerns show different patterns.

These experiments with texts which were degraded on criteria deemed to be the hallmarks of good writing and presented for evaluation, recognition of the nature of a problem and remediation, illustrate the deficits in available knowledge. The internalized set of criteria, against which writing is evaluated, was limited to mechanical concerns for the younger high school students although the oldest students employed a range comparable to that used by adults. Despite cueing with statements, students were not very successful at recognizing the nature of a problem in text. Also, successful changes to text seldom involved criteria where the level of concern was the whole text.

These findings suggest that a deficiency in available text-related linguistic knowledge, as defined by the criteria for effective writing, may account for unsuccessful attempts to revise. Bereiter and Scardamalia (1987) acknowledge that they have based their research on the premise that school writers possess, at least in part, the requisite knowledge to carry out the revision subprocesses. What school writers lack is an executive procedure to initiate and monitor the procedure. Failure to employ this executive or monitor *may* be a function of overloaded

processing capacity (cf. Bereiter & Scardamalia, 1981; Scardamalia & Bereiter, 1983a; Scardamalia, Bereiter & Goelman, 1982).

In the present series of experiments involving the revision subprocesses no initiation or monitoring of the procedure was required. The problems of likely capacity overload and criterion saliency were addressed by the design, whereby only one criterion for effective communication was represented in each degraded text. In short, the present series of experiments thus directly addressed the nature of linguistic knowledge available for each of the revision subprocesses because they controlled for important confounding variables which might mask performance.

The conclusion from these experiments is that younger high school students have a limited range of criteria for effective writing to apply in the subprocesses of revision. Given that the criteria for successful communication were presented singly, the deficiency exhibited is all the more salient. It seems that younger high school children not only lack an executive procedure to initiate and monitor revision, as suggested by Bereiter and Scardamalia (1987), but also lack the structure to which to apply the executive procedure.

Increased ability to make successful changes to text may also result from changes in information-processing abilities like the ability to handle larger chunks of material, or it could result from an increased ability to ascertain the characteristics of an audience (Scardamalia & Bereiter, 1983a). Part II of the thesis will explore the efficacy of such hypotheses. In doing so, an attempt will be made to define the component cognitive skills of revision and to determine whether the inability to revise could be attributable to a lack of general cognitive skill rather than a lack of linguitistic ability, specifically.

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PART II: COMPONENT SKILLS IN REVISION: COGNITIVE TASK EXPERIMENTS

CHAPTER 6

THE COGNITIVE SKILLS INVOLVED IN REVISION

OVERVIEW

The research reported in Part I of this thesis investigated which of the criteria for effective writing were available for use in the revision subprocesses of evaluation, recognition of the nature of a problem and remediation and attempted to examine, specifically, text related language skills in revision. But a writing task imposes not only linguistic but also general cognitive constraints, although these are by no means independent categories (Frederiksen & Dominic, 1981). The following chapters which make up Part II of the thesis report research which primarily considers cognitive constraints.

The research had two aims. The first was to explore the kinds of cognitive skill which might be involved in revision, by looking at their relationship to observable behaviour, specifically, the outcome of changes made to text. The second aim was to address the relative contribution of language-laden skills versus non-verbal forms of such skills. This chapter discusses literature bearing on the question of the cognitive skills which might be associated with ability to revise. Later chapters explain i) how tasks designed to tap these skills were devised for the present project and ii) the extent to which performance on these tasks explains differences in revising ability.

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RATIONALE

Exploring cognitive skill was seen as one way of approaching a definition of the components of developing expertise in revision, in a manner useful for diagnosis, explanation and prediction. Chapter 2 discussed the difficulties of this task. One problem is the current lack of empirical work which could guide delineation of the types of cognitive skill which might account for individual differences in writing ability. This problem stems, in part, from a failure in conceptualizing the nature of revision.

Empirical attempts at elucidating the nature of the processes of writing and establishing what could account for differences in performance can be dichotomized. There are attempts to link broad stages of cognitive development to particular aspects of writing. There are, in addition, studies which explore the relationship of discrete variables to writing ability .

DEVELOPMENTAL STAGE AND WRITING PROFICIENCY

The writing of young children is clearly quite different from that of adolescents. But the definition of developmental trends remains problematical. Classifying and counting language features over time has been one way of defining a model of development (e.g. Loban, 1976) but the unsurprising conclusions from such studies are that older children write more and with greater complexity.

A more detailed extension of the idea of relating language features to development is research concerned with the use of local connections which relate the ideas across several sentences into a coherent discourse. Developmental gains in the use of such have been consistently found (Bracewell, Frederiksen & Frederiksen, 1982; King & Rentel, 1979; McCutchen & Perfetti, 1982). McCutchen and Perfetti's work shows that differences with age in the use of cohesive devices reflects developmental differences in memory search strategies.

An allied approach has been to attempt to link general stages of cognitive development to global features of writing like function and audience. Moffett (1968) claims that cognitive development has linguistic correlates. This idea of a cognitive/developmental model of writing was developed and tested by Britton, Burgess, McLeod and Rosen (1975). They hypothesised that writing progressed, with age, through a series of functional categories. Their scheme was based on a distinction between participant and spectator. Writing progresses from a speech-based form to three broadly differentiated forms: transactional (writing to get things done), expressive (writing close to the self) and poetic (using language as an art medium). The progression is also characterized by a change from writing for an intimate audience to writing for a public audience.

The hypothesis of Britton et al (1975) that, with maturity, students write for audiences increasingly removed from themselves was not substantiated, perhaps because the model, by concentrating solely on cognitive development, was too limited (Wilkinson, Barnsley, Hanna & Swan, 1983). A more recent study (Ollilia, Collis & Yore, 1986) attempted to establish a direct relationship between writing ability and performance on Piagetian tasks of logico-mathematical abilities, on the

assumption that the skills embodied in such tasks appeared to be related to writing. Again, level of cognitive development did not emerge as a significant predictor of writing ability.

The explanation may be that cognitive development is not necessarily synchronized with affective, moral and stylistic development which could also exert an influence on writing (Wilkinson, Barnsley, Hanna & Swan, 1983). On the basis of this suggestion, Wilkinson et al (1983) developed a stage model encompassing each of these aspects- cognitive, moral, affective and stylistic- as a way of describing a particular piece of writing in some detail. Although intended for research purposes, the model may also serve as a guide for assessing students' stage of development in each of the four areas as a precursor to helping them develop further as writers. The concept of asynchronous development and the resulting model is potentially fruitful. Research has yet to establish the nature of the interrelationships among cognitive, moral, affective and stylistic development.

SPECIFIC VARIABLES ASSOCIATED WITH WRITING ABILITY

A second approach to attempting the definition of writing ability has been investigation of the relationship between discrete variables and writing skill. These variables include intelligence, reading ability, level of oral language development, and some environmental factors like family background. More detailed cognitive processes have also been considered as contributing to differences in writing ability. They include the limits of short-term memory and the speed of manipulation of information.

Performance on intelligence tests has been shown to bear little relationship to writing ability (Percival,1966).

The relationship between reading ability and writing skill has been found to be moderate (Tierney & Leys, 1986); for example, in a study by Ollilia, Collis and Yore (1986) a reading readiness measure accounted for 37% of the variance in first graders' writing achievement. In relation to revision, Beach (1984) reported a significant relationship between reading ability and the degree of specificity with which students regarded their goals and intentions in writing. In a study investigating the contribution of reading and other language awareness measures to writing, Gowda (1983, cited in Bereiter & Scardamalia, 1984a) found 31% of the variance in writing ability was accounted for by reading comprehension and general mental ability, while "language awareness" accounted for an additional 10%.

Reading ability and language awareness (as measured by pre-school knowledge of reading and writing) were included as potential antecedents of the

writing skill of nine-year-olds in a longitudinal study by Kroll (1983). He also selected background factors like oral language development, parental interest in literacy and family background. The most powerful predictors were, in order: parental interest in literacy ($r=.73$); the pre-schooler's own pre-reading and-writing knowledge ($r=.64$); family background ($r=.59$), and reading ability at age seven ($r=.54$). In a qualitative study, King and Rentel (1979) provide a more detailed analysis of aspects of early knowledge of literacy which are particularly relevant to writing. They conclude that what children bring to writing from oral language is a sense of story structure and the ability to produce unsupported, sustained utterances.

Memory and speed of information processing have been individually considered for their contribution to writing ability. The work of Daiute (1982, 1984) and Scardamalia (1981), alluded to in Chapter 2, shows the influence of working memory on, respectively, errors in production and revision, and level of co-ordination in writing.

In a somewhat different approach to explaining writing ability, Benton, Kraft, Glover and Plake (1984) drew on Hunt's idea that automatic processes, knowledge and elementary information-processing programs are sources of cognitive variation among individuals (e.g. see Hunt, 1978; Hunt, Frost & Lunneborg, 1975; Hunt, Lunneborg & Lewis, 1975). Benton et al tested whether differences in performance on elementary information-processing tasks were related to variation in writing ability. The tasks in question involved, inter alia, an iconic memory task, letter reordering, sentence reordering and paragraph assembly.

The results suggested that good writers manipulate information in short term memory more rapidly than poor writers and that, perhaps, this advantage stems from differences in mechanical abilities to store and process information. According to Benton et al (1984) it is more likely that variation in writing skill stems from differences in the quality and efficiency of writers' elementary information- processing programs. Good writers have a whole series of information-processing programs, like a strategy for ordering information, which operate almost automatically.

In a second study, Benton (Benton & Kiewra, 1986) found that similar tasks, assessing organizational strategies, explained a modest, but significant, 7% of the variance in holistically assessed writing ability. The variance was over and above the 22% accounted for by the Test of Standard Written English. The tasks in question included anagram solving, word reordering, sentence reordering and paragraph assembly.

However, Hunt (1977) himself questions whether variation in performing basic information-processing tasks is sufficient to make a difference in an ordinary educational setting. At this stage of progress in writing research, it does not appear desirable to determine whether differences in the use of elementary information-processing programmes are sources of individual variation in writing. Such processes may be too detailed and too remote from the act of writing to have practical significance. Likewise, findings of modest relationships between writing and more general abilities like reading, have limited pedagogical application. As was pointed out in Chapter 2, there is a need to explain complex verbal abilities, like revision, by reference to their specific cognitive components.

COGNITIVE COMPONENTS OF REVISION

The preceding two approaches to elucidating the nature of the writing process and establishing what could account for differences in writing ability- the developmental stage and writing proficiency approach, and the approach relating specific variables to writing- have a common deficiency. They fail to specify what the act of writing, or its subprocesses, involves. The approaches have been unable to predict writing ability, in a manner useful for diagnosis and instruction. For example, it is generally accepted that reading plays a role in writing; in revision a specialized form of re-reading is vital. But the salient question, theoretically as well as regards writing instruction, concerns the identifiable skills in reading which facilitate writing (Bereiter & Scardamalia, 1984a).

Previous studies of the revision process in writing have begun to specify the major mental acts. Part I of this thesis employed the protomodel of Flower and Hayes (Flower & Hayes, 1981a; Hayes & Flower, 1980a, 1980b). The revision process was described as comprising evaluation, detection of the nature of a problem and remediation. When Flower and Hayes outlined their model of writing, they acknowledged, first of all, that the model specified only the major thinking processes and, second, that it was based on the performance of an individual, an average writer. More detailed breakdown of the model into refined subparts and a consideration of individual differences would await a more "propitious" occasion (Hayes & Flower, 1980b, p.390).

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This section reports the results of an analysis which elaborated the gross description of the revision process to produce a more fine-grained description of the cognitive skills involved. The second aspect of the analysis considered how individual differences in these cognitive skills might explain ability to revise.

Research evidence from discrete, univariate studies of cognitive abilities which are related to written composition, together with literature from other areas of cognitive psychology such as reading comprehension and memory, has been employed to suggest these skills. Although the following analysis proceeds from the subprocess of evaluation to that of remediation, some of the cognitive skills occur in more than one of the revision subprocesses.

Revision involves a language system which works iteratively, using its own output as input (Bereiter & Scardamalia, 1981). Although the output to be considered might be ideas or pretext, central to evaluation is rereading actual text in order to test it against intended text and internalised criteria of good writing.

Rereading or rescanning is a strategy which has been found to differentiate good and poor writers. The latter fail to rescan (Pianko, 1979). Not only the frequency but also the nature of the reconstructive activity has been shown to be important to the quality of the text produced. According to Scardamalia, Bereiter and Goelman (1982) less effective attempts to reconstruct text produced concrete, content-based propositions of the 'what it is about' sort. More effective were propositions which encapsulated the underlying message of the text.

Thus, in evaluation, when comparing text produced with that intended, it is necessary to construct a representation of what has been written. Similarly, it is necessary to create such a representation when moving from a low level editing task to generating new material or when generating an alternative version of a piece. The format of this reconstruction or representation is open to speculation. In comprehension research the representation is often characterized as a semantic or text base, made up of a set of propositions (e.g. Frederiksen, 1975; Kintsch, 1974; Kintsch & van Dijk, 1978; Meyer, 1975; Miller & Kintsch, 1980). Comprehension requires establishing connections between propositions, identifying the structure of text and remembering content (Johnson, 1983). In addition, the construction of a succinct representation, the gist, probably involves the macro rules of deletion, superordination, selection and invention. These rules underlie comprehension of text (Kintsch & van Dijk, 1978) as well as the production of summary statements (Brown & Day, 1983). The latter also involves evaluation of the relative importance of the elements represented and a reduction of the selected ones by higher order transformations (Winograd, 1984). The implication is that text produced may be efficiently represented in gist form.

The reason for representing the gist of the text is to compare this representation with a representation of text intended. The mental representation of intended text may be bounded by the depth of planning (Nold, 1981). Planning encompasses the elaboration of the rhetorical situation, an activity in which good writers invariably engage (Flower & Hayes, 1981b). Critical to this elaboration of the rhetorical situation, and to reading as a writer is the ability to draw inferences as a reader, to put aside privileged knowledge (Bartlett, 1982) and to

infer details of audience characteristics. These aspects must be taken into account when generating text.

There is a considerable body of research devoted to the examination of the relationship between social perspective taking and language development (for a review see Dickson, 1981). The empirical relationship obtained between social perspective taking measures and particular assessments of communication skill has been low (Glucksberg, Kraus & Higgins, 1975). Kroll (1985) claims that some methods of investigating audience adapted writing skills (e.g. Britton, Burgess, McLeod & Rosen, 1975; Scardamalia, Bereiter & McDonald, 1977) do not focus on audience adaptation in its primary meaning of adjusting the content and style of a text to specific audience characteristics. The latter involves producing messages which differ in ways appropriate for an audience, for example, recoding a standard text for different audiences.

Findings, however, have been ambivalent regarding the ability to vary syntax according to situation. Crowhurst and Piche (1979) found that 12-year-olds differentiated their ways of writing persuasive arguments by using more complex syntax for a teacher than a friend. But, in work with 15-year-olds, Rubin and Piche (1979) found that they adapted their text little when writing for three audiences of differing degrees of familiarity to them.

It appears that the inability to link communication skill empirically to social cognition may be due to methodological shortcomings (Rubin, 1982). Rubin claims that indices based on measured cognitive complexity, defined in terms of differentiation of the interpersonal construct system, hold promise. This accords with the cognitive/developmental account of communication skill, namely, that the

increase in social cognitive acuity (skill at inferring others' covert psychological characteristics) underlies communicative effectiveness (e.g. Flavell, 1968). The logic is that the impression one forms of another is the basis for message formulation and adaptation. Individuals who form more differentiated, stable and psychologically centred impressions tend to produce more audience-adapted messages (O'Keefe & Delia, 1979). Constructing a representation of the inferred psychological characteristics of the audience in order to match these to an appropriate message would appear to be a skill which is utilised while evaluating, detecting problems in, and remediating, text.

The specialized rereading of produced text in order to evaluate, involves more than simply reading from the viewpoint of an audience or testing for comprehensibility. Detecting deficiencies in text involves attending to both content or meaning, and form. Often the meaning dominates and student writers notice little else about a piece (Church & Bereiter, 1983; Scardamalia & Bereiter, 1986b). That extraction of meaning is paramount was supported in a study reported by Hayes and Flower (1987). Familiarity with content impeded the detection of errors, presumably because the piece was read in a more cursory fashion.

Failure to detect errors in text has also been attributed to short-term memory constraints (Daiute, 1982, 1984). As short-term memory limits are assumed to be the same in rereading text as in producing it, Daiute concludes that, in revision, both detection and correction of deficiencies may be hindered. The results of Daiute's work suggest that, in order to revise successfully, writers need to be familiar with, and utilize, sentence pattern frames and, presumably, broader structures.

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Knowledge of structure at the discourse level is likely to be an important information-handling technique to offset constraints of limited capacity. Readers use formal text structures in comprehension (Mandler & Johnson, 1977; Stein & Glenn, 1979; Van Dijk, 1980). It is likely that skilled writers have templates or formats of text structure to use at the sentence or whole-text level to help them organize production (Scardamalia & Bereiter, 1986a). Witte (1985) speculates that differences in the types of revision writers undertake might stem from the ability to "frame", prior to transcription, the propositional content of the message. Pre-textual framing depends on, and reflects, availability in working memory of structures for organizing information.

Structures for organizing information may be especially important for children. Children's performance in writing-related memory tasks is only 40% of their performance on a traditional measure of working memory (Bereiter & Scardamalia, 1984b). Chi and Rees (1983) make the point that children may not have trouble holding the necessary information in mind to form new concepts, but they may lack the background knowledge that would provide ready made ways of coding and organising new information, such as the schemata or scripts of text comprehension (Anderson, 1978; Anderson, Spiro & Anderson, 1978; Rumelhart, 1975, 1980).

In summary, knowledge of structure has been implicated in text comprehension and production. It has also been suggested that, in revising text, structure patterns or frames may aid detection of errors. The ability to use

template-type cues, such as the structure of a story, was considered a cognitive skill likely to be implicated in successful revision.

The writer may also use such structures as an aid when maintaining information in working memory. Several units of information have to be readily available in revision, as text production is an interdependent system. In "executing a particular procedure, the products of other subprocesses must be simultaneously available" (Bereiter & Scardamalia, 1984b, p.409). When making changes to text, it is necessary for the writer to maintain, or have readily available, a number of elements. These include the gist of the text to date; an idea of intention or plan; the offending unit(s) and, finally, the alternatives generated.

The generating of alternatives is the usual form remedial action takes after the writer has evaluated appropriately and recognised the nature of any deficiencies. Ideational fluency, the ability to generate written material, was suggested as an important cognitive skill in writing by Bereiter (1980). In revision, when the writer experiences dissatisfaction with an aspect of writing and makes a decision to effect a change, an alternative (or several) to the offending part has (have) to be produced.

These alternatives have to be generated in the face of a potent stimulus, the unit that the writer perceived to be lacking. It has been suggested (Bracewell, 1980) that stimulus saliency makes it difficult for writers to go beyond what they have formulated, either in idea or actual text. In the research reported by both Bracewell (1980) and Scardarnalia, Bereiter and Goelman (1982), it appears that even when children perceive that what they have written is lacking, they are often able

ability to generate alternatives, when faced with previous attempts was seen as a cognitive skill salient to revision.

Generating alternatives to a piece of text deemed lacking is not like algorithmic problem solving where there is only one solution which will solve the whole problem. Rather, it is a case of generating many solutions and testing each for appropriateness (Cooper & Matsuhashi, 1983). This requires that the writer choose from a potentially vast number of possibilities, the most suitable for the context in question.

From observational research it is known that although young children can, and will, write a number of lead sentences, they will invariably select as best the final one they have written (Calkins,1982). According to Bracewell, Bereiter and Scardamalia (1979) to revise successfully writers need to maintain two representations and to learn to make rapid decentred comparisons between them. They claim that children's difficulties in revision stem from an inability to compare any two representations of the same event. Although these researchers were referring to comparing representations of actual and intended text, the suggestion applies equally to comparing actual text and alternative text, or making comparisons among alternatives. These comparisons have to be weighed up in the abstract by representing how the text produced will appear, minus the portion deemed inadequate, but with the addition of each alternative in turn.
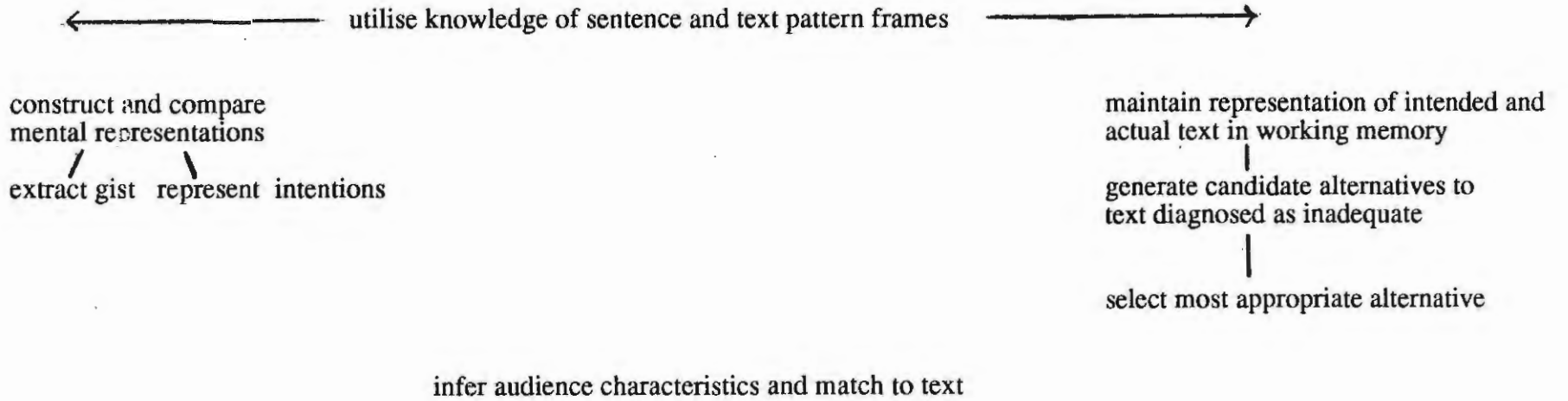
CONCLUSION

This chapter has outlined some of the more detailed cognitive skills which might underlie the global processes outlined by Flower and Hayes (Flower & Hayes, 1981a; Hayes & Flower, 1980a, 1980b). From a distillation of relevant literature, five cognitive skills were posited as being germane to revision. These skills are, namely: i) constructing, for comparison with intentions, a mental representation of text through extracting the gist; ii) inferring audience characteristics and matching these to a suitable message; iii) utilizing organizational structures to offset limited information-processing capacity; iv) generating new content or structure in the face of existing text and, v) problem solving, in the sense of weighing up alternative solutions in order to select the most appropriate one. Figure 6.1 shows how the preceding skills can be incorporated with a descriptive model of the subprocesses of revision.

The following chapter describes how tasks to tap these skills were devised and how performance on each was assessed. Chapter 8 presents the results of an investigation of the relationship of these hypothesized skills to revising ability and how individual differences in the cognitive skills contribute to variation in revising ability.

Evaluation   Recognition   Remediation

←————————————————— utilise knowledge of sentence and text pattern frames ————————————————→

construct and compare   maintain representation of intended and
mental representations   actual text in working memory
      /   \
extract gist   represent intentions   generate candidate alternatives to
                                                                         text diagnosed as inadequate

                                                                         select most appropriate alternative

                       infer audience characteristics and match to text

Figure 6.1

Cognitive Processes in Revision

CHAPTER 7

COGNITIVE TASK EXPERIMENTS I: METHOD

The previous chapter presented the rationale and literature which guided the formation of the hypotheses regarding the cognitive skills underlying successful revision. This chapter describes the tasks which were devised to measure performance on each of these skills.

SUBJECTS

The subjects who completed the cognitive tasks were the same subjects who participated in the text experiments described in Chapter 4. The 40 Year 7 and the 40 Year 9 students completed every task but, because of school restrictions, not all of the subjects in the oldest (Year 11) group did so. The Ns for the latter group varied with task (minimum N=76).

OVERVIEW OF METHOD, PROCEDURE AND SCORING

Subjects completed five pencil and paper tasks which measured the cognitive skills outlined in the previous chapter as possibly underpinning revision. Each task comprised two versions, verbal and non-verbal. In the non-verbal version the stimuli were pictorial and performance on this version of a task was taken to reflect an individual's level of ability in the relevant cognitive skill, unconfounded with verbal demands. The input for the verbal version was written text and performance here represented an additional factor, namely, facility in verbal articulation of the cognitive skill in question. In addition, subjects were tested on Raven's Progressive Matrices to provide a measure of intelligence.

The administration of the tasks was done in groups of less than 10 subjects for Years 7 and 9 and less than 20 for Year 11. Testing was spread over a number of sessions, the exact number depending on the scheduled school lesson length. The order in which the groups received the tasks was randomized and the order of the verbal and non-verbal versions of a task counterbalanced within each age group.

For each task instructions were given orally. Identical instructions appeared on a cover sheet. Also on the cover sheet was an example, used as an illustration, to explain how the task was to be done. The experimenter worked through this example with the subjects. The experimenter administered and scored all materials.

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The following description details, in turn, how each of the cognitive skill variables was measured: it describes the construction of the task; the testing procedure followed and the scoring system employed.

MEASURING THE FIVE COGNITIVE SKILL VARIABLES

Extracting the gist (GIST)

Materials:

The task to measure the skill of extracting the gist involved subjects' considering the content of a paragraph or picture, in order to extract its main points. The major points then had to be encapsulated in a short title for a photograph or paragraph. Production of this title involved inventing a superordinate term or telescoping a lengthy point. Each picture or text could be seen as having three main facets, namely, a setting or state; an action or connection, and an outcome.

For the verbal version seven short texts (of between 60 and 100 words) were selected or adapted from newspapers, magazines or appropriate subject texts in English. The reading level was suitable for even the youngest readers. The texts were presented in a booklet and above each was space for a title.

In the non-verbal version seven pictures or diagrams were employed. These were taken from suitable text or library material in general subject areas. These stimuli were also collated in booklet form but here a separate answer sheet

was provided for the titles. Verbal and non-verbal versions of the task are presented in Appendices C.1 and C.2, respectively.

Procedure:

In the verbal version of this task subjects were given the booklet containing the seven short texts. They were told that these were articles which could have come from a newspaper or magazine and that their task was to write a short appropriate title for each one, that is a title clearly related to the content of the text and including all of its main ideas. Instructions for the non-verbal task were similar to those for the verbal version, except that, this time, the titles referred to pictures.

The time allowed, 12 minutes, was the same for both versions of the task.

Scoring:

For the purposes of scoring, the main propositions in each text or picture were identified. These were categorized in terms of setting or state, action or connection, and outcome. Appendix C.3 contains the main propositions identified for each paragraph or picture, together with an example of an appropriate title. Each main proposition or idea suggested in the title produced by the subject scored one point with a maximum of three per item.

Social perspective taking: inferring audience characteristics and matching to message (AUD)

Materials:

This task required that subjects consider characteristics of a message, such as content and style, and match these with inferred characteristics and psychological needs of a target audience.

A common theme was chosen for both the verbal and non-verbal stimuli. All conveyed an anti-smoking message. The verbal version of the task consisted of written passages, taken largely from anti-smoking material produced by the Australian Capital Territory Health Authority. These passages were presented in a booklet, together with a list of likely target audiences (see Appendix C.4). The non-verbal version of the task consisted of nine photographs, which were copies of slides obtained from the Cancer Council of the Australian Capital Territory. They were selected on the following criteria: that they contain no verbal message and that they have a reasonably obvious target audience (see Appendix C.5 for the photographs, together with the list of descriptions of target audiences).

The stimuli shown in Appendix C.4 and C.5 and appropriate descriptions of the target audience groups were obtained from a pilot study in which adults were asked to nominate a likely target group for each anti-smoking photograph and paragraph. Only stimuli for which there was consensus with respect to target audience were retained. In a subsequent pilot study a small sample of educated adults (N=10) was found to be successful in matching the selected stimuli to descriptions of the target group at greater than 80% accuracy, the criterion set for acceptance.

Procedure:

For the verbal task subjects were informed that they would be given booklets comprising (i) nine paragraphs, each of which presented anti-smoking material designed for a particular target group (ii) a separate list of the target groups in question. Subjects were further informed that the task was to match the text with the appropriate target group.

In the non-verbal version subjects were presented with nine photographs on a display board and were informed that each numbered photograph represented an anti-smoking message aimed at a particular group of people. They had to match each photograph to a description from a set of target audiences presented on an answer sheet.

There was no set time limit for either version of this task.

Scoring:

The match between audience and photograph or paragraph identified by the adult pilot subjects was deemed to be the correct answer and these scored one mark each, giving a total of nine for each version of the task.

Working memory: organizing material (SORT)

Materials:

The basic requirement in this task was the mental manipulation and ordering of material. Test items were presented in a booklet, each item on a separate page. In the verbal version of the task a test item was a paragraph, its sentences having been randomly reordered such that it no longer constituted a

logical sequence. The subject's task was to arrange the misordered sentences so that they again formed an appropriately sequenced set of ideas. There were three such test items. When the respective randomly ordered sentences were appropriately sequenced, one item formed a narrative, the second a set of instructions, and the third an hierarchically ordered set of statements. The narrative and set of instructions involved chronological sequencing and blanks appeared before each sentence so the subject could indicate a chosen order. For the hierarchical sort a superordinate statement had to be identified for the top level; then the two major themes at level two and their associated subthemes for level three. A tree diagram was provided to record the order in the hierarchical sort. The three verbal items appear in Appendix C.6.

The non-verbal version employed three items which were designed to be non-linguistic analogues of the verbal items. Items 1 and 2 consisted of six randomly ordered pictures. Appropriately ordered, the pictures in the first item followed a chronological narrative (a picture sort item from the WAIS), while the pictures in the second illustrated the actions to follow if stranded in the desert without water. The third item consisted of a series of line drawings in boxes. When appropriately arranged in an hierarchy, each level contained all the elements of the lower levels. In Items 1 and 2 blanks were placed under each picture for the subject to fill in to indicate a preferred order. For the third item a tree diagram was again provided. The non-verbal items are shown in Appendix C.7.

Procedure:

Subjects were told that each page in the booklets contained a series of sentences (or pictures in the non-verbal version) which had to be ordered to form

a logical sequence. On pages one and two the sentences or pictures had to be numbered in the correct order with number one the sentence or picture starting the story. For the hierarchical sort the number of the sentence or diagram had to be placed where it belonged in the tree diagram. In the verbal task subjects were told to put at the top of the tree the number of the main or topic sentence, then the numbers for the subheading sentences and so on. For the non-verbal task instructions were that diagrams at one level should together contain the information needed to construct the diagram at the next level. Subjects were told to work quickly but accurately. To encourage speed they were given a stop watch to time themselves but completion time was not a variable analysed.

Scoring:

A simple scoring system was adopted for both verbal and non-verbal tasks with one point for a correct beginning, then one point for each adjacent placement correct.

Ideational fluency: generating new in the face of old (NEW)
Materials:

This task required that, given a context or setting and certain elements, subjects produce different combinations of the elements, each relevant to the context. In the verbal version subjects were given a context, that is information about the setting and either three or four words connected with that context. The requirement was to produce as many different sentences as possible, each using all the words within the constraints of the given context. For the non-verbal version a context was similarly given but the elements were shapes which had to be fitted together to produce recognizable objects, which were suggested by a given context.

The verbal and non-verbal versions of the task were each presented in four-page booklets in which each page contained one item followed by space to record responses. A cover sheet presented instructions and a worked example. Appendix C.8 contains the verbal task designed to measure the ability to generate new material when faced with old, while the non-verbal version is in Appendix C.9.

Procedure:

For the verbal task, subjects were told that each item contained information about a setting or context and some words. Their task was to use all the words in as many different sentences as possible to express ideas consistent with the contexts provided. Where it was feasible, a word could be more than one part of speech and the form could thus be altered. For example, food in item one could become feed.

For the non-verbal version, the subject had to combine elements in various ways to form representations of objects. Again, the idea was to construct as many different objects as possible that were associated with the context given. Subjects were advised that an element could be used more than once or on any scale or at a different angle but that an attempt should be made to include all the elements in each object.

In both versions of the task, a time limit of four minutes was allowed for each item.

Scoring:

For the verbal version of the task an attempt was scored if all words were used in a sentence which made sense in terms of both its expression and the context provided. It was possible to score a maximum of two points per sentence. One point was given where a new grammatical structure was implemented to express essentially the same idea as previously. A point was also awarded if a new idea or construct was expressed. If this new idea were not in the same format as a previous sentence it scored two points.

Scoring for the non-verbal version was similar. The object had to be recognizable (about 5% were not) and related to the context. However, the criterion for the number of elements used was set at three out of four. Each different object meeting the above criteria scored a point. However, the same object given for two different contexts failed to score on the second occasion.

Weighing alternatives abstractly (ALT)
Materials:

This task involved piecing together a coherent story with a specified ending. The aim of the task was to force the subject to choose from alternative content in constructing the story, with the constraint of a given ending.

The story-line was represented by sentences in the verbal version of the task and by pictures for the non-verbal version. Stories were constructed in a branching fashion with four levels. The first level was the start of the story, a very brief, general opening. At level two, the story branched in two directions, while at level three, a further branching meant that there were four alternatives

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from which to choose. There were eight alternatives at level four, from which the subject had to select the appropriate one according to instructions as to how the story was to finish. At each level only one of the alternatives made sense in terms of the constraints imposed by the necessary ending.

Both the verbal and the non-verbal versions of the task employed story lines which were liberal adaptations of stories from Andee Rubin and Bertram Bruces' original "Story Tree" software (Bolt, Beranek & Newman Inc.; Rubin, 1980). The verbal version of the task had one or more sentences as alternatives at each level. The non-verbal version employed illustrations to encapsulate the contents of each segment. Subjects were provided with a five page booklet for each of the verbal and non-verbal versions of the task. Each level was on a separate page. The contents of these booklets are contained in Appendix C.10 and C.11.

Procedure:

Instructions were on the cover page of the booklet. Subjects were to construct a logical story with a specified ending. They were told that the start of the story was at level one and that over the next page there were two alternatives from which to choose at level two; on the next page four alternatives at level three and, on the final pages, eight alternative endings for level four. They were informed that the experimenter would select the ending of the story at random from the list of endings at the front of the booklet.

A tick was to be placed beside the alternative (at levels two, three and four) which seemed to fit best, given the required ending. Subjects were encouraged to work quickly, but accurately. Again, as in the SORT task, they were

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each given a stop watch to time themselves. They were told that they could go back to make corrections but that the watch was not to be stopped until they were satisfied with the story they had produced. A practice trial of the procedure was given.

Scoring:

A point was given for each alternative identified correctly.

PILOT STUDY

A pilot study was undertaken with 12 Year 7 and 12 Year 9 students, representing a broad ability range, to establish whether the cognitive tasks, described above, were comprehensible, discriminating and reliable.

The subjects completed all tasks. They were carefully observed while doing the tasks, encouraged to ask questions and, after completing the task, were informally interviewed on such points as overall comprehensibility and the difficulty level of individual items.

From the observations of performance on the pilot tasks, realistic limits were set for the tasks which were timed. Instructions which were not completely clear were modified.

It was apparent from the pilot study where there were insufficient items or items of insufficient difficulty to provide a range of scores. Items which did not

provide such a range or which were contributing to low reliability, were discarded and substitute items devised.

Alterations were thus made to the cognitive tasks as a result of analysing data from the pilot study, preparatory to the main study. The results of the main study are reported in the following chapter.

CHAPTER 8

COGNITIVE TASK EXPERIMENTS II: RESULTS AND DISCUSSION

OVERVIEW

The primary aim of the analyses presented in this chapter was to examine whether the cognitive skills, hypothesized as underlying revision, bear a relationship to remediation ability, as measured by successful changes to text. The analyses examine the nature of this relationship and, in addition, address the question of whether the inability to revise successfully is due to cognitive or specific verbal factors.

Prior to investigating such questions, preliminary analyses were undertaken to establish the appropriateness of the cognitive tasks and the criterion measure, remediation ability. It was necessary to consider features like reliability, age effects and intercorrelations between versions of a task and between tasks, as a guide to the conduct and interpretation of the planned main analyses. These preliminary analyses will be presented first.

PRELIMINARY ANALYSES

The preliminary analyses comprised descriptive statistics associated with the cognitive tasks, other predictor variables, and the dependent measure,

remediation ability; and findings on the reliability of the cognitive tasks and the remediation ability score. These analyses also included the examination of three types of relationship: i) age and its relationship to the predictor and criterion variables ii) the degree of relationship between the verbal and nonverbal versions of each task and iii) the relationship between the different cognitive skills.

Descriptive statistics

Table 8.1 shows the mean and standard deviation for both verbal (V) and non-verbal (NV) versions of the cognitive tasks of extracting the gist (GIST); inferring audience characteristics and matching to message (AUD); utilizing organizational structures (SORT); generating new in face of old (NEW) and weighing alternatives abstractly (ALT). Also included are the descriptive statistics for IQ and the dependent measure, remediation ability (REMED). The dependent measure was obtained from Experiment 3 (Part I) of this study and was a total score, representing the extent to which the subject improved all of five degraded texts.

Table 8.1

Descriptive Statistics for Cognitive Tasks, IQ and Remediation Ability

Task#

	mean	sd	skew
VGIST (21)	10.96	3.60	-0.39
NVGIST (21)	9.18	2.85	0.19
VAUD (9)	3.98	1.97	0.27
NVAUD (9)	3.72	1.82	0.27
VSORT (20)	8.58	3.35	0.14
NVSORT (19)	15.79	3.37	-1.02
VNEW	13.10	6.53	0.23
NVNEW	15.79	6.28	0.03
VALT (4)	3.18	0.89	-0.86
NVALT (4)	3.41	0.79	-1.39
IQ	114.31	12.64	-0.95
REMED (25)	6.97	4.53	0.41

see text for code. Max score (where applicable) in brackets.

min N=159

Relative to their respective means, the variances appeared of similar magnitude, although the non-verbal sorting task (NVSORT) had a slightly

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constrained variance. A measure of the degree to which the distribution of scores on each task deviates from normality, the measure of skewness is included. None of the distributions deviated sufficiently from normal to warrant concern. There was a ceiling effect for the task of weighing alternatives abstractly and, to a lesser extent, for the non-verbal version of sentence sort. But both had levels of skewness well within the tolerance range (less than plus or minus 1.5).

Reliability

Cognitive tasks:

Most of the cognitive tasks devised for this research were novel. These short, paper and pencil tasks were developed for the purpose of establishing whether the cognitive skills represented by the tasks were involved in revision. Reliabilities are therefore reported to allow the results of the analyses presented in this chapter to be considered with reference to them.

Appropriate measures of reliability were selected according to the characteristics of measurement associated with the task.

GIST: Reliability for the verbal and non-verbal forms of the extracting-the-gist task was obtained using Cronbach's measure of internal consistency. The resulting coefficients were .98 for the verbal form and .62 for the non-verbal form.

AUD: Reliability for the task requiring the matching of audience characteristics and message was obtained using a measure of interitem consistency. As the scoring for this task was dichotomous, the Kuder-Richardson formula 20 for

the measurement of internal consistency was applied. A reliability coefficient of .55 was obtained for the verbal form and .56 for the non-verbal form.

SORT: The items in the sentence sort task were not homogeneous, therefore a measure of internal consistency is inappropriate as a measure of reliability (Anastasi, 1982). The most suitable measure of reliability for this task is a test-retest correlation. A sample group of 30 school students, similar in composition to the subject group, was used to obtain the measure. There was an interval of one week between test takings to attempt to offset the same pattern of responses occurring because of memory for previous responses. The test-retest reliabilities were respectively .88, .79 and .81 for the three items in the verbal version, and .92, .83 and .72 for their non-verbal versions.

NEW: The four items in both the verbal and non-verbal forms of the generating new in the face of old task were subjected to Cronbach's measure of internal consistency. The resulting reliability for the verbal form was .86, and, for the non-verbal, .65.

ALT: For the task involving weighing alternatives abstractly an alternate form measure of reliability was obtained. As there was a number of alternative endings for the story, from which the experimenter selected one at random, it was possible to administer two forms in immediate succession. The alternate forms reliability coefficient was .62 for the verbal version and .58 for the non-verbal version.

Remediation ability:

The dependent variable, remediation ability, was obtained from the remediation experiment in the study reported in Part I of the thesis. In this experiment subjects were asked to effect improvements to each degraded text. The problems of inter-rater reliability measures in the area of writing assessment, notably those of low reported measures of agreement and the possibility of one dimension dominating in holistic rating, have been discussed previously (see Chapter 3). Chapter 4 explained how the changes to texts were rated in the present study. It will be recalled that the agreement coefficient reported in that chapter (.68) was a measure of agreement for scores for individual degraded texts. However, in this part of the study, the dependent measure is the total score for improving the five degraded texts. The inter-rater reliability for this measure was .95.

Effects of age

As previously explained, the subjects in this study were drawn from three school years. To determine the nature and design of subsequent analyses, the effects of age on both cognitive task performance and remediation ability were examined.

The correlation matrices on which the following analyses are based are contained in Appendices D.1 and D.2.

Age and performance on cognitive tasks

The correlations of age with each of the cognitive tasks, in both verbal and non-verbal versions, were uniformly low. The mean correlation of the non-

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verbal tasks with age was .11 (range .01 to .26). Taken individually the only non-verbal version of any task to correlate significantly with age was GIST. The mean correlation between age and the verbal tasks was slightly higher at .24 (ranging from -.02 to .44). For these tasks all but weighing alternatives abstractly were significantly related to age.

Age and remediation ability

The relationship of age to remediation ability, was examined. Age correlated .48 with ability to make appropriate changes to text. Thus, while age effects were weakly represented in cognitive task performance, they were significant in remediation ability.

Associations between the verbal and non-verbal measures of a cognitive skill

Of the two types of test of cognitive skill, the non-verbal version was taken to represent the ability in general, while the verbal version included an additional written language facility component. The verbal and non-verbal versions of each task were significantly correlated, as is shown in Table 8.2.

The significant correlations between the two forms are consistent with the assumption made in this study that both were measures of the same underlying cognitive skill. This is also supported by a consideration of the complete intercorrelation matrix (presented in Appendix D.1) which shows that the verbal and non-verbal forms of a task were consistently more highly correlated with each other than with any other task.

Table 8.2

Correlation Between Verbal and Non-verbal Measures of a Cognitive Skill

Cognitive Skill	r
extracting the gist	.53*
inferring audience characteristics	.33*
utilising organisational structures	.24*
generating new in face of old	.40*
weighing alternatives abstractly	.37*

min. N=158   *p<.001

The fact that the correlations between the verbal and non-verbal versions of a task, while significant, were only moderate, might reflect the level of reliabilities of the measures. Alternatively, the moderate level of relationship might reflect the fact that two different types of manifestation of the cognitive skill were obtained. In this case, it is not possible to distinguish between these alternative explanations.

Associations between cognitive tasks

Since the verbal and non-verbal versions of the tasks were significantly correlated, the two versions were added together for purposes of considering associations between the five cognitive skills.

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The Pearson product moment correlations between the five cognitive skill areas are summarized in Table 8.3. As expected, given that the cognitive tasks were designed to measure aspects of the same general ability, they are modestly intercorrelated and, in all but one case these intercorrelations are significant.

Table 8.3

Intercorrelations Between Cognitive Skills

Cognitive Skills

	GIST	AUD	SORT	NEW	ALT
GIST	...	.42**	.47**	.37**	.27**
AUD		...	.38**	.35**	.22*
SORT			...	.23*	.24**
NEW				...	.16
ALT					...

Min N=158   *p<.01   *p<.001

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MAIN ANALYSES

The main analyses were of four kinds. Initially bivariate correlations were computed between remediation ability and the individual cognitive skills.

Multivariate analyses were then conducted to determine the relative contribution of the various cognitive skills to remediation ability. In the first instance a total (i.e. verbal + non-verbal) score for each cognitive skill was entered into the multiple regression equation. Subsequently, verbal and non-verbal scores were separated and the separated scores used in a further multiple regression analysis. The aim of this analysis was to determine whether or not a specifically linguistic manifestation of a cognitive skill makes a contribution to remediation performance, over and above any contribution which might be made by competence in the skill in a more general form.

The main analyses also included an examination of the relationship between IQ, as measured by Ravens Progressive Matrices, and remediation performance. This was to discount the possibility that the contribution of cognitive skill to remediation ability could be explained simply by differences in general intelligence.

Bivariate correlations between cognitive skills and remediation performance

In the initial examination of the association of cognitive task scores with the dependent measure, remediation ability, the scores on both verbal and non-verbal versions of each task were totalled to represent overall performance on that skill.

As Table 8.4 shows, each of the cognitive skills was significantly related to the ability to revise. Appendix D.1 illustrates that both verbal and non-verbal versions of each cognitive skill, taken alone, were significantly correlated with remediation score, with the exception of the non-verbal form of generating new in the face of old (NVNEW). It is also obvious from the matrix in Appendix D.1 that the verbal versions of each task correlated more highly with remediation score than their non-verbal counterparts, although it is acknowledged that this might be due to the lower reliability coefficients of the non-verbal tasks.

Table 8.4

Bivariate Correlations of Cognitive Skills and Remediation Ability

Cognitive Skill	r
GIST	.54*
AUD	.40*
SORT	.41*
NEW	.43*
ALT	.31*

*$p<.001$

The preliminary analyses, reported above, established that although there was a low correlation between age and cognitive task performance, the former was a significant factor in the dependent variable, remediation ability. Before undertaking multivariate analyses, the correlation of each task with remediation ability was compared for the three age groups. Appendix D.3 contains the table showing the correlation of each skill with remediation ability for the three age groups separately.

The cognitive skill by remediation coefficients for the youngest age group were compared with the respective coefficients for Year 9 using Fisher's z' transformation of r. There were no significant differences between the correlations for the two younger age groups. Accordingly, from these two groups, the

correlation coefficient for each task that was most discrepant from that of the Year 11 group was tested. Only the correlation between generating new in face of old and remediation ability was significantly different ($z'=2.43$, $p<.05$).

In summary, it appears that the cognitive skills, hypothesized as underlying the ability to make changes to text, were related to remediation ability and that the relationship between each cognitive skill and remediation was generally consistent across age groups.

Multiple regression analysis of remediation ability against age and cognitive skill

The result, presented above, of the comparison of the correlations of cognitive task performance with remediation ability across age groups supports the combining of the three age groups to provide a larger, more stable sample for the multivariate analyses proposed in this part of the study.[1]

Two different multiple regression analyses were performed. The first of these involved regressing remediation ability against age and the total score for each cognitive skill while the second regressed remediation ability against age and the separate verbal and non-verbal scores for each cognitive skill.

Remediation ability, age and overall cognitive skill performance

Remediation score was first regressed against age and the cognitive skills of extracting the gist, inferring audience characteristics, utilizing organizational structures, generating new in the face of old and weighing

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[1] For a regression analysis with 11 independent variables (the largest number proposed in the present analyses) a minimum sample size of 110-144 is recommended (Pedhazur, 1982).

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alternatives abstractly. Because it had been shown to be significantly related to the dependent variable, it was necessary to control for age. In order to ascertain whether cognitive skills had an effect on remediation ability over and above the effect of age, the latter variable was forced to enter the equation first.[2] The five cognitive task variables were entered as a block. Table 8.5 shows the results of a blockwise regression of remediation score against age and cognitive task scores, while Table 8.6 summarizes the change in variance accounted for by the addition of each block of variables.

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[2] Subjects in this study were drawn from Years 7,9 & 11 and thus age was not normally distributed. Despite this, when plots of standardized residuals from the regressions were examined they were found to be normally distributed.

Table 8.5

Blockwise Multiple Regression of Remediation Ability Against Age and Cognitive Task Scores

Predictor	Adj R^2	$Beta^\#$
age	.23	.29***
GIST		.22**
AUD		.15*
SORT		.13
NEW		.13
ALT	.49	.19**

*p<.05   **p<.01   ***p<.001

all variables in equation

As Table 8.6 shows, age accounted for 24% of the variance while the cognitive skills accounted for an additional 27%. (Appendix D.2 contains the correlation matrix for all relevant variables.)

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Table 8.6

Summary Table for Blockwise Regression of Remediation Ability Against Age and Cognitive Task Scores

Block	no. variables	R^2	R^2change	Fchange
age	1	.24	.24	42.98*
tasks	5	.51	.27	14.56*

*$p<.001$

Three of the cognitive skill variables, namely, inferring audience characteristics then matching to message, extracting the gist, and weighing alternatives abstractly emerged as significant predictors of remediation ability.

Two cognitive skills (SORT and NEW) were not significant predictors. This may have been for several reasons. Utilizing organizational structures and generating new in the face of old could, of course, be genuinely unrelated to remediation ability but the significant zero order correlations, shown in Table 8.4 ($r=.43$ and .41, respectively), appear to indicate otherwise. Investigation of the relationship of age to each of these variables ($r=.27$ and .14, respectively) suggests that the correlations of new in the face of old and utilizing organizational structures with remediation ability were not spuriously inflated with age variance.

Another possible explanation is that these two variables did not emerge as significant predictors because they had insufficient unique variance. Utilizing organizational structures correlated .47 with extracting the gist, suggesting that it may be a component process of this higher order skill. Utilizing organizational structures also correlated .38 with inferring audience characteristics, while generating new in face of old correlated .35 and .37, respectively, with these variables. The unique contribution of cognitive skills to explained variance in remediation ability will be discussed further in a following section.

The conclusion from this analysis is that cognitive skill in general emerged as a significant contributor to variance in remediation ability, after controlling for age. Three of the hypothesized cognitive skills made significant unique contributions to explained variance.

Remediation ability, age, and verbal and non-verbal performance on cognitive skills

There is no reason to suppose that the cognitive processing and linguistic components of revision are independent. To circumvent the problem of attempting to construct tasks that allegedly represent 'pure' cognitive and 'pure' linguistic components of revision, this research adopted a novel approach. To explore the question of whether the ability to revise is constrained by cognitive skill or linguistic facility, two similar versions of the task to tap each cognitive skill were constructed. In one, the non-verbal version, the items were pictorial and this form was seen as representing a relatively pure measure of the cognitive skill. For the verbal version, the material was written text and this was seen to represent the same skill with an additional factor, a verbal or written language facility.

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The relative contribution of these two components of cognitive skill (verbal and non-verbal) to remediation ability was considered. Given that the verbal and non-verbal versions of the cognitive tasks were intercorrelated, a regression procedure partitioning the variance was inappropriate. Attempting to see if the verbal tasks accounted for significant variance over and above that accounted for by the non-verbal tasks, could be misleading, in that the first block of variables entered into the equation would include common variance. Pedhazur (1982) argues that, for this reason, "variance partitioning is not a valid approach for the purpose of determining the relative importance of the effects of independent variables on a dependent variable" (p176).

Given that variance partitioning is inappropriate, an alternative is simply to consider unique variance by examining the squared semi-partial correlation coefficient between predictor and the dependent variable to obtain what Darlington (1968) terms the "usefulness" of the former. This represents the decrement in total explained variance which would result from the elimination of a specified predictor from the model. The method is considered unsatisfactory as values obtained are small and do not total to variance explained (Pedhazur, 1982). These drawbacks are illustrated by the results of such an analysis, presented in Table 8.7.

Table 8.7

Unique Contribution of Verbal and Non-verbal Cognitive Skill Variables to Remediation Ability.

Predictor	Squared semi-partial correlation coefficient
age	.056
NVGIST	.003
NVAUD	.013
NVSORT	.005
NVNEW	-.001
NVALT	.011
VGIST	.010
VAUD	.002
VSORT	.003
VNEW	.027
VALT	.009

It is difficult to discern from such an analysis how much variance in remediation ability is accounted for by the cognitive skills collectively. Also, this method of considering unique variance allows nothing to be said about the variance in remediation ability that a given variable may share with other variables. This

common variance is, in some sense, part of that given variable's contribution to remediation ability (Howell, 1982).

Hoffman (1962) argues that it is possible to represent the independent contribution of each variable, while taking into account their common variance. In the present study it would allow consideration of the contribution of each of two correlated blocks of variables. Values are calculated which reflect both the unique variance contribution of the individual variables, plus a proportion of common variance. These are r x *beta* values, arrived at by multiplying the *beta* value of the independent variable by the zero-order correlation of the independent variable with the dependent variable. The sum of the r x *betas* is the total explained variance.

On the basis of Hoffman's proposed method, a multiple regression was performed forcing age to enter first, then the separate verbal and non-verbal scores for each cognitive task, all as a block. These two blocks, age and cognitive tasks, together accounted for 53% of the variance in remediation score (adjusted R^2=.49). Appendix D.2 contains the correlation matrix on which the regression is based.

Table 8.8

Regression of Remediation Ability Against Age and Verbal and Non-verbal Cognitive Task Scores

Predictor	beta[#]	r	rbeta	rbeta total[+]	R^2
age	.283**	.490	.139	.139	.24
NVGIST	.082	.460	.038		
NVAUD	.125	.353	.044		
NVSORT	.078	.260	.020		
NVNEW	-.035	.216	-.007		
NVALT	.116	.256	.030	.125	
VGIST	.137	.532	.073		
VAUD	.062	.403	.025		
VSORT	.060	.407	.024		
VNEW	.217*	.528	.115		
VALT	.110	.259	.028	.256	.37

Total R^2=.529

all variables in equation

+ for block of variables

* $p<.01$ ** $p<.001$

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Table 8.8 shows the *r* x *beta* values and the sum of these for each block of variables. The sum of the *r* x *betas* representing the contribution of verbal task variables to explained variance, .265, is more than twice that of the non-verbal task scores, .125. It is noted that the pattern of results is not discrepant from that obtained using squared semi-partial correlations. The total variance explained by the verbal tasks, compared to that explained by the non-verbal tasks, was proportionally similar to that obtained by summing individual tasks' unique variance.

There are two possible disadvantages with the above method. One is that age variance becomes part of the commonly apportioned variance and is therefore equally represented in verbal and nonverbal tasks. A previous analysis of the correlations of verbal and non-verbal tasks with age suggests that although both are small, verbal correlations are higher. The second possible problem concerns the interpretation of a negative *r* x *beta*. However, in this case the negative *r* x *beta* for the nonverbal task generating new in the face of old (NVNEW in Table 8.8) is not significant. If it were it would be indicative of a suppressor variable which, in this case, would make sense in that ideational fluency (the task NEW) would constrain performance on other tasks.

The role of intelligence

In this study, IQ correlated .29 with remediation score. This value is comparable with values found in previous studies (e.g. Percival, 1966). The question remains as to whether cognitive skill makes a contribution to remediation ability, independent of that of intelligence.

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A verbal ability factor emerges in most IQ tests. Those high in verbal ability have a wide vocabulary, recognize words more readily, are better at acquiring word meanings and are more sensitive to context (Hunt, 1985). Such abilities may well be components of the cognitive skills measured by the tasks in the present study. Therefore, general intellectual ability was measured here with a non-verbal test (Raven's Progressive Matrices). A non-verbal measure of IQ was used in order to simplify interpretation of results and to clarify the role of specific cognitive skills in revision, as opposed to general intellectual ability.

A regression analysis was performed to ascertain the contribution of cognitive skill to remediation ability, over and above the contribution of intelligence. Again age variance in remediation ability was controlled by entering age into the equation first. The score on Raven's Progressive Matrices was then entered and this variable accounted for 12% of the variance, taking the variance explained to 37% (see Table 8.9). When the cognitive task scores were entered, they accounted for a further 15% of variance in remediation ability.

Table 8.9

Blockwise Multiple Regression of Remediation Ability Against Age, IQ and Cognitive Task Score

Block	No. variables	R^2	R^2change	Fchange
age	1	.25	.25	45.15*
IQ	1	.37	.12	27.50*
tasks	5	.52	.15	8.05*

Total R^2adj=.50   *p<.001

Compared with the amount of variance previously accounted for by the cognitive task variables (27%, Table 8.6), there is some decrement when IQ is entered into the equation. However, cognitive skill still makes a significant unique contribution to explained variance, which is comparable with the contribution of IQ.

The fact that the performance on tasks tapping cognitive skills predicts a significant amount of variance over and above age and IQ lends further support to the claim that such skills are important determinants of success in revision in their own right.

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DISCUSSION

It was argued, in Chapters 1 and 6, that the ability to revise, like writing ability generally, is constrained both by cognitive skill and by specific linguistic knowledge. The research reported in this part of the thesis was designed to establish what it is that a writer must do to revise in terms of cognitive component skills. In Chapter 6 the argument for the most likely candidates was advanced. A descriptive model of the cognitive components of revision, which is more fine-grained than previous gross descriptions, was outlined. The results presented in the current chapter provide a test of the feasibility of the descriptive model.

The preliminary analyses established that the cognitive tasks, although mostly novel, were moderately reliable and had sufficient variability to discriminate good from poor remediators. Inter-rater reliability for measuring remediation ability was high. Age, although showing low correlations with the cognitive tasks, was significantly correlated with remediation ability and, for this reason, was controlled for in the multivariate analyses undertaken.

The significant correlations between verbal and non-verbal versions of a cognitive task, reported in the preliminary analyses, suggest that the attempt to construct similar verbal and non-verbal versions of a task was successful. However, given that the correlations were not of the magnitude of parallel form reliability

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coefficients, the verbal and non-verbal versions clearly represented different facets of a skill.

The results of the main analyses of the contribution of cognitive skills to revising ability, support the hypothesis that the cognitive skills of mentally representing the gist of text, inferring audience characteristics, utilizing organizational structures, generating new in the face of old, and weighing alternatives abstractly are related to the ability to revise although, in a multivariate situation, not all are significant predictors.

The task of extracting the gist involved identifying the major propositions in text or picture and reducing the selected elements by means of transformation such as superordination. Such processes are implicated in comprehension and in producing summaries of written material. The production of other representations might be necessary in revision, for example, planned content and intentions, and future research needs to establish whether there are processes common to constructing each different representation.

The recognition of the need to adapt to an audience was likewise a significant predictor of remediation ability. Thus, although the empirical relationship between some measures of social perspective taking and communication has often failed to be established (Glucksberg, Kraus & Higgins, 1975), the present study was successful in demonstrating the relationship. This could be attributable to the type of measure used. The measure involved recognising messages which differ in ways appropriate for the implied psychological characteristics and needs of an audience. This type of measure has been proposed as an appropriate index of

cognitive complexity, in terms of ability to differentiate the interpersonal construct system (Rubin, 1982).

Finally, the claim that children's difficulties in revision might stem from an inability to compare two representations of the same event (Bracewell, Bereiter & Scardamalia, 1979) which, in this case, involved making comparisons among alternatives is supported empirically and merits more detailed investigation.

The cognitive skills tested in this research were relatively complex processes and could be further considered in an attempt to identify the underlying simple verbal processes involved. Simple verbal processes rely mainly on access and retrieval of linguistic elements stored in a memory system (Perfetti, 1983). According to Perfetti, they are not as general or elementary as elementary information processes. Simple verbal processes which account for reading ability differences are letter recognition, decoding, name retrieval and semantic access. Obviously, the cognitive tasks which involve written language as input could be affected by variations in a subject's reading ability or basic perceptual abilities associated with reading skills, as components of higher order skills.

Arguing that the current state of writing research did not permit or warrant such analyses at the detailed level of simple verbal processes, this research adopted a different approach to investigating the contribution of verbal processes, generally, to revision. The analyses presented attempted to elucidate the relationship between non-verbal cognitive task performance and analogous task performance with verbal demands. The analysis considering relative performance on non-verbal and verbal forms of the cognitive tasks as contributors to remediation

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ability showed that facility with written language was the important factor. The tentative conclusion is that ability to revise is not so much constrained by general cognitive processing ability as by processes involving verbal demands.

The usefulness of considering the cognitive skill measures employed in the present research for their implications for instruction and measurement is further supported by the finding that cognitive skill, as represented by the cognitive tasks, emerged as a significant contributor to remediation ability after controlling for age and intelligence, both themselves significant predictors.

The research indicates the value of extending the study of individual differences to encompass a range of communication relevant cognitive skills and also the contribution of individual differences to an understanding of what constitutes competence in revision, a central process of writing.

CHAPTER 9

CONCLUSIONS AND IMPLICATIONS

SUMMARY OF FINDINGS

The present study was based on the premise that both specific text-related knowledge and more general cognitive skills underlie the ability to revise effectively. In Part I of this report research was outlined which concerned the former, in Part II, the latter.

Text-related knowledge was investigated from a developmental perspective and within a novel framework. In this framework, the subprocesses of revision outlined by Hayes and Flower (1980a, 1980b; Flower & Hayes, 1981a) were investigated in conjunction with criteria for effective writing derived from Nold (1981, 1982). Thus, the application of criteria relating to conventions, syntax, lexis, structure and rhetorical stance was examined in relation to each of revision's subprocesses, namely, evaluation of text, explicit recognition of problems in text and actual remediation of text.

Criteria x subprocess combinations were presented to student subjects from three age groups via a set of specially constructed texts. This set comprised a flawless original and five degraded texts, each of which embodied violations of one of the criteria of good writing. Subjects were required to award each text a mark, to match a degraded text with appropriate prepared statements describing

criterion-related problems, and, finally, to make changes which would improve the quality of each of the five degraded texts.

The first finding of the research reported in Part I is that the range of criteria which are used in appraising text increases with age. In the two younger groups of the present study, this range was extremely restricted, consisting of only the criterion relating to conventions (spelling and punctuation). In the oldest group of school-age subjects, the range of evaluative criteria extended to include, in addition to the conventional criterion, lexical, structural and rhetorical criteria.

The second principal finding is that the tacit acknowledgement of the importance of a criterion, which is apparent in evaluation, usually translates into explicit awareness in the subsequent subprocesses, but does not necessarily do so. Application of the conventional criterion in evaluation transfers to other subprocesses. All three age groups achieved more than 50% success in choosing statements which applied to the conventional degrade, and all three effected significant remediation to this degraded text. The younger age groups were also generally consistent in their failure to apply the remaining criteria to any of the subprocesses.[1] The oldest group was similarly consistent across subprocesses in the application of the rhetorical criterion and in the non-application of the syntactical criterion.

Inconsistent with this general trend was the oldest group's application of the structural criterion. there was implicit acknowledgement of its importance in

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[1] One exception is that Year 9 were able to improve the rhetorical degrade but did not consider audience concerns spontaneously when evaluating.

evaluation but inability to recognise explicitly what was wrong with the structural degrade, or to execute an effective remediation of it.

More general cognitive skills posited as underlying effective revision were examined from a differential point of view, in that individual variations in performance on these skills were examined with respect to their relationship to the remediation of text.

The major finding of the research reported in Part II of the thesis was that performance on the remediation of the texts (Part I, Experiment 3) was related to the possession of a number of cognitive skills, namely, constructing a mental representation of text by extracting the gist (GIST); inferring audience characteristics and matching them to an appropriate message (AUD); utilising organisational structures to manipulate information in working memory (SORT); generating new content and structure when faced with previous attempts (NEW), and weighing up alternatives and selecting appropriately (ALT). These skills were all shown to be significantly related to remediation ability in a bivariate situation, while three of them (GIST, AUD and ALT) remained significant predictors in a multivariate analysis.

Separate consideration of the verbal and non-verbal versions of the tasks devised to tap the cognitive skills revealed that performance on the former explained twice the variance in remediation ability which was explained by performance on the latter. The tentative conclusion is that revision is not so much constrained by general cognitive processing abilities alone, as by a combination of such abilities with a linguistic factor.

In brief, cognitive skill, defined as an aggregate of performance on the five tasks outlined in Part II of this thesis, was an important predictor of remediation ability, over and above age and intelligence. These results argue for a consideration of such cognitive skills as important determinants of success in revision.

THEORETICAL IMPLICATIONS

Together, the findings summarised above, suggest that the following factors underlie effective revision: appropriate representation of intended text; appropriate representation of actual text, and the ability to detect discrepancies between the two. Revision involves reconciling such discrepancies.

Representation of intended text

When writers have to revise their own or others' written text, they need to consider the several facets which comprise intended text. Intended text includes actual task-related content retrieved from memory; the goals of the writer; information about the audience, and the writer's representation of criteria for good writing.

In the present research, rigged texts controlled for differential domain knowledge so that subjects did not have to represent ideas from their long term memory. But, in revision, intended text also comprises the alternatives constructed for portions of the text deemed inadequate and the writer has to choose the most

appropriate from these alternatives. The latter involves mentally considering how the current text, minus the offending portion, will appear with the insertion of each alternative. The construction and comparison of these representations in the ALT task was a significant predictor of ability to remediate effectively.

The second facet of intended text involves an aspect of the rhetorical situation, namely, elaborating the goals of the writer in terms of what the piece of writing is intended to accomplish and how the writer wants to be perceived. In the experiments with rigged texts a brief statement of the fictitious writer's aims and the desired projection of self was supplied, but it was apparent that subjects seldom considered this aspect when evaluating, nor did they recognise that the argument was too one-sided to square with the aims of the writer. The present study thus suggests that high school writers exhibit a deficiency in that they do not represent intended text in terms of the writer's goals.

Another aspect of the rhetorical situation entails considering the audience. This involves inferring the psychological characteristics and needs of the target audience in order to marry these appropriately with intended text. The importance of the ability to construct such a representation was underscored by the fact that the cognitive task encapsulating this ability (AUD) was a significant predictor of remediation ability. In addition, results from the text experiments indicate that, with age, students were increasingly able to consider audience needs in evaluation, at least in terms of an appropriate style or tone, to recognise deficiencies relating to such needs and to remedy these deficiencies.

Finally, the concept of intended text also incorporates the set of criteria for good writing which the writer represents. The findings from Part I of the thesis indicate a marked limitation in the employment of criteria for effective writing in the case of younger high school students. The representation of internalised criteria for good writing can exist on several levels. Younger high school students seem to represent criteria for good writing at the graphical level, the level of literal language which means that the representation is essentially that of individual words or phrases. They do not appear to consider whether the language they represent is appropriate to the meaning intended or whether it represents that meaning parsimoniously. They certainly do not appear to represent an idealised structure. Nor do the younger students appear able, spontaneously, to construct a differentiated dual-process representation whereby, initially, audience characteristics and psychological needs are elaborated and then are married to appropriate textual manifestations in terms of content, style, tone and, perhaps, structure.

Thus, inability to revise in a constructive form may stem from inadequacy in the representation of intended text in terms of alternatives to portions deemed inadequate, the goals of the writer, the characteristics of the audience and internalised criteria for good writing.

Representation of actual text

A representation of actual text is constructed by re-reading the text-to-date in order to represent it in a form appropriate for comparison with intentions, or for use when moving from revising to generating additional text.

In reconstructing this representation of text-to-date, a writer may operate differently from a reader. In reading for comprehension, it is the written text which largely constrains the representation constructed (Bracewell, Frederiksen & Frederiksen, 1982). The reader accesses words one at a time and builds a temporary meaning configuration in working memory, then builds and updates a mental model of text (Perfetti, 1986). It is the latter which is consulted when a reader's comprehension is measured. According to Perfetti, content knowledge and knowledge of structure may have some effect on the building of this representation or model, but such knowledge says little about reading ability.

However, in revising writing, it seems reasonable to speculate that factors such as focus of attention in reading to evaluate may influence representation of text-to-date. This focus or mental set may well be determined by the criteria for effective writing which the author entertains. Matsuhashi and Gordon (1985) claim that the operation of mental set in revision explains why young writers cannot detect referential ambiguities in their own writing- because they are focusing on meaning- and why college writers, such as those described in studies by Bridwell (1980), Faigley and Witte (1983) and Sommers (1980), could not release themselves from concentrating on surface error.

Part I of this thesis reported an investigation of the underlying representations against which writers may be evaluating texts. The findings indicated a marked limitation in the employment of a range of criteria for effective writing in the case of younger high school students. The extent and manner in which this deficient range of criteria for good writing influences the representation of text-to-date when reading to evaluate is, at present, open to

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speculation. There is some evidence from this research that the internalised criteria for good writing may influence the re-reading of text in that, generally speaking, if subjects failed to acknowledge a criterion implicitly in evaluation they did not recognise the nature of the problem when reading the text.

It appears that the form of this reconstruction of text produced could be a major factor influencing text quality. A reconstruction at the level of propositions encapsulating the text's underlying message is likely to be the most effective (Scardamalia, Bereiter & Goelman, 1982). The results of the present research lend support to this hypothesis. The cognitive skill measuring the ability to construct a mental representation of text-to-date involved extracting the gist or main propositions in a stimulus paragraph or picture and encapsulating these in a title. Performance on this task was a significant predictor of the ability to remediate text successfully.

Detection of discrepancies between intended and actual text

The results of the research presented in this thesis suggest the nature of some of the mental representations of intended and actual text which influence the success of the revision process in writing. It seems likely that some of these representations would be constructed when elaborating the rhetorical situation, for example the inferred psychological characteristics of the audience, and that these representations would remain and be accessed at will when evaluating or when generating new text. Other representations, like the mental representation of the text-to-date, may be constructed and reconstructed in the course of composing. It is probable that the representation of intended text in the form of criteria for

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good writing changes in regard to what is considered ideal in text. With age, the representation becomes more inclusive of features of good writing.

The detection of discrepancies between intended and actual text depends on the nature and effectiveness of the representation of each. If there has been a failure to elaborate the rhetorical situation with regard to the psychological characteristics and needs of the target audience, or with regard to the aims of the writer and the purpose for writing the piece, then the writer has an inadequate representation of intended text in these terms. Even if a writer were to have available appropriate comparison processes, these could not be usefully applied unless s/he also had available suitable representations to which to apply such processes. Similarly, the process of comparison may be limited by the range and nature of the criteria for good writing which the author entertains.

ASSESSMENT AND INSTRUCTIONAL IMPLICATIONS

Diagnostic assessment of students' writing, and instruction in revision based on such assessment, have always posed a formidable challenge to classroom teachers. This remains the case despite a substantial amount of recent research on the reviewing of text. However, at this stage, there is no cause for pessimism. Each new study makes a modest contribution to our knowledge of the revising process and it is reasonable to assume that the accumulation of findings will result in a breakthrough in educational practice.

The results of the present study also suggest some strategies which might be implemented in both the assessment of writing ability in a manner useful to the promotion of effective revision, and in subsequent instruction directed to this end.

Assessment

There are two general types of approach to the assessment of writing, the direct and the indirect. The direct approach involves evaluations of students' written text, usually essays. From the perspective of usefulness in informing educational practice, there are two problems. First, such evaluations tend to be global and, hence, non-diagnostic. The second problem is related to the first, namely, that direct measures are, typically, of questionable reliability (see Chapter 3).

Indirect measurement consists of attempts to assess writing ability, not in terms of students' written compositions, but from their performance on tasks designed (or selected) by researchers to tap skills which are hypothesised to underlie good writing. Methods used in indirect measurement include multiple-choice instruments and cognitive tasks.

Indirect assessment has the advantage over direct assessment in terms of reliability. It also has a potential advantage in terms of diagnostic power. However, multiple-choice tests have problems of face validity and (potentially) of content validity; and the employment of cognitive tasks has typically been unaccompanied by an analysis of the set of cognitive skills involved in writing and, hence, is also open to the question of content validity.

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In relating performance on cognitive tasks to revision performance, the present study was, in effect, implementing one variant of the indirect approach to the assessment of revision ability. In this case, however, the selection of the cognitive tasks was preceded by an analysis of revision in terms of its several component skills. In this way, an attempt was made to achieve face validity for the several tasks and content validity for the tasks taken collectively.

The salience of each of the five skills examined was established by the significant correlation between scores on the cognitive task designed to tap it and scores for the revision exercise. That at least some coverage of aspects of revision was provided by the tasks collectively was indicated by the fact that unique contributions were made by three of them, namely, creating a mental representation of text by extracting the gist; inferring audience characteristics and matching these to a suitable message, and weighing alternatives and selecting appropriately. Verbal versions of tasks tapping the cognitive skills proved better predictors of revision performance than did non-verbal versions.

Three of the cognitive tasks of Part II of this thesis (GIST, AUD & ALT) could be included in a battery of tests for indirectly measuring individuals' facility in revision. Although these tasks were derived from an analysis that was intended to provide a comprehensive list of revision skills, it might be necessary to add to them in order to produce a test battery with satisfactory predictive validity. It would also be desirable to hone the psychometric properties, particularly the reliability, of the individual tasks used in the present study. These are problems which could profitably be addressed by future research.

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Instructional implications

Evidence from this research suggests that awareness and utilisation of a range of criteria for effective writing may be a relatively late-developing process. It appears that students are unlikely to consider higher level aspects of language while their teachers seem to value, by virtue of written comments and language activities, concerns like spelling, syntax and lexis. Restricted workbook-like activities must colour a student's view of writing (Clay, 1982).

Often the more subjective hallmarks of "good" writing are taught only implicitly, by means of models. Much instruction is based on discrimination training, according to Bracewell and Kress (1979, cited in Bracewell, 1983), and is of the model-analyse-write variety, that is, consider a quality piece of writing, work out what makes it such and apply these findings. The rationale for such a method in composition teaching is that when students recognize the distinguishing features of "good" writing, they should be able to apply them. This may be the case with some rule-based features but the results of the present study of criteria for effective writing utilised in the subprocesses of revision highlight inadequacies in this approach. The oldest students implicitly used the criterion of structure when evaluating but they could not recognise the nature of the problems in the structural degrade, nor improve this degrade.

Learning from models also tends to be focused on discrete elements with more complex or global charateristics being overlooked. The two younger groups of high school students in this study overwhelmingly utilized, at each subprocess, dimensions of language concerned with discrete units. What needs to be cultivated,

suggests Bracewell (1983), is not just isolated knowledge but the mental processes that underlie the activity of writing.

This elaboration of the mental processes in composition may be less than straightforward. Apparently, students cope with much school-based writing by employing a method of composing which essentially relies on pre-existing oral language skills (Bereiter & Scardamalia, 1987). There is no need for elaborated, substantive revision when writing in this fashion, as there is no goal-directed planning. Less skilled writers, operating within this mode, do not represent text at the level of goals and main ideas and thus have no mental representations to revise. The present research illustrated the importance of being able to represent the underlying ideas of the text and of being able to elaborate the rhetorical situation in a consideration of the audience.

There appear to be two levels of approach to the problem of acquiring the requisite thought processes. At one level, Sowers (1985) concludes that talk about aspects of writing is internalized by children who subsequently use it to regulate their writing processes. Newkirk (1982) reports individual students referring to "giving myself a conference" (p.456). This technique is open to the problem of using the strategy without understanding the thought processes underlying the operation. At a more abstract level, Scardamalia and Bereiter (1983c, Bereiter & Scardamalia, 1985) talk of fostering self-knowledge and regulation by means of direction of students' attention to cognitive processes.

To do this the language experience of students needs to be enriched in a more directed, active fashion with instructional procedures designed to bring the

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cognitive processes into the open (Scardamalia, Bereiter, Burtis & Tetroe, 1983). Cognitive and linguistic explanations for writers' problems appear to be adduced on an ad hoc basis and remedies are suggested without a serious and coherent attempt to explain what it is that writers must learn to do (Bartlett, 1982). Hayes and Flower (1987), in similar vein, urge that "good process instruction must be built on an understanding of the writing process and good diagnosis of developing writers' problems and needs" (p.29).

This research has succeeded in delineating some of the representations of intended and actual text which form the basis for the comparison which is essentially the core aspect of revision. Writers could be assisted to form these necessary representations and the two parts of this study suggest ways in which such assistance could be provided. Students could be asked to analyse a text degraded on the rhetorical dimension in terms of the problems which it could present to a reader. Using a similar paradigm, Shriver (1987, cited in Hayes & Flower, 1987) designed lessons to increase students' sensitivity to readers' needs. Students read a flawed text and predicted reader problems. Next they read a thinking-aloud-protocol of a reader trying to comprehend the text. They then revised, and the effect of instruction was to increase the ability to predict reader problems.

This process of prediction could be extended similarly to inferring the audience's psychological needs and characteristics and matching these to the appropriate message, as in the cognitive task in the present research which was positively related to the ability to remediate. Such prediction tasks serve to make the student aware of the cognitive procedures that produce language structures

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(Bracewell, 1983). Thus, the attempt to define the component processes and skills of revision has implications for designing instruction to render them overt and, therefore, potentially amenable to improvement.

CONCLUSION

In summary, this research has attempted to make a modest contribution in several ways. Methodologically, text-related knowledge has been investigated in a controlled form within a novel framework. The value of an individual difference approach to revision has been demonstrated. The research has established which criteria for effective writing are utilised at different ages. It has also established cognitive skills involved in successful revision.

From a theoretical point of view, the findings indicate the range and nature of some of the mental representations of intended and actual text which are necessary to effective revision. From a pedagogical point of view, the results of the research suggest ways in which both assessment of an individual's composition abilities and the means of instruction in writing could be enhanced. The concept of measuring communication-relevant cognitive skills in order to diagnose and predict writing ability was proven feasible by this research.

Finally, the present findings suggest two broad avenues for further research. The first is an extension of the range of cognitive skills in relation to which individual differences are examined. The second suggested direction for research is an examination of the effect of variation in the extent of internalised

criteria for good writing on the mental representation of text, both actual and intended.

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APPENDIX A: STIMULI FOR TEXT EXPERIMENTS

THE ORIGINAL TEXT AND THE FIVE DEGRADED VERSIONS.

Original.

Energy is involved in every aspect of our lifestyle including basics like how we move around, obtain food and shelter from the weather. We use massive amounts of energy, nearly all of which comes from fossil fuels. These are being used up more rapidly than they can be renewed. One course of action is to save fossil fuels, while another course is to develop alternative sources of power.

Saving energy means using fuel and materials with greater care. Cities need to be designed so that we can obtain goods and services with less transport. Houses and public buildings need to be constructed using energy efficient materials and designs. Also, household and other equipment could be made more durable and repaired instead of being thrown away.

Energy conservation and the development of new sources of power go hand in hand. Alternative sources of energy are nuclear, solar, water and wind. About a third of the research money for alternative energy is spent on nuclear development. Many argue that there are dangers at several stages of the nuclear power cycle. For instance, uranium mining releases radioactive dust which is thought to cause cancer. There is the problem of disposing of materials contaminated with radioactivity. Also, it is possible to modify plutonium produced in commercial reactors for use in nuclear weapons.

By comparison, solar energy is clean and safe, can be collected by anyone and has no military use. Solar energy can be captured directly from the sun's rays or indirectly from vegetation, wind and waves. Solar technology is improving and becoming less expensive. If our society were able to rely on solar energy, the environment need not be further threatened and may begin to renew itself.

Rhetorical Degrade.

Energy is implicated in every aspect of our existence including our means of locomotion, provision of sustenance and protection from the elements. Exorbitant amounts of energy are consumed by mankind, the preponderance of which derives from fossil fuels. These are being squandered at an exponential rate. We must conserve fossil fuels and evolve alternative sources of power.

Saving energy requires more prudent utilization of fuel and materials. In order to save fuel, cities must be designed to minimize the transportation required for the provision of goods and services. Dwellings and public buildings must be rendered energy efficient. Consumables are energy extravagant, so fashion and packaged goods must be boycotted.

Energy conservation and the development of new sources of power must progress simultaneously. Alternative sources of energy include nuclear, solar, water and wind. The majority of research money for alternative energy is expended foolishly on nuclear development, notwithstanding the existence of a multiplicity of counter-arguments. For instance, uranium mining releases carcinogenic radioactive dust and there exists no avenue for the safe disposal of spent fuel. Additionally,

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the link between nuclear power and nuclear weapons is open to abuse. Effective nuclear terrorism by groups using plutonium bombs is the most likely spark to initiate world catastrophe.

By comparison, solar energy is non-pollutant and non-toxic, can be readily accumulated and is militarily neutral. Solar energy can be captured directly from the sun's rays or indirectly from vegetation, wind and waves. In a society which relies on solar energy, the quality of the environment will be maintained and restored after the ravages of excessive energy use.

Structural Degrade.

We need to save fossil fuels and develop alternative sources of power. Fossil fuels make up most of the massive amounts of energy we use. These are being used up more rapidly than they can be renewed.

Cities should be designed so that we can get the goods and services we need with less transport. Household and other equipment could be made more durable and repaired instead of being thrown away. It means constructing houses and public buildings with energy efficient materials.

About a third of the research money for alternative energy is spent on nuclear development. Solar technology is improving and becoming less expensive. Uranium is needed to produce nuclear power. Cancer may result from the radioactive dust released by the mining. There is the problem of disposing of

materials contaminated with radioactivity. Plutonium produced in commercial reactors possibly could be modified for use in nuclear weapons.

Anyone can collect solar energy and it is clean and safe with no military use. Many argue that there are dangers at several stages of the nuclear power cycle. Solar energy can be captured directly from the sun's rays or indirectly from vegetation, wind and waves. The environment need not be further threatened and may begin to renew itself, if our society were able to rely on solar energy.

Lexical Degrade.

Energy is involved in every aspect of our lifestyle including basics like how we move around, provide food and shelter from the weather. We use bulky amounts of energy, nearly all of which arises from fossil fuels. These are being used up at an over-fast rate, faster than they can be replaced. It should be obvious to you all that one course of action is to use less fossil fuels while the other is to develop alternative origins of power.

Saving energy, it seems to me, means using fuel and materials with greater care. Cities need to be designed so that we can obtain goods and services with less cars. Houses and public buildings need to be made from energy conscious materials and designs. Also, household and other equipment could be made more wearable and repaired instead of being thrown away.

Energy conservation and the development of new sources of power go hand in hand. Alternate sources of energy are nuclear, solar, water and wind. About a

third of the research money for alternative energy is spent on nuclear experiments. Many argue, quite forceably in some cases, that there are dangers at several stages of the nuclear power structure. For instance, the mining from the ground of uranium releases radioactive dust particles which, it is thought, may cause cancer. Added to this, there is the hazard of freeing ourselves of materials contaminated with radioactivity. Also, it is possible and feasible to change plutonium produced in commercial reactors for use in the building of nuclear weapons.

By comparison, solar energy is clean and safe, can be collected by anyone and has no killing use. Solar energy can be caught directly from the sun's rays or indirectly from vegetation, wind and waves. Solar technology is improving and becoming less expensive. If our society were able to rely on solar energy, the environment need not be threatened more and may begin to replace itself.

Syntactical Degrade.

Energy is involved in every aspect of our lifestyle including basics like how we move around, obtaining food and sheltering from the weather. Fossil fuel provides nearly all of our massive energy consumption. This is being used up more rapidly than it can be renewed. One course of action is to save fossil fuels while the other is developing alternative sources of power.

Saving energy means using fuel and materials with greatest care. Cities need to be designed so that we can, with less transport, obtain goods and services. Using energy efficient materials and designs, houses and public buildings need to be constructed. Also, household equipment could be made more durable and

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be constructed. Also, household equipment could be made more durable and repaired, as well as other equipment, instead of being thrown away.

Energy conservation and the development of new sources of power go hand in hand. Alternative sources of energy is nuclear, solar, water and wind. About a third of the research money for alternative energy is spent on nuclear development. Many argue that dangers at several stages of the nuclear power cycle. For instance, uranium mining releases radioactive dust and is thought to cause cancer. There is the disposal problem of materials contaminated with radioactivity. Also plutonium produced in commercial reactors for use in nuclear weapons it is possible to modify.

By comparison, solar energy is clean and safe, can be collected by anyone and has no miliary use. This can be captured directly from the sun's rays or indirectly from vegetation, wind and waves. Solar technology is improving and now less expensive. The environment need not be further threatened if our society were able to rely on it and may begin to renew itself.

Conventional Degrade.

Energy is involved in every aspect of our livestyle including basics like how we move around, obtain food and shelter from the wether. We use massive amounts of energy, nearly all of which comes from fossle fuels. These are being used up more rapidly than they can be renewed one course of action is to save fossle fuels while the other is to develop alternitive saurces of power.

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Saving energy means using fuel and materials with greater care. Cities need to be dezigned so that we can obtain goods and services with less transport. Houses and public buildings need to be constructed using energy efficent materials and dezigns. Also, household and other equipment could be made more durable and repaired instead of being thrown away.

Energy conservation and the development of new saurces of power go hand in hand. Alternitive sources of energy are nuclear soler water and wind. About a third of the research money for alternitive energy is spent on nuclear development. Many argue that there are dangers at several stages of the nuclear power cycle. For instance uranium mining releases radioactive dust which is thort to cause cancer. There is the problem of disposing of materials contaminated with radioactivity also it is possible to modify plutonium produced in commercial reactors for use in nuclear weapons.

By comparison soler energy is clean and safe can be colected by anyone and has no militry use. soler energy can be captured directly from the sun's rays or indirectly from vegetation wind and waves. Soler tecnology is improving and becoming less expensive. If our society were able to rely on soler energy the enviroment need not be further threatened and may begin to renew itself.

APPENDIX A.2.

EVALUATION EXPERIMENT : MARK SHEET.

MARKS GIVEN TO EACH VERSION

RED:_____   BLUE:_____

YELLOW:_____   PURPLE:_____

ORANGE:_____   GREEN:_____

RECOGNITION EXPERIMENT: STATEMENTS SUGGESTING IMPROVEMENTS.

Selection of statements suggesting improvements which could be made to the texts. Circle those which apply to the [colour] version.

1. There are mistakes in grammar (e.g. subjects do not agree with verbs, sentences have parts missing or it is not clear what a pronoun refers to).

2. The expressions and the words used are not suitable for the reader level for which the passage was intended.

3. Often a word, while grammatically correct, is not quite right to express the meaning intended.

4. The text seems to be a jumble of ideas with no overall plan or structure.

5. There are a number of spelling errors.

6. The argument presented is too obviously one-sided to be convincing.

7. There are some words or phrases that seem better suited to a talk or conversation rather than a written piece.

8. Basically all right with no major changes needed.

9. There are some phrases and clauses that seem to be in the wrong place within a sentence so that the sentence does not really make sense.

10. Paragraphs do not appear to be organized around a clear topic sentence with the ideas in the paragraph developed logically.

11. Punctuation marks (commas, full stops, capital letters) are missing.

APPENDIX A.4.

INSTRUCTIONS: EVALUATION,
RECOGNITION AND REMEDIATION EXPERIMENTS.

Evaluation experiment.

In the booklet there are several attempts by a high school student to write an assignment. The assignment was to write a short, general article about our use of energy for young high school readers (Years 7-8). The writer wanted to inform and convince the readers but did not want to appear too biased (although the writer is sympathetic to the views of the conservationist lobby).

You are to give a mark out of 20 to each attempt. Try to show how much better one attempt is than another by the difference in the marks you give. You can compare by looking forward or backward.

Recognition experiment.

In the booklet there are several attempts by a high school student to write an assignment. The assignment was to write a short, general article about our use of energy for young high school readers (Years 7-8). The writer wanted to inform and convince the readers but did not want to appear too biased (although the writer is sympathetic to the views of the conservationist lobby).

Could you suggest to the student concerned what is needed, if anything, to improve each piece of writing? Use the answer booklet and from the list of suggestions circle the number of the comments which best describe the weaknesses in each version.

Remediation experiment.

In the booklet there are several attempts by a high school student to write an assignment. The assignment was to write a short, general article about our use of energy for young high school readers (Years 7-8). The writer wanted to inform and convince the readers but did not want to appear too biased (although the writer is sympathetic to the views of the conservationist lobby).

In each case you are to make any changes that you think would improve the quality of the piece of writing. You may make the changes on the text or on the the page provided. If you do not wish to rewrite the entire text, use line numbers e.g. line 52 change we to us.

REMEDIATION EXPERIMENT : CRITERIA FOR RATERS FOR SCORING EACH DEGRADED VERSION.

Conventional Degrade.

: use of the conventional written signal system, namely, spelling and punctuation.

Syntactical Degrade.

: use of grammatical strings of words and appropriate methods of embedding (e.g. no missing parts of speech, referential ambiguities or subjects which do not agree with verbs).

Lexical Degrade.

: use words appropriately to represent meaning

: use language appropriate for written expression

: use words economically.

Structural Degrade

: use of a topical plan which will best carry the message to the audience

: use of a layout which reflects major shifts in topic, approach or time

: relationships signalled (between sentences and paragraphs) and cohesive devices employed.

Rhetorical Degrade.

       :   use of a point of view with a basis of validity which the audience will accept

       :   use of style appropriate for the target audience

       :   writing that fulfils the author's aims.

APPENDIX A.6.

RATER SCORING SCALE.

Circle the appropriate point on the scale (you may use midpoints).

0   no discernible difference

1   a barely discernible improvement

2   some improvement

3   reasonable improvement

4   considerable improvement

5   vast improvement

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APPENDIX B: TEXT EXPERIMENTS: DATA

APPENDIX B.1

ANALYSIS OF VARIANCE: TEXT EVALUATION DIFFERENCE SCORES

Tests of between-subject effects

	df	SS	MS	F
Within cells	200	4028.51	20.14	
Constant	1	1136.61	1136.61	47.02*
Age group	2	94.20	47.10	2.34

Tests involving within-subject effects

	df	SS	MS	F
Within cell	1000	5496.27	5.50	-
Texts	5	806.57	161.31	29.35*
Age x texts	10	183.67	18.37	3.34*

*$p<.001$

APPENDIX B.2

ANALYSIS OF VARIANCE: TEXT RECOGNITION SCORES

Tests of between-subject effects

	df	SS	MS	F
Within cells	200	163.09	0.82	
Constant	1	457.19	457.19	667.75**
Age group	2	6.94	3.47	4.25*

Tests involving within-subject effects

	df	SS	MS	F
Within cell	1000	458.89	0.46	
Texts	5	111.99	22.40	48.81**
Age x texts	10	5.51	0.55	1.20

$*p<.05$ $**p<.001$

APPENDIX B.3

ANALYSIS OF VARIANCE: TEXT REMEDIATION SCORES

Tests of between-subject effects

	df	SS	MS	*F*
Within cells	157	500.58	3.19	
Constant	1	1571.92	1571.92	493.01*
Age group	2	149.60	74.80	23.46*

Tests involving within-subject effects

Within cell	628	504.22	0.80	
Texts	4	477.23	119.31	148.59*
Age x texts	8	4.70	3.09	3.84*

*p<.001

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APPENDIX C: COGNITIVE TASK EXPERIMENTS: STIMULI

C.10   Weighing alternatives abstractly (verbal task)

C.11   Weighing alternatives abstractly (non-verbal task)

EXTRACTING THE GIST (VERBAL).

Instructions

In this task you will be given 7 short articles which could come from a newpaper or magazine. You have to write an appropriate title for each one. The title must be clearly related to the main points of the article. The title you choose should include all of the main ideas in the article.

The title must be short (like a newspaper headline) and sum up the story.

Example:

TITLE: _____ Kylie : The youngest black belt in

Australia. _____

Kylie Engemon really gets a kick out of her sport. She is the youngest holder of a karate black belt in Australia and she is very proud of mastering such a complex and difficult martial art at the early age of 13.

You have 10 minutes. Any questions?

1. TITLE: _____

_____

People are being forced to drink fluorinated water. There is no end of drugs that at one time were thought safe, but which have been withdrawn or restricted. Nearly every country in Europe has now banned or stopped adding this poison, fluoride, to their water. Are Australians a different sort of biological species who are immune to the effects of fluorine which has been shown to harm vital body proceses?

2. TITLE: _____

_____

The computer, which loomed so ominously in most people's minds at the start of its career seems much less of an ogre today. We have come to accept the mechanical mind more as an everyday aid than as a potential menace. We are becoming more familiar with computers.

It is comforting to know that they are subject to human error. Even more comforting is the realization that the computer is only as good as the information fed into it and that, in the end, the computer is no more than a very convenient tool for people, not an impersonal robot beyond our control.

3. TITLE:_____

_____

Projects to develop and install an energy system built on conservation and renewable resources could go a long way towards ending our employment mess. The

reason is that solar and conservation technologies are labour intensive. The materials needed are cheap and plentiful. The techniques are simple. People not machinery are the key input. Most of the money for solar conservation projects goes to pay people to pull things together. The jobs are safe and longlasting.

4.   TITLE: _____

_____

Do you want to stay well all year? Then the advice is stay happy. Amazingly, the latest research shows our state of mind and personality can make us more likely to get colds and flu. Scientists say that the people most likely to keep catching cold are those under strain who have recently had a change in circumstances.

5.   TITLE: _____

_____

Our rich native forests are being eaten up by a greedy industry chasing profits. Certainly, many clearfelled areas are rapidly regenerated. But beauty is sacrificed for efficiency. No amount of planting can replace ruined wilderness or restore the character of undisturbed forest. Boring plantations, criss-crossed with roads, with trees of the same species, all destined for the pulpmill in 60-80 years are no substitute for a real forest.

6.   TITLE: _____

A group of primary school children in Perth has just proved that computer-aided design is no longer the preserve of high tech. engineers and architects.

The children's design for an addition to their school, done with the help of a computer, has won a competition for school improvements.

The four Year 7 students won the competition with plans and drawings produced on an Apple MacIntosh computer, illustrating their suggestions for a new outdoor shelter for the school.

7.   TITLE: _____

_____

A tough audience, but Bruce Springsteen has just brought them to their knees with 3 1/2 hours of no-mercy, flat out rock n' roll. Now he is suffering for it. Even after a half hour rubdown by his trainer, Bruce aches from the gruelling marathon of singing, dancing and screaming. 'Man', he rasps, 'this was a four and a half hour show. I usually lose between 3 and 5 pounds during a show, and that one felt like a four point five.'

EXTRACTING THE GIST (NON-VERBAL).

Instructions.

In this task you will be given 7 pictures in a booklet. You have to write an appropriate title for each one. The title must be clearly related to what is happening in the picture. The title you choose should include all the main ideas in the picture.

The title must be short and sum up the main points of the picture.

Example:

TITLE: ____The frustrations caused by thoughtless

family members._____

You have 10 minutes. Any questions?

STOP HERE. WAIT FOR INSTRUCTIONS.

1. TITLE:_____

_____

2. TITLE:_____

_____

3. TITLE:_____

_____

4. TITLE:_____

_____

5. TITLE:_____

_____

6. TITLE:_____

_____

7. TITLE:_____

_____

1901
1851
1801

LIVERPOOL   BIRMINGHAM   LEEDS

1801
1851
1901
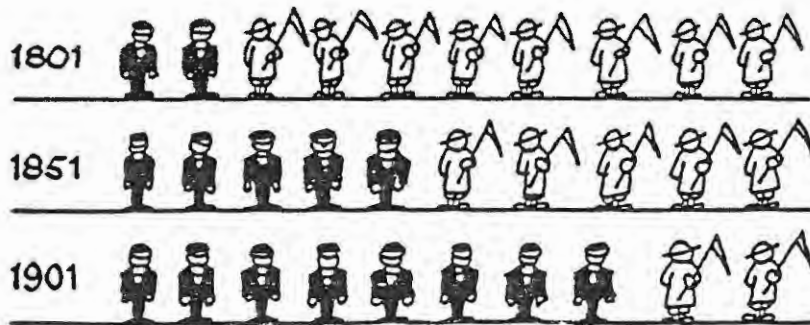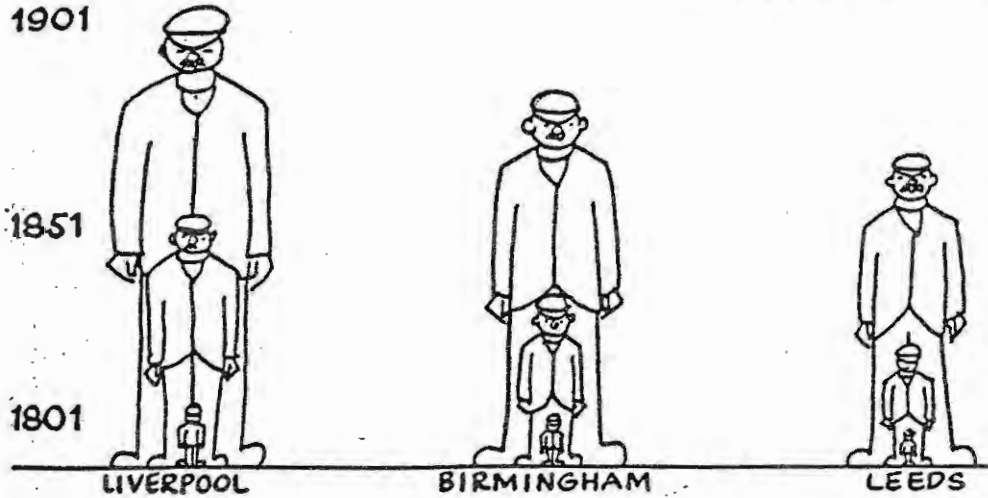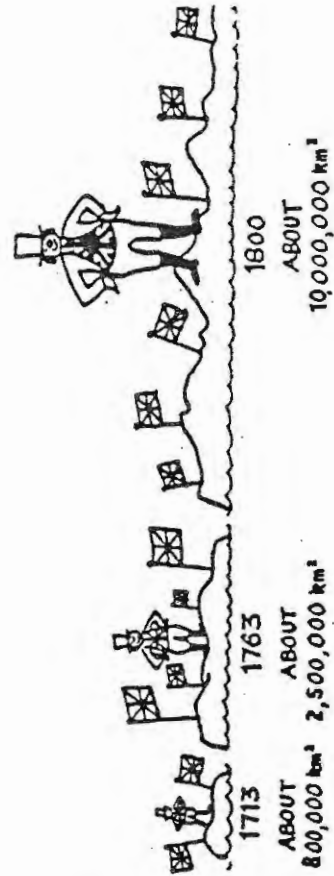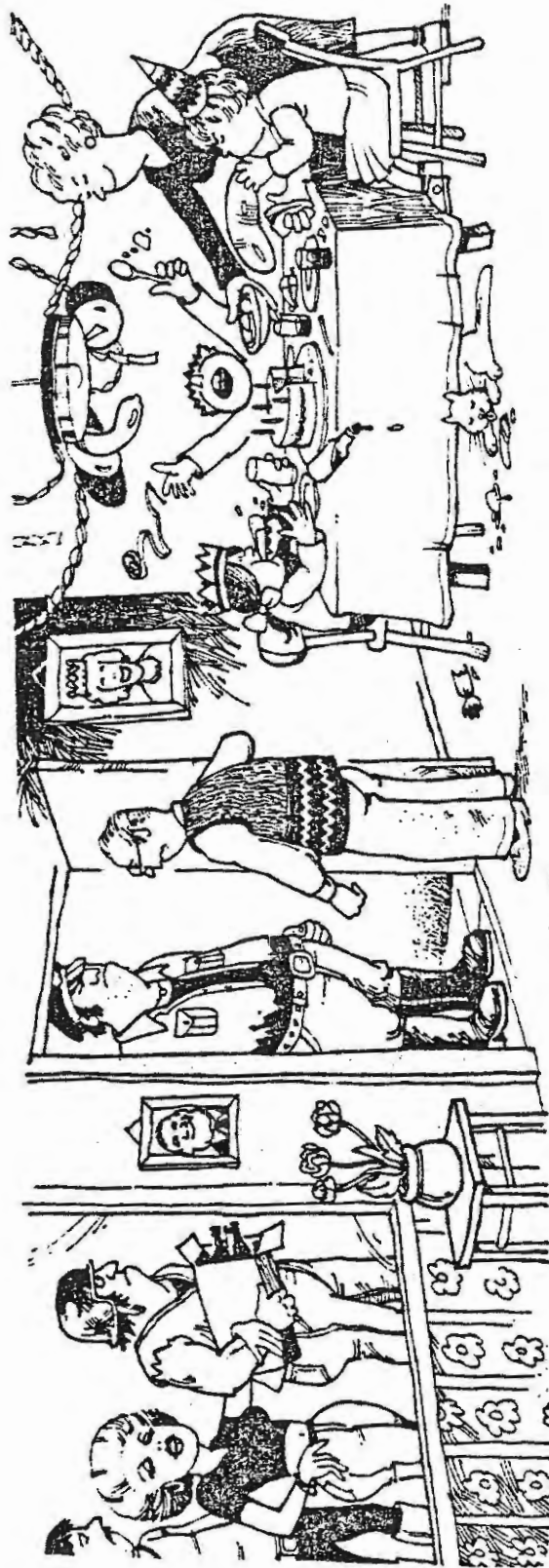
1713
ABOUT
800,000 km²

1763
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10,000,000 km²

208

209
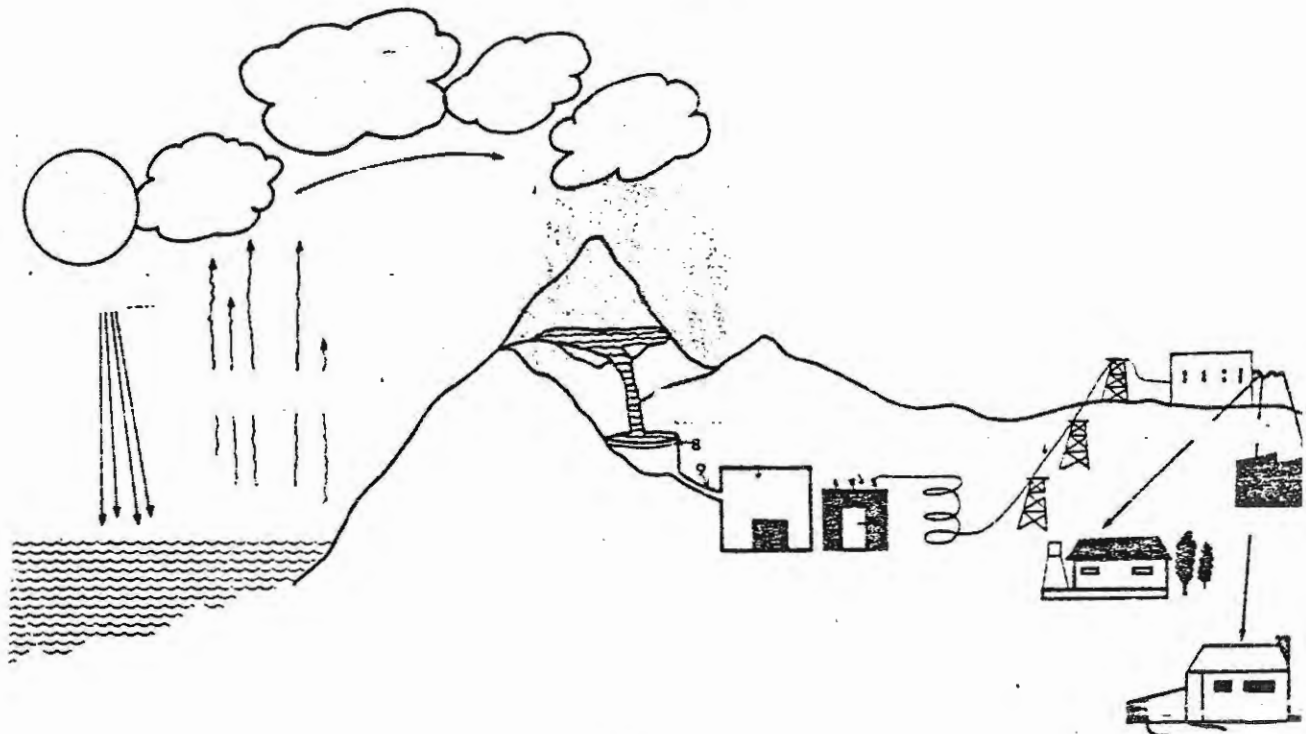
EXTRACTING THE GIST : MAIN IDENTIFIED PROPOSITIONS AND EXAMPLE
TITLES (VERBAL).

1. Not so faultless fluoride still forced on us.

      (i)   no choice about fluoride in our water

      (ii)   now considered harmful elsehere and withdrawn

      (iii)   Australia continues to fluoridate water.

2. Computers : from mechanical ogres to controllable tool.

      (i)   threatening, infallible, mechanical mind.

      (ii)   attitudes changing over time

      (iii)   tool controlled by people - fallible.

3. Safe and long-lasting energy and jobs from the sun.

      (i)   Solar energy - safe, renewable resource

      (ii)   jobs - labour intensive power source

      (iii)   solve unemployment and pollution

4. Stay happy and stay healthy.

      (i)   positive mental state

      (ii)   affects/leads to

      (iii)   enhanced physical wellbeing

5. Contrived profitable pine plantations replace natural wilderness.

(i)   Undisturbed beauty of native forest

(ii)   gone/replaced/changed

(iii)   boring, but profitable, pine plantations

6. Winning design for school addition child's play on Mac.

    (i)   young primary school children

    (ii)   use computer with ease - computer aided design

    (iii)   design (for school improvement) wins competition

7. Non-stop rock 'n roll marathon brings Bruce and his audience to their knees.

    (i)   concert - sing/dance

    (ii)   energy intensive non-stop performance

    (iii)   audience won over/artist loses weight

EXTRACTING THE GIST : MAIN IDENTIFIED PROPOSITIONS AND EXAMPLE TITLES (NON-VERBAL)

1. Bushland activities : some enjoy; some despoil.

      (i)   Outdoor - forest bush. setting

      (ii)   different activities

      (iii)   effect - some carefully enjoying, others polluting/despoiling.

2. The shift from the countryside to industrial cities in the nineteenth century.

      (i)   Time period 1801-1901

      (ii)   rural/urban shift

      (iii)   industrial cities grew rapidly.

3. A noisy party attracts unsuitable guests.

      (i)   Kids' party in full swing.

      (ii)   Noise attracts gatecrashers

      (iii)   mismatch between type party and gatecrashers.

4. Feigned nonchalance in the face of adversity: hunter becomes the hunted.

      (i)   Animals outnumber and corner 'hunter'

      (ii)   irony - role reversal

      (iii)   hunter feigns nonchalance.

5. British colonies increase tenfold in the eighteenth century.

(i)   British overseas territory.

(ii)   time period 1713-1800

(iii)   increase 1 million to 10 million sq. km.

6. A newcomers introduction to life on the goldfields last century.

(i)   Gold diggings/era last century

(ii)   unkempt - drunken life of diggers

(iii)   contrast - new arrivals.

7. The hydro-electric cycle :water is harnessed to provide power.

(i)   runoff from precipitation (rain cycle)

(ii)   converted

(iii)   provide power for homes and factories.

INFERRING AUDIENCE CHARACTERISTICS AND MATCHING TO MESSAGE (VERBAL).

The paragraphs in this booklet contain information about smoking. Each of the paragraphs is written with a particular group of people in mind and is aimed to be of special relevance to them. You have to match the text with the description of the target reader group which you think it is most likely meant for. There are more target reader groups than texts.

Target Reader Group

A.   Parents or other adults

B.   Heavy or longtime smokers

C.   Young teenagers

D.   Women, especially younger women

E.   Those who like to feel in control of their lives

F.   Those who live and work with smokers

G.   Young children, probably 5-8 year-olds

H.   Older population of smokers

I.   College and university students

J.   Those who have yet to try smoking but are tempted to

K.   The general population of smokers.

Smoking is a narcotic. Those who are addicted automatically feel free to impose their addiction on others. The evidence linking involuntary or passive smoking to health problems and the evidence that smoke drifting off the cigarette's end has harmful constitutents in greater concentration means that the majority suffer for the habit of a minority.

Target reader group _____

With the increasing evidence of the deleterious health effects of smoking, sports sponsorship by tobacco companies is a hypocritical and insidious sales exercise. Some sports clubs, strong enough to refuse, view it as 'blood money. There is certainly blood on the hands of the multi-national cigarette companies as they continue to dump high tar cigarettes, rejected in the developed world, on to unsuspecting third world nations.

Target reader group _____

Children who live in smoke free homes are less likely to get colds, bronchitis or pneumonia. Passive smoking is a hazard. Young children are likely to imitate adults who are in a close relationship to them. Statistics show that there is a trend for children of smokers to become smokers themselves.

Target reader group _____

Smoking is a way of imitating what seems to be sophisticated adult behaviour. It is a way to be accepted as part of a group. But only those people who are not sure of themselves need to prove something to others.

Target reader group _____

If we never start smoking in the first place, chances are we will have healthier lungs and a healthier heart. These things are important if we want to live a healthy life.

Target reader group _____

Many smokers put off attempts to give up smoking because they're afraid of putting on weight. It's true that on giving up smoking, many people find that their taste buds become more sensitive to the subtle flavours of food. They may find that their appetite increases. Furthermore, some ex-smokers use food as an oral substitute for cigarettes. Stopping smoking doesn't actually put on the weight, though, over-eating does! Many people who are giving up the habit find that they put on some weight initially, which admittedly can be a bit alarming, but this tends to level off. Even if a moderate weight gain persists, it still represents a much lower risk to health than continuing to smoke. And if you've beaten smoking, you can certainly tackle your weight.

Target reader group _____

If you start smoking, you are beginning a habit that is very hard to give up should you ever change your mind and want to stop. Is smoking something to drift into or something to decide against?

Target reader group _____

Recent figures show that 40% of heavy smokers die before age 65, compared to 15% of non-smokers. Death from heart attack is 3 to 5 times more common in smokers than non-smokers. But, once a smoker quits, the risk of heart attack tends to fall quickly (within weeks) to that of a non-smoker.

Target reader group _____

Tobacco is a narcotic. Dependence is a mixture of both psychological and physical factors. Psychologically, a person feels unable to cope emotionally without using the drug either some or all of the time. Physical dependence is when a person's body has adapted to a drug to the point where it needs the drug just to function normally.

Target reader group _____

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INFERRING AUDIENCE CHARACTERISTICS AND MATCHING TO MESSAGE (NON-VERBAL).

Each of the numbered photographs contains an anti-smoking message which is aimed at a particular group of people. You have to match each photograph with the description of the target audience group which you think it is most likely to be aimed at. There are more descriptions than photographs.

Target Audience

Photo Number

Parents whom children copy behaviour from   ....

Longtime and heavy smokers   ....

Women, especially younger women   ....

Those who probably have not tried smoking
but are tempted to   ....

Those who like to feel that they are in
control of their lives   ....

The general population of smokers   ....

People who care for the environment   ....

Older age group smokers   ....

Both non-smokers and smokers   ....

Young to mid-teen age groups   ....

Smokers who cause others, who are unable to

do anything about it, to 'secondary' smoke

(to inhale the smoke as if they were

themselves smoking)   ....
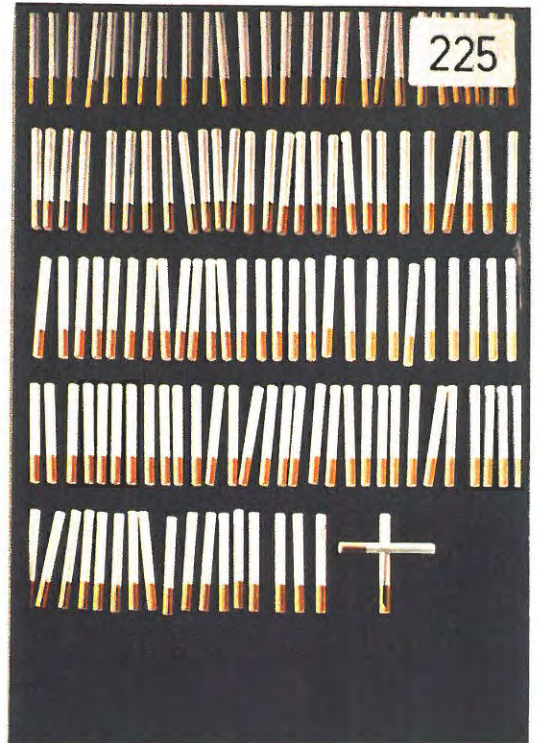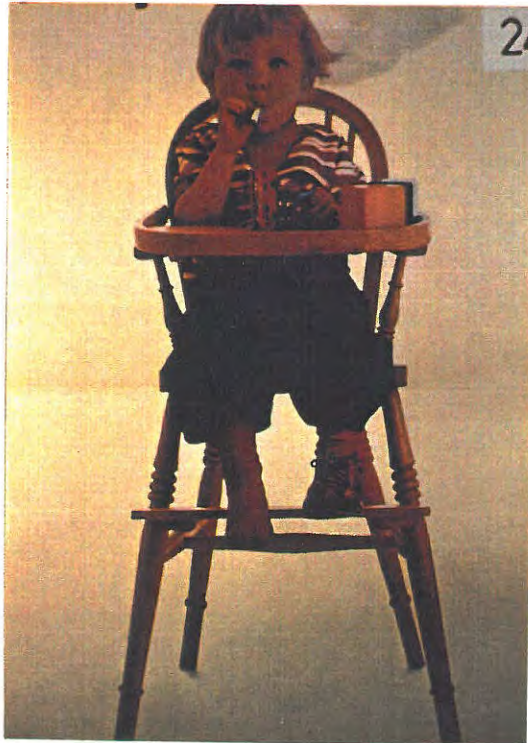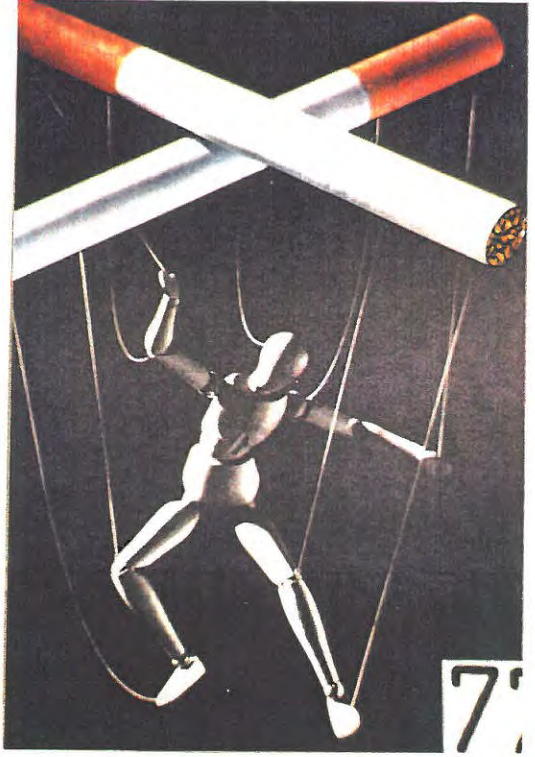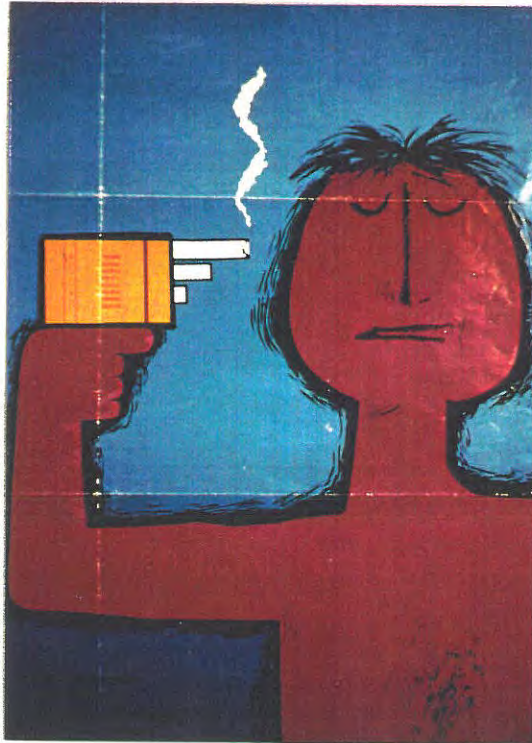
WORKING MEMORY : ORGANISING MATERIAL (VERBAL)

Instructions.

There are 3 pages in this booklet. Each page contains a number of sentences. You have to order the sentences to form a sensible paragraph. On pages 1 and 2 place the correct order number of the event in the blank alongside the sentence. Put 1 beside the sentence you think is the first one in the paragraph; 2 beside the second sentence and so on.

Example:

_5_	Suddenly Albert was pulled through the water into a boat, caught by a fisherman.
_3_	Albert knew how delicious worms tasted and he wanted to eat that one for his dinner.
_2_	One day Albert was swimming around the pond when he spotted a big juicy worm on the top of the water.
_6_	Albert felt sad and wished he had been more careful.
_1_	Once there was a big grey fish named Albert who lived in a big icy pond near the edge of a forest.
_4_	So he swam very close to the worm, then bit into it.

Page 3 is different. The sentences have been given a number. Put the sentence number where it belongs in the diagram provided. At the top of the tree diagram put the number of the main heading sentence, next come the numbers for the sub heading sentences and so on.

1.   Cats are useful as mousers.

2.   Dogs are fine as guardians.

3.   Cows give milk.

4.   Animals are useful in a variety of ways.

5.   Some pets are useful and enjoyable.

6.   Sheep furnish wool.

7.   Farm animals are essential.

Answer:
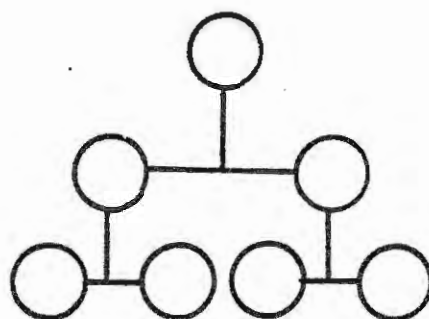
Cross out if you change your mind (no rubbers or whiteout). You will be told when to start and timed. Work as quickly as possible. Signal when you have completed each page and stop the watch. Wait for further instructions.

Answers

_____ She put a bowl of food in front of the opening to he cave and she sang soft music.

_____ She knew her trick had worked and felt very happy.

_____ Once there was a woman who lived in a forest.

_____ The lonely tiger came out and listened to the music.

_____ She really wanted a tiger's whisker and decided to try to get one.

_____ One day she was walking up the hill and she came upon the entrace to a tiger's cave.

_____ The lady then pulled out one of his whiskers and ran down the hill very quickly.

SIGNAL AND STOP THE WATCH

RECORD TIME ____ mins ____ secs

DO NOT TURN THE PAGE

Answers

_____ Next plan logically, using maps and what you remember of the country crossed, the best route to safety.

_____ Find a nearby open area and signal regularly with smoke, shouts, a flashing mirror or torch or by waving clothing.

_____ These activities will help you calm down as being calm and feeling as much at home as possible is most important when lost.

_____ There is no best route to safety if you don't know where you are so stay put in a sheltered campsite if this is the case.

_____ If you become lost in the bush stop moving and, where possible, light a fire or build a rough shelter.

_____ Travel only in daylight and mark out your route with stones, arrows and blazes.

SIGNAL AND STOP THE WATCH

RECORD TIME __mins __secs

DO NOT TURN THE PAGE

1. Aerobic exercise promotes physical health.

2. Exercise reduces stress and helps relazation.

3. Exercise can help foster mental well being.

4. It tones up muscles.

5. Exercise can give a sense of well being for several reasons.

6. Some exercise activities encourage social contact.

7. The cardio vascular system is strengthened.

Answer:
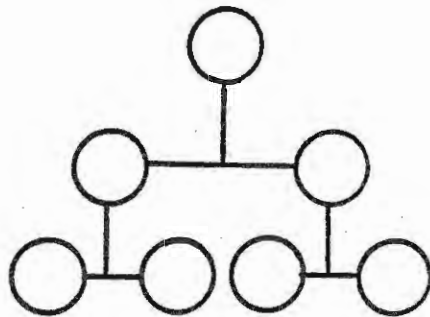
WORKING MEMORY : ORGANIZING MATERIAL (NON-VERBAL).

Instructions.

There are 3 pages in this booklet. Each page contains a series of pictures. The pictures are to be ordered to form a sensible story. On pages 1 and 2 number the pictures in the correct order. Number 1 is the picture which starts the story.
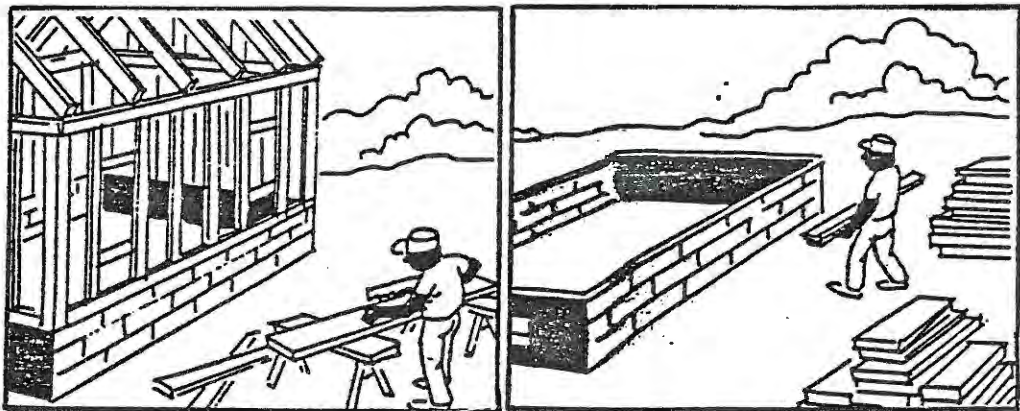
Cont'd

Page 3 is different. On page 3 the pictures have been given a number. Place the picture number where it belongs in the diagram provided. Pictures at a lower level should contain the information needed to construct the picture at the next level.

Example:
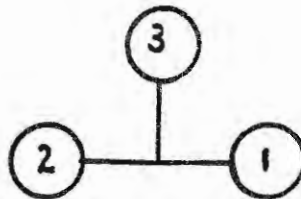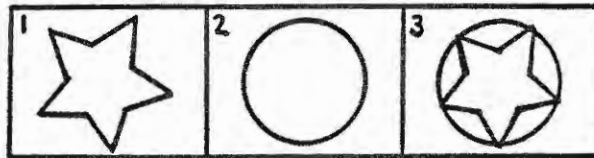
Cross out if you change your mind (no rubbers or whiteout). You will be told when to start and will be timed. Work as quickly as possible. Signal when you have completed each page and stop the watch. Wait for further instructions.

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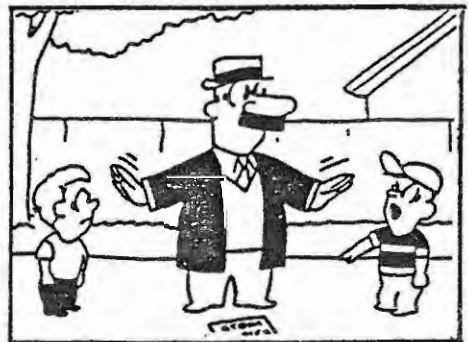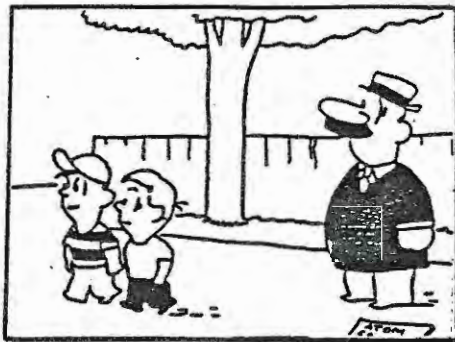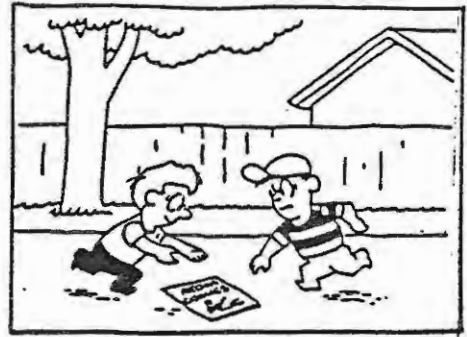
SIGNAL AND STOP THE WATCH

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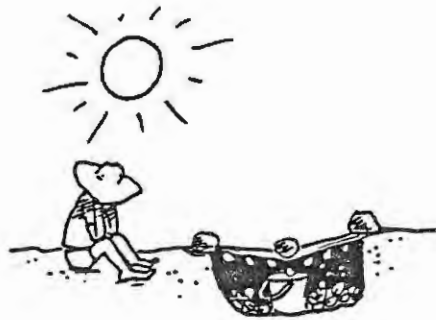
RECORD TIME ___ mins ___ secs

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SIGNAL AND STOP THE WATCH
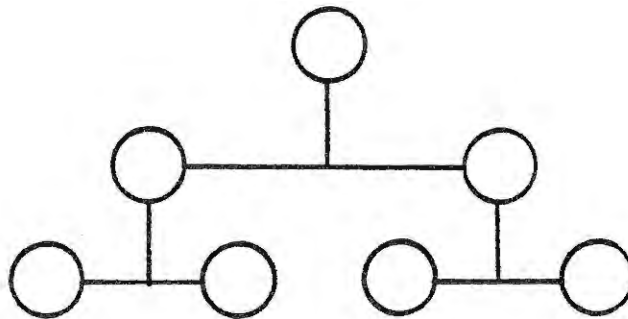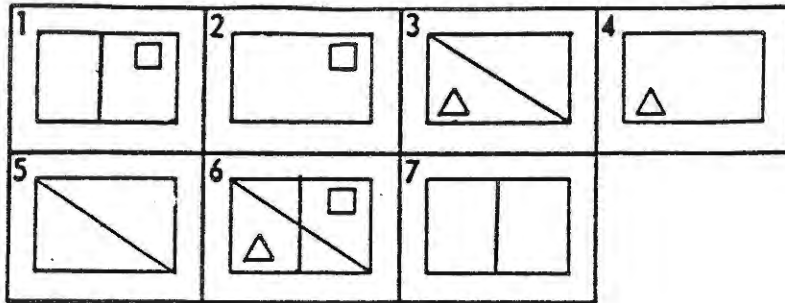
RECORD TIME ___ mins ___ secs

230

IDEATIONAL FLUENCY : GENERATING NEW IN FACE OF OLD (VERBAL).

Instructions.

In this task you are given a setting or context and some words. You have to express the ideas suggested by the words, within the context given, in as many different waays as you can. Try to use only one sentence.

Example:

        Context :   Choice of school subjects

        Words :   freedom, choice, motivated, better

1.   If students were free to determine their own curriculum by choosing the subjects they wished to study, they may be more motivated and produce better results. _____

2.   Better grades and higher motivation would come from a situation where students were free to choose what to study. _____

3.   Students usually behave better if they are motivated so the freedom to choose what to work on is important.

4.   It is better to be free to choose than made to take a particular subject as being forced to do something you don't like lowers motivation.

Notice that in each sentence ALL the words are used. The words need not be used as they are spelled. In the above example free is used instead of freedom, choosing instead of choice and motivation instead of motivated, but the idea expressed by the word is the same.

There are 4 parts. You have 4 minutes for each part.

Are there any questions?

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Part 1 (4 minutes)

Context: Famine in Africa

Words: aid, food, starvation

1.   Sport aid is another fund-raising effort to provide food relief for the millions in Africa who are starving.

2.   _____ .

_____

3.   _____

_____

4.   _____

_____

5.   _____

_____

6.   _____

_____

DO NOT TURN THE PAGE UNTIL ASKED TO DO SO

Part 2 (4 minutes)

<u>Context:</u>   Parental control

<u>Words:</u>   rights, discipline, limits

1.   <u>Parents have some rights to set limits on their children's behaviour and to discipline them when they step over these limits.</u>

2.   _____

3.   _____

4.   _____

5.   _____

6.   _____

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

Part 3 (4 minutes)

Context: The marathon.

Words: runner, distance, pain, determined

1.   <u>In a long distance run it requires determination to overcome the physical pain.</u>

2.   _____

3.   _____

4.   _____

5.   _____

6.   _____

Part 4 (4 minutes)

Context: Youth unemployment

Words: work, frustration, economy

1.   When the economy is in a down turn it is often the young who suffer the frustration of being unable to find work.

2.   _____

_____

3.   _____

_____

4.   _____

_____

5.   _____

_____

6.   _____

_____

IDEATIONAL FLUENCY : GENERATING NEW IN FACE OF OLD (NON-VERBAL)

In this task you have to combine the elements given in various ways to form a representation of an object. You have to construct as many different objects as you can that are associated with the context given.

You may use an element more than once. An element may be used on any scale (that is you can change its size) or on a different angle. Try to use all elements in each object.

Example:

Context: weather

Elements:

Answers.
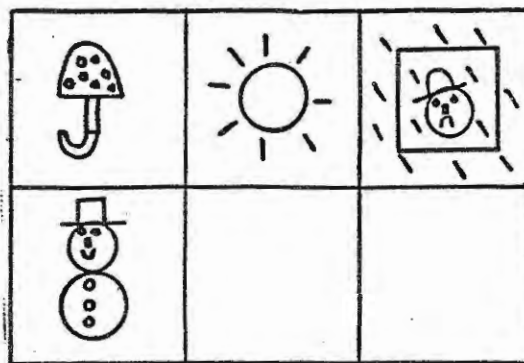
There are 4 parts. You have 4 minutes for each part.

Are there any questions?

Part 1 (4 minutes)

Context: Recreational activities

Elements:
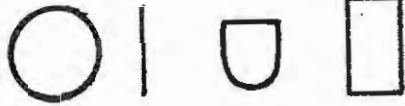
Answers:

DO NOT TURN THE PAGE UNTIL ASKED TO DO SO.

Part 2 (4 minutes)

<u>Context</u>: city life.

<u>Elements</u>:

☐ ∪ |

<u>Answers</u>:

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Part 3 (4 minutes)

<u>Context</u>: at home

<u>Elements</u>:
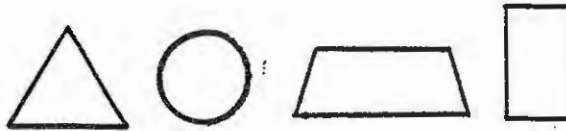
<u>Answers</u>:

Part 4 (4 minutes)

Context: heavy

Elements:

| ○ ∪ ▱

Answers:

APPENDIX C.10

WEIGHING ALTERNATIVES ABSTRACTLY (VERBAL).

In this task you have to construct a story which makes sense. You will be told how the story is to end. The idea is to piece together a story which leads logically to this ending.

The start of the story is at level 1. At the other levels you have to choose from alternatives (at level 2 there are 2 alternatives; at level 3 there are 4 alternatives and at level 4 there are eight alternatives). You tick the box beside the alternative which seems to fit best given the start and the ending.

You will be timed so work quickly but accurately. You may go back to make corrections but do not stop the watch until you are satisfied with your story.

Any questions?

Endings: You will be told which one is to be the end of your story.

1. Construct a story in which Lace decides never to go to the haunted house again.

2. Construct a stoy in which Lace turns into the witch from 'the wiz'.

3. Construct a stoy in which Frankenstein gets run over by a double decker bus.

4. Construct a story in which Batgirl and Lace watch T.V. together.

5. Construct a story in which Lace is almost tricked.

6. Construct a story in which Lace and Frankenstein have all of Macdonalds and the food to themselves.

7. Construct a story in which Lace gets into trouble with Mrs Mummy.

8. Construct a story in which Catwoman gives Lace a pet lion.

STOP. DO NOT TURN THE PAGE

<u>Level 1</u>   START OF STORY

Lace opened the front door and

Level 2

saw the Joker.

slipped into a big bowl of what appeared to be spaghetti.

Level 3

It was really the mummy taking a bath. The mummy grabbed Lace. She slipped out of his arms but her dress fell off.

She hear Batgirl's screams coming from somewhere in the house. Lace sneaked up behind the Joker. She pushed him in the alligator pit. Then she jumped on a mysterious turning chair which switched her to another room.

Frankenstein was cooking it for his dinner. Before Frankenstein got angry, Lace suggested they go to MacDonalds. Lace and Frankenstein walked up to the counter. Everyone ran out of Macs screaming.

He picked up his cane and sprayed Lace with whipped cream. Lace slipped on the whipped cream. The riddler and the crowman both ran into the room. All three bad guys carried Lace to Catwoman's bedroom in the haunted house.

<u>Level 4.</u>   END OF STORY

Catwoman threw Lace in a closet. Lace found a trapdoor at the bottom of the closet. She went through. It led outside. Lace ran all the way home and never went to the haunted house again.

                                        END

Frankenstein ran blindly after them yelling 'fast food junkies'. He was run over by a double decker bus.

                                        END

Catwoman liked Lace and gave her a pet lion to take home.

                                        END

Lace grabbed a witch's outfit hanging nearby and put it on. She ran out of the house and caught up with the scarecrow, Toto, Tinman and the lion on the yellow brick road. She had turned into the witch from 'the wiz'.

                                        END

There she saw a taperecorder. "Another trick! But I outsmarted him this time", Lace thought.

END

At that moment the mummy's wife came in to take bath. She saw Lace and in a rage demanded a divorce. Lace ran for her life chased by an angry Mrs Mummy trailing bandages.

END

So Lace and Frankenstein had hundreds of Big Macs, cokes, french fries and ice cream sundaes to themselves.

END

"Aha, here is Batgirl", Lace said. Lace untied Batgirl and then they both went to watch Batman and Robin on T.V.

END

STOP THE WATCH

RECORD THE TIME _____mins_____secs

APPENDIX C.11.

WEIGHING ALTERNATIVES ABSTRACTLY (NON-VERBAL).

In this task you have to construct a story which makes sense. You will be told how the story is to end. The idea is to piece together a story which leads logically to this ending.

The start of the story is at level 1. At the other levels you have to choose from alternatives (at level 2 there are 2 alternatives; at level 3 there are 4 alternatives and at level 4 there are 8 alternatives). You tick the box under the picture which seems to fit best given the start and the ending.

You will be timed so work quickly but accurately. You may go back to make corrections but do not stop the watch until you are satisfied with your story.

Any questions?

Endings You will be told how the story is to end.

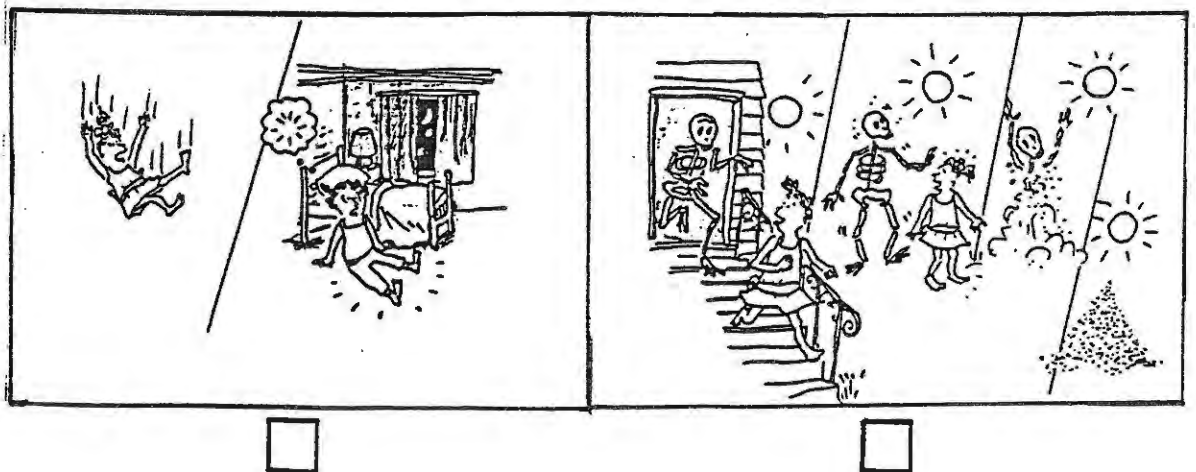Ending 1
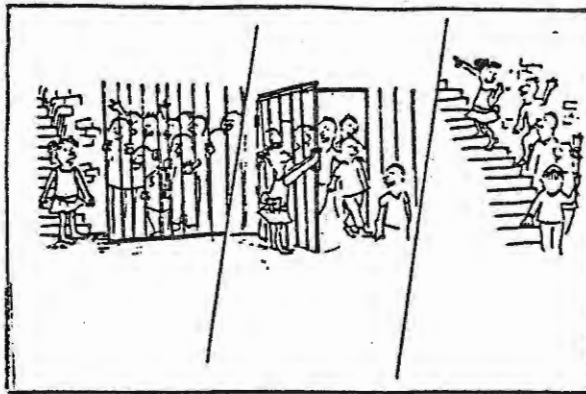
Ending 2

Ending 3

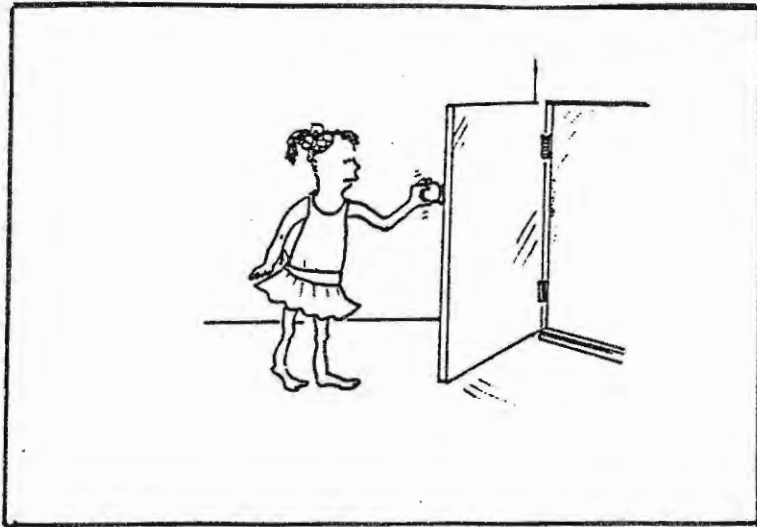Ending 4

Ending 5   Ending 6
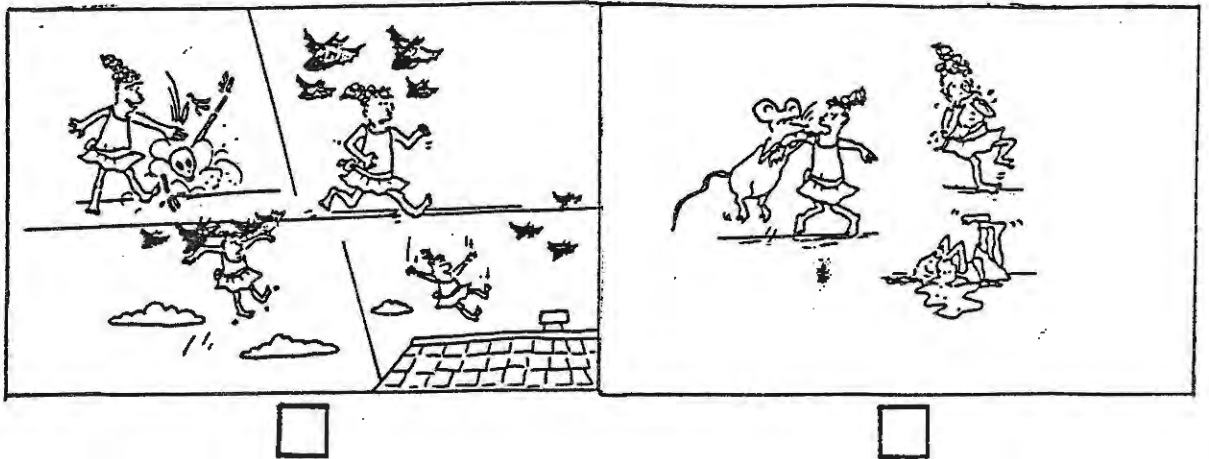
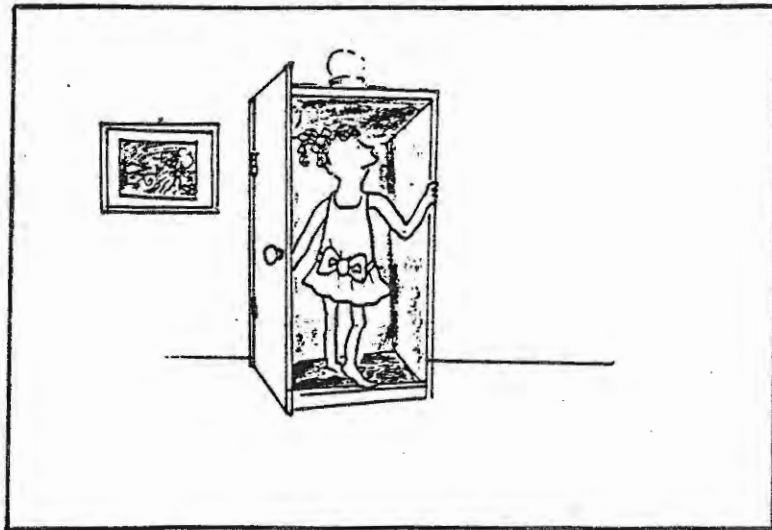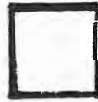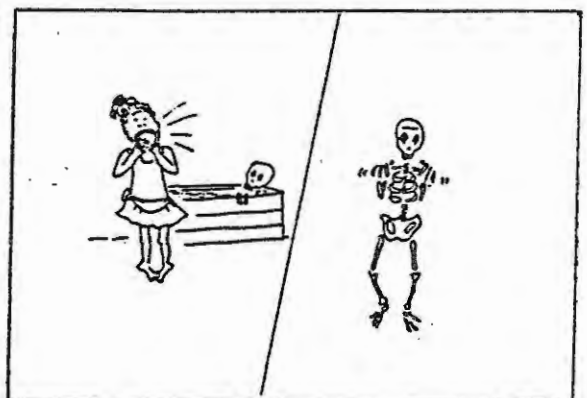□   □

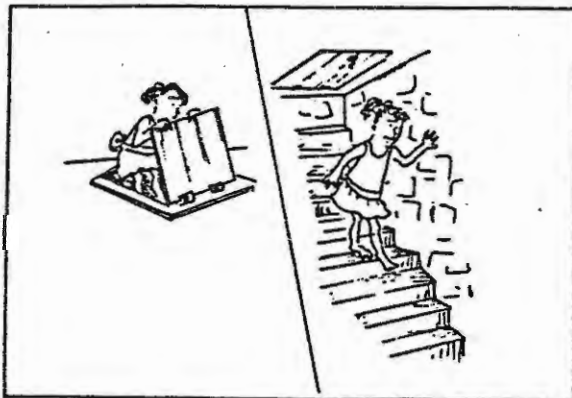Ending 7   Ending 8

□   □

251

The start of the story
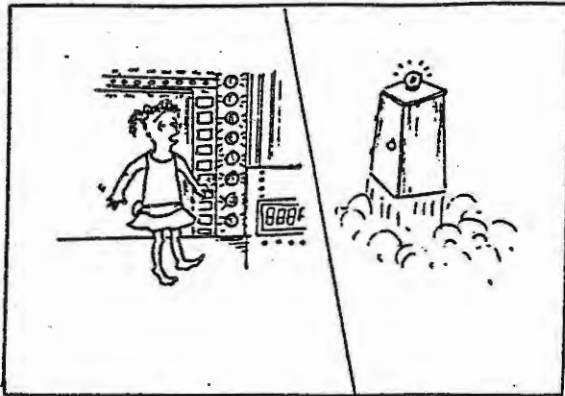
252
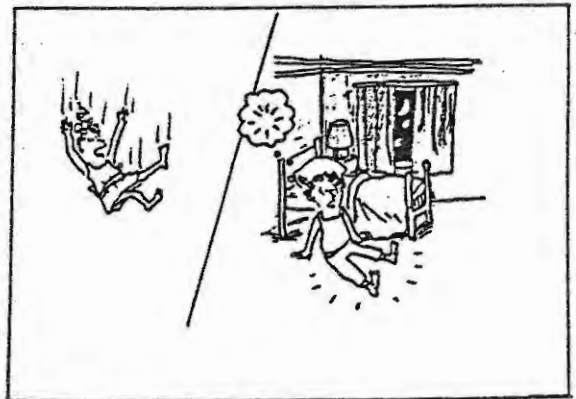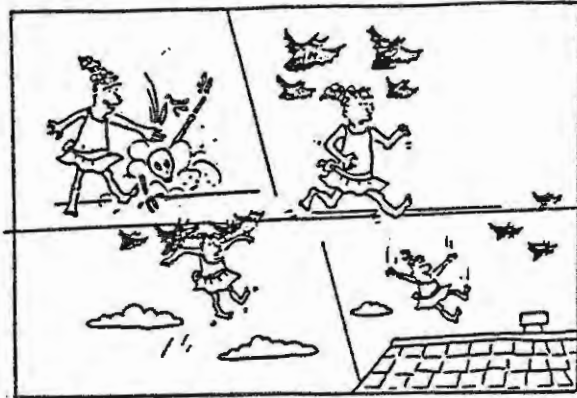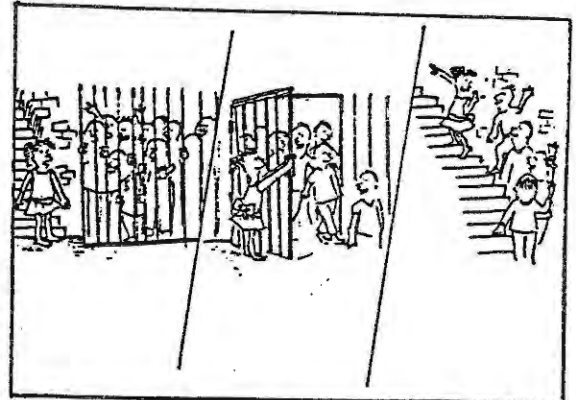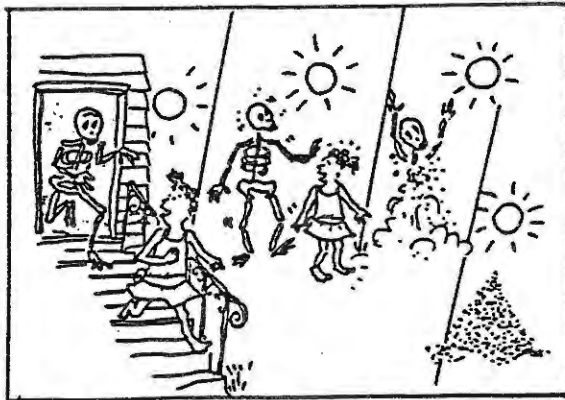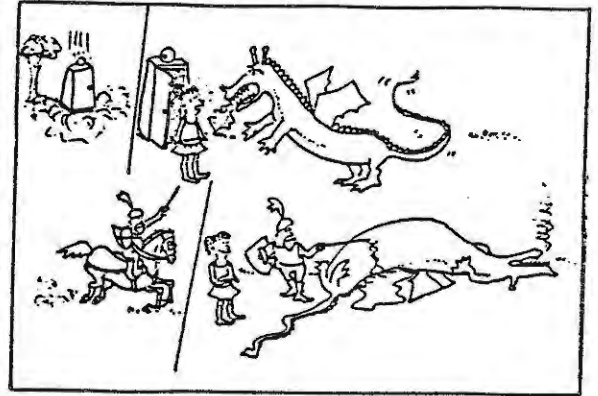
STOP THE WATCH. RECORD TIME _____mins_____secs

APPENDIX D

COGNITIVE TASK EXPERIMENTS : DATA

D.1. Correlation matrix : Cognitive skills (verbal and non-verbal), age, and remediation ability.

D.2. Correlation matrix : Cognitive skills, age, IQ and remediation ability.

D.3. Correlation between each of the cognitive skills and remediation ability for Year 7, Year 9 and Year 11.

Correlation Matrix: Cognitive Skills (Verbal & Non-verbal), Age and Remediation Ability

	NVGIST	VAUD	NVAUD	VSORT	NVSORT	VNEW	NVNEW	VALT	NVALT	AGE	IQ	REMED
VGIST	.53**	.31**	.28**	.47**	.17	.39**	.17	.21*	.19*	.44**	.24*	.51**
NVGIST		.27**	.33**	.37**	.30**	.39**	.18	.27**	.08	.26**	.36**	.43**
VAUD			.33**	.30**	.17	.39**	.24*	.21*	.15	.28**	.35**	.41**
NVAUD				.27**	.22*	.23*	.08	.16	.04	.10	.33**	.36**
VSORT					.24**	.37**	.09	.26**	.06	.20*	.38**	.40**
NVSORT						.15	-.01	.25**	.03	.02	.30**	.25*
VNEW							.40**	.18	.19*	.30**	.33**	.51**
NVNEW								.03	.06	.15	.11	.18
VALT									.31**	-.02	.31**	.28**
NVALT										.04	.14	.22**
AGE											.09	.48**
IQ												.29**
REMED												

*p<.01   **p<.001

Note: This correlation matrix is based on pairwise deletion of missing data.
For the regression analyses, deletion was listwise and this results in minor differences in some *r* values.

Correlation Matrix: Cognitive Skills, Age, IQ and Remediation Ability

	GIST	AUD	SORT	NEW	ALT	AGE	IQ	REMED
GIST		.42**	.47**	.37**	.27**	.42**	.33**	.54**
AUD			.38**	.35**	.22*	.24*	.42**	.48**
SORT				.23*	.24**	.14	.43**	.41**
NEW					.16	.27**	.27**	.43**
ALT						.01	.29**	.31**
AGE							-.09	.48**
IQ								.29**
REMED								

*$p<.01$ **$p<.001$

Note: This correlation matrix is based on pairwise deletion of missing data. For the regression analyses, deletion was listwise and this results in minor differences in some r values.

Correlation Between Each of the Cognitive Skills and Remediation Ability for Year 7, Year 9 and Year 11

	Year 7	Year 9	Year 11
Cognitive Skill			
GIST	.55**	.59**	.37**
AUD	.49*	.37	.45**
SORT	.39	.55**	.36**
NEW	.39	.59**	.19
ALT	.40*	.44*	.31*
	N=40	N=40	N=79

$*p<.01$ $**p<.001$