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INSTRUCTOR ATTENTION TO ORAL READING ERRORS: 

A FUNCTIONAL ANALYSIS.

STUART McNAUGHTON

ACKNOWLEDGEMENTS

This thesis has benefitted from the stimulation and support of Marie Clay, Joe Delquadri, Ted Glynn, and Vance Hall. Ted also provided invaluable feedback for my errors.

My thanks to the teachers who allowed me and associated observers/tutors into their rooms. These were, Glenda Kerr in Kansas City, Kansas, and Muriel Maule in Auckland. The observers and tutors, Pearl, Eva, Dirk and Meng were most efficient and conscientious. The research in Auckland was permitted by the District Senior Inspector of Schools (Primary) and received financial support through an Auckland University Research Committee grant, 141 Education 10.

The typist, Nancy Payne, has worked with remarkable speed and accuracy under pressure and I am grateful for her work.

Trudie has lived with this thesis for more than three years. It has gained immeasurably from her support.
ABSTRACT

The effect of attention to oral reading errors has received little specific examination by researchers in applied behaviour analysis. Some data suggest attending to such errors can have inappropriate effects on learning. A conceptual framework was developed to examine the effects of error attention on the acquisition of proficient reading responses. Analyses of reading behaviour employed concepts and data from 'structural' accounts of reading. These concepts provided details of the components of response systems. Acquisition of proficient reading was seen to involve trends towards accurate integrated responding which becomes self controlled. Error attention was conceptualised as having motivational and informational properties which could directly affect acquisition trends.

The first experiment (Chapter Three) demonstrated that under appropriate conditions oral reading behaviour was facilitated by error attention. Eleven year old readers in a Learning Disabilities classroom were measured in their usual reading setting. Two readers received extra tutoring with error attention procedures. A further two readers acted as a contrast for the effects of increased opportunities to respond. These readers received extra practice tutoring with minimum levels of praise. A third subject received no extra tutoring during the course of the experiment. Results indicated that both practice and
error attention produced substantial increases in accuracy and correct rates. Accuracy levels were higher for error attention subjects suggesting error attention can have important learning outcomes. Additionally, predictions concerning the error attention dimensions of modelling and prompting were tested. Prompts were found to be more effective with the more proficient reader while models were more effective with the less proficient reader.

The second experiment (Chapter Four) examined specific predictions about timing of error attention. Six, 6 year old normal readers received daily sessions of either delayed or immediate attention to errors. Every second day the subjects also read a text on which they were not tutored. Results showed that delayed attention increased the percent of errors self corrected for five subjects in both the tutored and non tutored texts. Increases in self corrections were consistently associated with increased accuracy. The data supported both the predictions and the proposed model of self correction behaviour as having a tutorial or self instruction function.

Both experiments were discussed in terms of the functions of error attention in facilitating acquisition of proficient reading. Methodological issues in the behaviour analysis of oral reading were also discussed and implications from the studies for instruction in learning to read are drawn. The usefulness of concepts
from 'structural' accounts of reading for a predictive 'functional' account of error attention is examined in a concluding section.
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CHAPTER ONE : CONCEPTS

A. INTRODUCTION.

Attention to inappropriate, incorrect or inexact acts is pervasive. Educational settings have unique opportunities for error production and subsequent attention. A majority of teacher-pupil interactions are predicated on teachers' assumptions and instructional habits of correction of errors. Such interactions are readily observable during early reading instruction.

The following research programme evolved from observations of error attention interactions made during an earlier study (McNaughton, 1974). In that study, tokens and teacher praise were made contingent on 'appropriate' reading responses of Special Class readers. General recommendations about teacher attention to errors were incorporated into the programme. Possible causal relations between teacher attention and errors were not examined, even though this attention to errors was assumed to be effective within the total programme (Glynn and McNaughton, 1975).

Three years later there is still very little behavioural data on the causal status of attention to errors within reading programmes. In behaviour analysis studies of oral reading, attention to errors by the instructional agent has either been an unanalysed component of the instructional package (e.g. Berner and Grimm, 1972; Knight, Hasazi and McNeil, 1971; Lahey and Drabman, 1974; Staats
and Butterfield, 1965) or, has not been present at all (e.g. Gray, Baker and Stancyk, 1969; Lovitt, Eaton, Kirkwood and Pelander, 1971; Staats, Staats, Schutz and Wolf, 1962).

Given the pervasiveness of error attention in instructional interactions in classrooms (e.g. Rosenshine, 1976), there may be advantages in using error attention variables for constructing more effective instructional settings. This is an important area for research. Such research would have specific significance for instructional programmes. Additionally, specific analyses within this one academic area could contribute to a wider instructional and psychological theory. It would provide applied analyses of the processes involved in learning from feedback to errors.

The following discussion outlines a unified theoretical framework of attention to errors in oral reading. Specific predictions from that framework are made in Chapter Two. Evidence relating to the predictions is reviewed in Chapter Two, and, in later chapters, research is described which attempts to test some of these predictions.

The task of building a conceptual framework has two dimensions. One is the need to provide an analysis of functional properties of attention to errors. Less obvious, but equally necessary, is the need to state the author's conceptualisation of oral reading. At the simplest level
to refer to a behaviour as an operant is to provide a conceptual framework for that behaviour. This increases the possibilities for control over that behaviour.

Explanatory systems in psychology are often separated into 'structural' and 'functional' accounts of behaviour (Catania, 1972; Whitehurst and Vasta, 1977). These accounts are often thought to be mutually exclusive (Reese and Overton, 1970). While integration of opposed paradigms may be logically impossible the concepts and data of one may, given suitable interpretation, provide important additional concepts for the other.

This thesis argues for the usefulness of 'structural' concepts of reading to a predictive 'functional' account. The data generated within the 'structural' account provide details of the components of behavioural systems and the possibilities for combination in components over time. These details are often neglected or not available to researchers in the 'functional' tradition.

In this chapter a conceptual statement about the properties of reading responses is attempted. This is followed by an analysis of possible error attention properties. Together these two frameworks provide an extended basis for interpreting and predicting error attention phenomena in the acquisition of proficient oral reading.
B. LEARNING TO READ

1. Major behavioural components

Several complex response systems are involved in proficient oral reading. During proficient reading these systems are essentially interdependent, interfacilitatory and nearly automatic. Thus the separation of response systems which follows is somewhat artificial in terms of a typical sequence of proficient reading. However this separation is necessary for gaining an understanding of what is involved in learning to read.

a. Attentional and cue selection response systems

Reading is a special case of stimulus control by a compound stimulus. A text is a compound stimulus array containing two major stimulus dimensions to which a reader can attend. These dimensions contain graphic visual cues and contextual cues. In addition to the control by visual stimulus elements (e.g. ... a letter feature in Gibson's, 1969 analysis) attention and response selection in reading are also superordinately controlled by 'meaning' (e.g. ... Goodman, 1976b). 'Meaning' is gained by attention to, and use of contextual cues.

Various writers have documented intra- and inter-reader changes in response topography with changes in both stimulus dimensions of the compound stimulus (e.g. Clay, 1972; Wanat, 1976). These can be taken as support for the concept of
stimulus multi-dimensionality in texts. Similarly, they support a concept of differential attention as in the definition of attention supplied by Honig, (1970). From these descriptions it is possible to state the general nature of the two stimulus dimensions.

(i) **Graphic cues:** graphological features, graphophonic associations and orthographic cues.

Graphological features are the minimal or elemental distinctive visual features of letters (Gibson, 1971). Graphological features are the basic invariant bits of visual information that a reader can use to make efficient generalised letter discriminations (Tawney, 1972). In combinations they provide the visual stimuli that control graphophonic or letter-sound associations.

Orthographic cues are the redundancies of written English (Gibson, 1971). There is, for example, only one position that "ng" can occupy in written English. These regularities and redundancies can be attended to as higher-order cues so that not every feature in a word has to be attended to in order for the appropriate response to be emitted.

All oral reading responses are, in a special sense, grounded in the graphic visual stimulus. However, responses can differ in the extent to which only graphic cues are used.
Responses can be made which are controlled primarily by graphic features, orthographic cues, and graphophonic associations. Letter and word match-to-sample, letter and word recognition, letter and word identification responses, and grapheme-phoneme combinations are examples of responses which can be made without attention to contextual cues.

The process of learning to read involves the acquisition of control by the compound visual stimulus. Different oral responses are controlled by combinations of graphological features, graphophonic associations and orthographic cues. Attention to these cues provides a basis for accurate oral responding. In this sense, attention to context (and thus meaning) depends on accurate and efficient selection of these cues. However, such attention is not necessarily prior, or subordinate, to attention to the other dimension. Indeed, selection of all visual graphic cues may be facilitated by continued attention to contextual cues (Broadbent, 1977; Salzinger, 1973).

(ii) **Contextual cues: syntactic and semantic cues.**

Generally it is considered that syntax conveys meaning (e.g. . Brown, 1973). Therefore syntax and semantics together provide contextual cues for meaning. The two sources of contextual cues are here considered separately in order to identify the general nature of this source of stimulus control.
1. **Syntactic Cues**

The categorical relationships between words (i.e. syntactical or grammatical rules) can be used as cues for oral responding (Salzinger, 1973). These "intraverbal" cues (Winokur, 1976) supply contextual information which typically precedes any one reading response. That is, responses to earlier stimuli can provide detailed information about probable stimulus classes which follow. Earlier responses can thus be seen as self-produced cues providing usable information. It is assumed that responding is only partially controlled by syntactic cues because the intraverbal relationships control response classes (K. Salzinger, 1973). Control by syntactic cues involves a general predisposition to make a certain type of response.

Control is determined also by established oral language repertoires. Thus a further assumption is that knowledge and use of syntactic cues in a text is directly related to the degree of control syntax exerts in oral language responses (Clay, 1972). Indeed, several sources imply or claim that the development of learning to read connected prose depends initially on the production of oral responses. Meaning is gained in a manner analogous to listening (see theoretical statements by Goodman, 1976a, and Skinner, 1953; and empirical data in Bradshaw, 1975, and Doehring, 1976). Over time, this response sequence
becomes more covert, refined and automatic so that meaning is gained directly. Conceptualising a developmental progression of this sort reduces the anomalies noted by Bradshaw (1975) in research on the presence and absence of phonological recoding in reading. Research with deaf readers would indicate overt oral responding may not be a necessary precondition (Bradshaw, 1975). Nevertheless, such a progression may be typical, and the most efficient.

2. Semantic cues

Meaning results from attention to semantic cues in the stimulus array. There are two sources of meaning cues for reading stimuli (such as words or phrases). The first source is the stimulus itself, attended to and recognised in isolation; and the second, as in the operation of syntactic cues, is contained in preceding responses. Thus the meaning of current stimuli can be attended to, and secondly, prior meaning events can 'attune' the response system so that stimulus classes are expected. In the second instance the meaning gained from previous responding can be used in making responses prepotent.

Although the ontological status of the term 'meaning' is not at all clear it is assumed to be a function of the relationship between a contextually induced abstract framework and a particular stimulus (Bransford, McCarrell, Franks and Nitsch, 1977; Skinner, 1974). This abstract framework can be considered to be a covert event which might
also be associated with overt oral responses, such as the oral response "dog" in the presence of a small four legged animal. The perception of meaning is therefore conceptualised as involving the relationship between covert perceptual events (responses), external stimuli and associated overt responses.

In the acquisition of "ideas" "knowledge" and "understanding" covert events come under the control of specific stimuli. Many of these relationship repertoires are acquired through the contingencies applied by the oral language using community (Day, 1976b; Skinner, 1974). Meaning therefore often involves a verbal component as a result of the verbal medium of learning the event-stimulus relationships (i.e. to 'see' and 'understand' things often involves being able to make verbal responses concurrently with the event-stimulus relationship). The meaning of a word is given by the stimulus-event relationship of which it is a function (a related definition is contained in Winokur, 1976).

Covert responding, however, can also occur in the absence of the specific stimulus which typically controls the event, as in 'conditioned' and 'operant' seeing, or, dreaming and hallucinating (Skinner, 1953, 1974). Meaning is gained from a text in a similar fashion. The associated verbal response can become the stimulus controlling the covert event. When reading a word, events which have been typically associated with specific stimuli can be produced
solely under the control of the related associated verbal response. Thus overt responses in oral reading provide the stimuli (semantic cues) for meaning events. A similar claim is made by Gibson (1977). He notes that perception of the 'affordances' (or combined properties) of actual objects, and verbal and motor repertoires associated with those perceptions, are available with the verbal symbol, in part as if the objects were also present. A developmental progression, similar to that with syntactic cues can be described for semantic cues. This would involve a trend from overt mediating responses to covert, nearly automatic generation of meaning.

In reading, 'meaning' is gained to the extent that perceptual events are generated under the control of the verbal stimuli in the text. This will depend on the characteristics of attention to previous response-produced cues as well as to current cues. An essential condition for meaning is that active or 'controlled' attention (Shiffrin and Schneider, 1977) is given to response-produced cues. In this analysis meaning depends on the affordances which objects have for individuals. Prior experience will determine what properties objects have for individuals. However, new meaning can be mediated by novel verbal response combinations which control novel perceptual event associations, e.g. at a more abstract level the 'new' meaning gained by readers of the present thesis.
3. **Context and Meaning**

Syntactic and semantic cues together provide contextual information. Contextual information facilitates the availability of response classes and even specific responses within classes. Given appropriate reading programme goals, meaning is the superordinate and typical goal in reading. Thus during oral reading, attention is given to the semantic cues in oral responses which produce, or generate, meaning (i.e. covert events and their associated repertoires). A specific textual stimulus occurs in a context. A word has a precontext and a postcontext. Cues available from the precontext attune responding (Broadbent, 1977; Gibson, 1977) so that certain stimuli are expected. The pre-context controls a response class but can accurately control a specific response to a limited extent only. The post word context can add more specific cues to produce a specific response. For example, in a story about a cat and a mouse, the following sentence might occur: "THE ——— RAN INTO THE LITTLE HOLE". Given preceding sentences and the first word in the sentence only (i.e. THE ..) cues are available for selecting a noun and possibly one of the agents in the story (i.e. the cat or the mouse). The post context words however, (i.e. RAN INTO THE LITTLE HOLE) make it much more likely that the missing word is mouse.

b. **Self-Control response systems.**

A second major response system acts primarily to
maintain, refine and improve the generation of meaning. This system includes self monitoring or observation, self evaluation, self correction and self reinforcement. These are general component skills which have been defined, and to some extent analysed in behavioural models of self control or self regulation (e.g. Bandura, 1976; Glynn, Thomas and Shee, 1973; Kanfer, 1970). The generation of meaning is the usual goal of reading. Self control systems operate on the attention and cue selection skills which determine the efficient generation of meaning.

Self correction and self improvement aspects of the proficient self control system are described further below. The essential characteristics of the system are that they are learned skills. In reading, self control occurs as self produced responses are monitored and evaluated against current graphic and contextual cues, and ongoing 'meaning'. Self correction occurs as meaning is interfered with and mismatches are observed between responses and cues. Self correction involves a homeostatic process so that meaning is maintained. It also involves a process of differentiation and refinement of skills so that meaning becomes more efficiently and accurately generated. Self correction allows for the learning of more appropriate attention and cue selection skills as well as the more appropriate use of already developed skills.
2. Proficient Reading

a. Integrated reading

When reading a text, a proficient reader attends to limited areas of the stimulus array, selecting graphic cues to respond to (Clay, 1972; Goodman, 1976b; Smith, 1971). Previous responding provides syntactic and semantic cues which increase the probability of occurrence of both particular classes of responses and of specific responses within classes. Thus a response or class of responses is selected where possible in advance of the graphic cues specifically related to that response. A specific response occurs as the graphic cues are attended to. A characteristic of proficient reading is the tendency towards minimal graphic cue selection. Cues are selectively attended to to the extent that enough information is available to make a specific response. That response in turn is added to the contextual cues available for attention and the generation of meaning.

A controversy exists at this point in the cognitive or information-processing literature (McConkie and Rayner, 1976). Some theorists adopt an 'hypothesis' position where responses are made as guesses or predictions and specific cues within the text segment are selected in order to confirm the guess (Goodman, 1976b). The alternative
position is termed (and possibly misnamed) \(^1\) by McConkie and Rayner, the 'direct perception hypothesis'. This alternative conceptualises incoming stimuli as being automatically processed and combined with existing trace data until a decision results in recognition.

Both models incorporate the concept of different sources of cues being available to and used by the reader. The models differ in when cues are used, and how actively they are used. The models also differ on when specific responses are first produced in complete form in relation to the stimulus array. It would seem that some form of both the 'hypothesis' and 'combination' positions are possible, and may occur as a result of either changes in text, or, changes in the ability of the reader, or both. These variables, particularly concerning limitations in reader abilities and structural features of attention (see

\[1\] The perception in this conceptualization is anything but direct. Stimuli are processed at successive levels in the processing system of the perceiver before perception occurs. This can be compared with "direct perception" frameworks that do not adopt the memory metaphor (Bransford et. al. 1977).

In these frameworks, perception or generation of meaning occurs with the support of a perceptual system or structures. The structures, however, do not carry, hold or store stimuli as in memory metaphor accounts. Bransford et. al. (1977) define direct perception as an epistemic act. There are some similarities here with Skinner's radical behaviourism (e.g. Skinner, 1974), who also claims the memory metaphor poses difficult epistemological and empirical problems. The assumptions adopted in the present discussion are more congruent with this interpretation of the direct perception view. The second position outlined by McConkie and Rayner might be more appropriately termed the 'automatic combination' hypothesis.
below) will determine what is the most efficient form of responding at any one time.

It is assumed from error and self correction analyses that the proficient reader is both maximally sensitive to syntactic and semantic cues and normally makes less use of isolated graphic cues (Clay, 1972; Goodman, 1976a; Smith, 1971; Weber, 1970; Williams and Clay, 1973). The availability of contextual cues and the degree to which graphic cues can be utilized will determine how much, and how efficient complete preselection and check is. The combination model stresses more specific use of graphic features which are then added to an undifferentiated response base. Combination in this sense is more likely in situations where syntactic and semantic cues are less clearly related to following cues. Similarly, combination is more likely where a reader has a repertoire for accurately using those distinctive graphic features. Nevertheless, the distinction between the two positions is often difficult to sustain as the combination (or integration) characteristic of responding is common to both positions.

Acquisition of proficient reading can include a trend from forms of 'hypothesis' to 'combination', especially in the sense of a trend towards efficient integration of all cues to generate meaning. As early readers have not learned the fine-grained visual discriminations necessary for use of some graphic cues they stress oral language-based cues
(Clay, 1972; Doehring, 1976). This is especially the case in New Zealand primary school reading programmes.

The most efficient and accurate form of integration tends towards maximum sensitivity to syntactic and semantic cues with minimal use of graphic cues to confirm or complete the preselected/prepotent response. Reading continues in a series of selections of graphic cues in the text to confirm preselected responses or provide more cues on which to make a specific response. Responses which occur add to a context setting the occasion for further general or specific responding. Sufficient sampling of graphic cues is carried out to maintain the generation of textually derived meaning. Cue selection strategies change under appropriate conditions. These include general changes in the difficulty of text being read (Schvaneveldt, Ackerman and Semlir, 1977; Wanat, 1976) and anomalies or interference in the meaning generated by responding.

b. Self-corrected reading

Proficient reading also involves a self control system. A major aspect of self control in reading is seen in the operation of self correction of errors. Self corrections are based on continuous self observation. Cues attended to and oral responses made are compared with responses already emitted and prepotent response classes. Self correction is the act of independent observation of mistaken use of cues. Observation leads to independent correction and subsequent production of the correct response.
Several types of oral reading errors can be specified (e.g. Clay, 1972; Goodman and Burke, 1972). Errors can vary from non-attempt pauses (i.e. no response) through to complex substitutions which are appropriate in terms of several cue dimensions (e.g. substitution of "house" for home). It is likely that high frequencies of no-response errors in New Zealand primary school programmes are often a function of aversive consequences for responses which are errors and positive consequences through teacher attention for no attempts (McNaughton, 1974). Given appropriate attention to the text, substitution and addition errors occur from inadequate and/or inappropriate use of cues. Self correction occurs with these response type errors.

There are at least two major situations in which an error (i.e. mismatch between oral response and text) occurs. These correspond to problems with use of contextual or graphic cues. Each situation can result in an immediate or delayed mismatch.

(i) Mismatches can occur when earlier contextual cues have low relevance for a particular text segment. In this instance, over reliance on these cues may be inappropriate. This is more probable at the beginning of sentences and where there is a change in action or agents etc. in the story. Mismatches also occur when semantic and syntactic cues are either ignored, or inexactely attended to. An example of the latter error might occur when reading
a text about going to school. In previous sentences a child has been getting ready to go to school and the sentence occurs: Off he went to school. Inexact attention to contextual cues might result in a reader saying: "Off he went to Grandma's". The reader has not used the general context of getting ready for school. A second error, based on inattention to syntactic cues, might occur over a sentence which reads: He liked to read and the reader says: "He liked to road".

Both inexact and inappropriate attention to contextual cues will result in an error. In immediate mismatches concurrent attention to the graphic stimuli provides cues which are at odds with an emitted response that was based on inaccurate attention to contextual cues. A second situation and possible mismatch between a particular text segment and a response may not be immediately observed. Cues from the error response may then be used to preselect a response class or a specific response for the following text segment. This correct use of incorrect cues can lead to a delayed mismatch. The cues contained in the following text do not match with the prepotent response or response class selected. This then produces a situation similar to the immediate mismatch. An example of this mismatch occurs when a reader misreads a text sentence The cat purred by substituting "the mouse" for The cat. He then finds a different verb from the class or specific verb expected (e.g. Reader: "The mouse ... purred? ... mice can't purr!").
(ii) A second major situation occurs with inexact or restricted selection of graphic cues. An immediate mismatch can occur when the graphic cues selected are not the cues expected on the basis of contextual cues (e.g. reading "house" for horse in a story about show jumping). As with the earlier situation, observation of the mismatch may be delayed. This occurs when cues in following words are at odds with the cues expected from the incorrect context produced by the error. (For example, the reader reads .. "The teacher was the monkey", instead of The teacher saw the monkey, and says "how could the teacher be a monkey?".) Again, an important attribute of this instance is that if a mismatch is observed it is based on accurate attention to incorrect response-produced contextual cues.

Self correction depends on observation of the mismatch between what has been read/said, and what is currently being attended to.

The observation of a mismatch is much more likely to occur when the error response produces a discrepancy at the level of meaning, than if little change in meaning results. That is, a response is more likely to be corrected if it produces syntactic and semantic cues which are discrepant from the pre-error/preceding context (Clay, 1966) or the post error/following context (Weber, 1970). Given observation of a mismatch a regression or movement back to the area of text containing the mismatch occurs.
Younger readers tend to regress to earlier portions of the pre-error text than older readers (Clay, 1966). This is possibly due to younger readers being unable to attend to cues for as long as older readers. Thus regressing to earlier segments of the text may be a useful control strategy for younger readers in that it makes pre error contextual cues more available.

Following the regression, the reader gives more attention to associated contextual cues (e.g. pre-error context) and graphic cues around the mismatch. The rereading of text up to the error and increased attention to every cue source is an attempt to select the cues needed to correct the response. The reader attends more closely to all available cues in an attempt to reduce the mismatch which is interfering with meaning. Thus self correction initially depends on (behaviours of) monitoring of responses, observation of the mismatch, regression and repeated attention to and selection of cues.

An error can be seen to have the general characteristics of incomplete or inexact integration of cue selection responses and interdependent responding. Successful self correction primarily occurs if some integration and/or refinement of inexact cue selection occurs. There is a major implication in this conclusion. Instances of self correction, especially in early reading, have crucial tutorial or instructional functions.
Observation, regression and reselection responses provide an opportunity for refinement of particular attentional response systems. They also provide an opportunity for learning integrated and interfacilitatory use of all cue attention systems. Additionally, successful correction might be hypothesised to operate as a reinforcer for more appropriate use of cues, given that the generation of meaning has reinforcing properties. Thus from some self-corrections essential perceptual learning is possible. This learning results in refinement and system attunement to appropriate cues. This may provide a crucial setting for learning both content and strategies for acquiring visual information (e.g. Day, 1975). Similarly, self correction might develop more integrated, efficient and interdependent responding.

There is evidence which suggests that early high incidence of self correction is a significant predictor of high progress. This is claimed to be more predictive than traditional measures such as reading readiness and intelligence tests (Clay, 1972). Other data on self correction indicate that high progress first grade readers are much more likely than low progress readers to self correct errors which are grammatically discrepant with post error context (Weber, 1970). In the study which precipitated the present investigation the development of self correction behaviour was associated with high rates of progress in mildly retarded subjects (McNaughton, 1974).
This association between high progress and high self correction rates has been replicated with older children (Clay and Imlach, 1971; Watson and Clay, 1975; Williams and Clay, 1973). Data from these studies are congruent with the model of self correction and reading presented above, which claims self correction can involve significant learning. Hence one major reason for claiming the importance of making any response in oral reading is that responding is a precondition for self correction and thus self improvement.

There is one form of inappropriate, or inexact use of cues resulting in an error which has significance in terms of later discussion. Over use of a cue source is possible. Although over use of any source can occur, there are important outcomes associated with the situation of increased or exclusive use of graphic cues. Attention to graphic cues can occur without attention to the specific semantic cues also contained in a stimulus. There are data which suggest continued active or "controlled" attention (Shiffrin and Schneider, 1977) to graphic cues reduces the opportunity to attend to syntactic and semantic cues (Klein, 1976; LaBerge and Samuels, 1974). This reduced attention to contextual cues will, paradoxically, in turn reduce the efficient and accurate use of graphic cues. This conclusion is based on the well documented finding that use of contextual cues increases the accuracy of word and letter identification and
recognition (e.g. Broadbent, 1977; Schvaneveldt, et al. 1977). It is interesting to note that the previously mentioned research on the characteristics of high progress readers also shows that these readers can be distinguished from low progress readers by a greater ability to use contextual cues. This distinction does not occur when ability to use graphic cues is compared.
3. **Structural Characteristics of response systems.**

The fully functioning attentional response systems are based on structural, or physical characteristics which define the range of conditions under which the systems operate. These conditions determine the time taken to attend, and the number and type of cues that can be attended to. There are, for instance, attentional limitations defined by the characteristics of the visual apparatus. For example, limitations exist in how much visual information can be attended to in any one fixation (Rayner and McConkie, 1976).

The characteristics most relevant to the present investigation are those which limit the use of contextual cues and the generation of meaning. These have been examined traditionally in studies of "primary working" and "operational" memory (e.g. Baddeley and Hitch, 1974; Craik and Lockhart, 1972) and capacity limitations in attention (Riley, 1977a; Shiffrin, 1976). Here, these become questions concerning the length of time previous responses are available as contextual cues, limitations on how many cues can be attended to, and the effects of differential attention on other aspects of the response system.

Recently, a comprehensive two part review (Schneider and Shiffrin, 1977; Shiffrin and Schneider, 1977) has provided a conceptual integration of studies germane to
these questions. The authors distinguish between two fundamental types of information processing which include attention to and use of cues. These are termed automatic and controlled processes. Automatic processes are well-learned sequences activated automatically by stimuli and operate without active control or attention by the subject being necessary. These automatic processes operate in parallel, are not restricted by capacity limitations and are difficult to alter or suppress when learned. Controlled processes are highly constrained by capacity limitations (of short term or operational memory) so that they typically operate in serial fashion with demands for a second process interfering with use. Under some conditions two sequences might be able to be interwoven serially. These processes are under active control by the subject and are easily established, altered or even reversed. Further capacity limitations are restricted comparison rates, and small amounts of information that can be maintained.

Perceptual learning is the development of automatic processing. As distinct from the framework of earlier models, the framework and supportive data that Shiffrin and Schneider present places emphasis on conditions of training. Automatic attention, for example, requires a considerable amount of consistent training. Consistency is defined in terms of mapping or association of stimuli with responses. What is most important in Shiffrin and
Schneider's model is that automatic processes are typically learned through the easier use of controlled processing. Thus attentional limitations will operate during acquisition of automatic responding. The authors make few statements about the conditions which determine acquisition or use of controlled processing other than implicating instructional control (e.g. Shiffrin and Schneider, 1977 p. 159). This may be an area where contemporary developmental research can provide concepts such as examination of self control processes or concepts of metacognition and metamemory (see Flavell, 1976).

Controlled processing facilitates long term learning including automatic processing. What is remembered is what is attended to and given controlled processing. Some degree of controlled attention is thus a prerequisite for remembering. Stimuli need active attention to remain salient. Without controlled processing stimuli rapidly lose salience. Controlled attention appears necessary for "deep" levels of processing. (i.e. attending to semantic cues and generating meaning). Thus Shiffrin and Schneider (1977) expect skilled readers to process automatically graphic cues and to give controlled processing to conceptual properties of the text (p. 169). They note that typically during skilled reading little information would be gained regarding the surface structure of details. However, if controlled processing were directed towards levels of analysis usually carried
out automatically, the features attended to would be remembered. It will be assumed later that this can be one of the functions of error attention, i.e. to direct controlled processing to features of the text. This is also the assumption behind the proposed tutorial function of self correction in reading.

The authors also describe how after invariant relations are learned at one stage (resulting in reduced discrimination time, ignoring of irrelevant information) processing becomes automatic and controlled processing can be allocated to "higher" "deeper" levels. This concept can lead to a linear model of acquisition of automatic reading responses (... Laberge and Samuels, 1974).

The model adopted in this thesis is formulated within the New Zealand context. It is more complex, in that it conceptualises acquisition as involving parallel mixed processes. However, acquisition of proficient reading is assumed to be dependent on the operation of the two basic processes and the development of automatic responding. In New Zealand school reading programmes it is possible to begin acquisition of reading responses with controlled attention to some semantic cues already developed (particularly those based on oral language repertoires). In general it appears that the generation of meaning during reading will involve capacity-limited controlled attention (e.g. Shiffrin and Schneider, 1977, p.178).
Thus demands for controlled processing of graphic features will drastically reduce controlled attention available.

The studies and discussion which follow are interpretable in terms of the general framework presented by Shiffrin and Schneider (1977). Additional data are provided on structural limitations and the relationship between attention to different cue sources. The asymmetrical nature of relationships noted below may arise in reading because controlled attention to semantic cues during reading may allow controlled attention to graphic cues but not vice versa.

Several sources suggest that the amount of attention available for different stimulus sources in complex discrimination tasks is limited (Estes, 1976; Riley, 1977b). Under some conditions increased or sustained attention to one cue source may reduce the amount of attention available for other sources. As has already been noted, this may mean that over-use of graphic features can decrease the amount of meaning generated. However, examination of these possibilities is complicated somewhat by an asymmetry in the relationship between response systems.

Attention to graphic cues alone, as in attention to grapheme-phoneme associations or, specific graphic feature discriminations, does not directly facilitate
the generation of meaning (Goldstein, 1975). There is an indirect effect in that, the development of automatic attending skills does mean attention can be given to contextual cues. However, controlled attention to a meaningful context, 'attunes' the perceptual system of the reader (Broadbent, 1977) so that automatic selection of graphic cues can be facilitated (Reicher, 1972; Schvaneveldt et. al., 1977), and learning of grapheme-phoneme associations is possible (Goldstein, 1975). This asymmetry in facilitation between systems is behind the previously mentioned finding that sustained over reliance on graphic cues can reduce the accuracy of selection of graphic cues (Klein, 1976).

Another characteristic of response systems is that there are differential outcomes for differential use of cues. The availability or continued salience of a particular response appears to depend on the cues that were used in producing that response. Thus Craik and Lockhart (1972) claim that 'level of processing' determines the retention of items. "Deeper" levels of processing (controlled attention to semantic cues) are associated with more elaborate, longer lasting and stronger 'traces'.

There is support for this position from other theoretical frameworks. For example Tulving's encoding specificity principle (see Crowder, 1976) says the encoding operations used determine what is stored. The interpretation here is simply that the cues attended to and responses made
to those cues, determine what responses are available over time to the reader when the same or similar cues are presented.

These concepts indicate that restricting selection to visual features reduces the salience of syntactic and semantic cues in that retention or acquisition of discrimination is reduced. Epstein, Phillips and Johnson (1975) demonstrated that recall of related and unrelated word pairs was reduced when attention was restricted to visual features, possibly because of the unavailability of a facilitative context. The converse of the above claim is that attention to visual features is facilitated if syntactic and semantic cues are made salient. Demonstrations of this effect have included facilitation of: immediate recall of groups of words (Marslen-Wilson and Tyler, 1976), recall of words (Klein and Saltz, 1976) and speed and accuracy of word recognition (Meyer et. al. 1977).

It is possible that in some situations where responses to graphic cues only are required (e.g. word recognition) use of contextual cues is inappropriate (Ciccone and Brelsford, 1975). Nevertheless, for normal reading there is some indication that accurate use of contextual cues facilitates attention to and selection of graphic cues. This facilitation effect reduces the amount of attention needed for attention to graphic cues (Broadbent, 1977).
Thus over-emphasis of graphic cues reduces the amount of attention available for syntactic and semantic cues, which in turn makes further attention to graphic cues more difficult. Hence still more attention is needed for visual cues (setting up a self limiting cycle, e.g. Klein, 1976).

If learning is definable in terms of availability and strength of response then it appears that some learning in reading will be determined by what cues are selected (Anderson, Goldberg, and Hidde, 1971). This is a crucial aspect of the instructional model presented below. Attention to semantic and syntactic cues can generate meaning and facilitate limited learning about graphic cues. Attention can also provide practice for integrated interfacilitative responding. Attention to graphic cues alone can provide a learning situation for those cues and the opportunity for attention to semantic cues only if time, accuracy and attentional limitations permit.

This introduces a final area of concern; how long and under what conditions specific responses remain salient as contextual cues. That is, what are the temporal and interference characteristics of operational memory and deeper level memory? Interference effects which reduce the availability of previous responses are difficult to summarise. The conclusion from several
current research frameworks is that memory for graphic and/or contextual cues will have capacity limitations and will be sensitive to interference. Another conclusion is that only a few specific words can remain salient at any one time (Paddely and Hitch, 1974; Crowder, 1976). Craik and Lockhart (1972) predict that when attention is diverted from the cues, information will be lost at faster rates for graphic cues and at a slower rate for semantic cues. This means there will be real time limitations on the availability of cues and a variety of interference effects are possible.

Klein (1976) reviews data in this area to interpret his finding that attention specifically to graphic cues can also reduce the availability of the prior, response produced context. The conditions and parameters of these effects are empirical questions and remain to be examined in oral reading. Nevertheless, there is sufficient evidence to suggest that interpolated activities in memory tasks interfere with retention of specific bits of information (e.g. Sanders, 1975). This suggests all instances of error attention in oral reading will have general properties of interference of 'short term' or 'working' memory. Thus reduction in the salience of immediately preceding graphic cues and perhaps contextual cues will occur. Additionally, other evidence suggests that active or 'controlled' attention has capacity limitations, so that cues can be considered to compete for
specific controlled attention (Perfetti and Hogaboam, 1975; Posner and Snyder, 1975; Shiffrin, 1976). These data suggest that all error attention which directs 'controlled' attention to cues will interfere with attention to other cue sources.

4. Acquisition trends

Proficient reading was described as involving several response systems. These have special features which include being interdependent and integrated. The acquisition of these ideal attributes occurs as a reader learns to read. A basic feature of learning to read appears to be flexibility. There seem to be as many theoretical insights into instructional sequence as there are theoreticians to be insightful (for example contrast Staats, 1968, with Smith, 1971). Typically, developmental descriptions (e.g. Doehring, 1976) add to the confusion by not distinguishing instructional artefact from developmental necessity. Barr (1975) and Clay (1972) are exceptions to that rule. The former has examined relationships between reading programmes and response characteristics and the latter is very careful to make conclusions which are conditional on the rather unique instructional milieu operating in New Zealand schools. What contemporary descriptions do indicate is that conceptualisations of learning to read as an incremental process are not necessarily correct. The concept of an hierarchically
ordered set of skills may be logically compelling, but may not be empirically accurate. In several instructional settings there is every indication that concurrent multi-skill acquisition is the usual mode of learning (Clay, 1972; Doehring, 1976).

The model of proficient reading proposed above implies certain necessary acquisition trends for the beginning reader.

Especially in New Zealand settings, and possibly in a general sense, it also implies that typically the most effective format for learning would be concurrent multi-skill acquisition. This is not to say that isolated incremental skill acquisition has no place. Rather it is a claim that the typical trend towards proficiency will be slowed given too much temporal and spatial separation of skill learning. Similarly, individual skills will be most effectively learned if there is a substantial amount of concurrent, combined learning experience. In other words, the best framework for learning to read is reading. Data from which the following trends have been abstracted are referenced at the end of the section.

a. Efficient and accurate responding.

Attention and cue selection responses become increasingly efficient over time. A reader learns to use fewer and more informative cues including more cues in
peripheral vision. This is accomplished partially through progressively finer stimulus control whereby the most distinctive or informative graphic cues and contextual cues are responded to. An important parallel process is learning to attend maximally to contextual cues. This learning is sensitive to variations in the instructional programme used (e.g. Barr, 1975). It appears, however, that optimal responding and possibly optimal acquisition occurs as readers learn to attend more to contextual cues.

At the same time, a process of 'differentiation' and 'decontextualisation' is occurring (Bransford and Franks, 1977). In this process knowledge of contextual and graphic stimulus elements becomes increasingly more precise and generalised, so that it becomes less dependent on particular contextual contraints. This knowledge sets the stage for articulating new information and in turn clarifies and reshapens knowledge. This implies that the reader becomes more able to attend to and use specific elements of the stimulus complex and to generalise that capability to 'novel' situations.

A further aspect of efficient responding is flexibility in the use of cues. The most informative cues for efficient responding may vary from within word units to longer than phrase units as changes in conditions for generating meaning to occur. Readers learn to use the most informative cues as conditions dictate. This is
especially possible when readers are able to automatically attend to higher order graphic units (e.g. orthographic cues).

b. Integrated and interfacilitatory responding.

The efficient use of each cue source is learned in a manner which facilitates attention to the others. As noted above there is some asymmetry in the degree of interfacilitation. Nevertheless, where semantic and syntactic cues are not available or effectiveness of contextual cues is reduced, the reader becomes able to direct more controlled attention to graphic cues and specifically use those cues. Similarly where difficulty levels rise or conditions of reading pose discrimination problems a reader can direct more attention to contextual cues or to controlled attention to graphic cues. This ability to use a cue source when others are not available increases as efficient responding is acquired. The use of syntactic and semantic cues enhances the efficiency of graphic cue selection as the reader becomes more sensitive to contextual cues and thus more 'attuned' or 'pre-attentive' (cf. Bransford et al., 1977; Broadbent, 1977; Wanat, 1976). Similarly, automatic responding to graphic cues aids the discrimination and use of syntactic and semantic cues in that more controlled attention is available for those cues. Proficient reading involves the integration of response systems so that all sources of cues have potential for use to achieve efficient prediction, sampling,
and discrimination of informative cues in the stimulus array.

c. **Automatic responding.**

Attention to graphic cues and possibly to syntactic cues tends to become automatic. Automatic responding depends on progressive reduction in the time taken and the number of separate responses necessary for successful responding. It also depends on both refinement of response topography and changes in mode of responding. Finally, automatic responding depends on previous controlled attention and the conditions necessary for perceptual learning to occur. This acquisition trend is reflected in a typical developmental sequence from overt to covert responding, or from general use of phonemic mediation to use only under difficult conditions. Thus, for Goodman (e.g. Goodman, 1976a) this trend to near automatic responding occurs as the phonemic recoding and concomitant decoding of early reading is reduced to nearly direct generation of meaning.

d. **Self monitored, self corrected and self improving responding.**

As reading behaviours are learned the reader also learns to monitor meanings and match these with ongoing responding. The ability to monitor and correct inappropriate responses, and learn from mismatches and attempted corrections is slower and more unwieldy at
early stages. Nevertheless all behaviours are available at an early stage and tend to become more efficient, rapid and covert. This system is a superordinate integrating system. High progress rates are based on an efficient accurate self correction system. The model of self correction adopted specifically predicts that acquisition of a self correction system leads to more accurate and efficient responding. This is achieved as a reader learns which cues to use and which to ignore following reselection of cues after a mismatch. Thus, this system is dependent on other acquisition trends for proficient performance (Biemiller, 1970; Bradshaw, 1975; Clay, 1972; Clark, 1976; Day, 1975; Doehring, 1976; Goodman, 1976a; Guthrie, 1973; Jackson and McClelland, 1975; Klieman, 1975; LaBerge and Samuels, 1974; Lefton and Fisher, 1976; McConkie and Rayner, 1976; Medin, 1975; Rayner, 1975; Schneider and Shiffrin, 1977; Schvaneveldt et. al., 1977; Smith, 1971; Shiffrin and Schneider, 1977; Wanat, 1976; Williams and Clay, 1973).
C. ERROR ATTENTION AS A LEARNING VARIABLE

1. Introduction

Error attention by persons other than the reader may serve little or no functional purpose. Thus it is important to consider the general theoretical significance of error attention in learning.

There is a traditional interest by programmed learning technologists in the status of errors in the learning process. Skinner maintained (e.g. Skinner, 1953; 1958; 1968) the fewer errors and subsequent attention to them, the better. This conclusion was derived from both theoretical and pragmatic concerns. Theoretically, attention to errors was typically considered to involve the presentation of an aversive stimulus (punishment) and punishment has been shown to have inappropriate outcomes under some circumstances. Problems can be caused by anxiety generated with even mild punishment levels, and by incomplete reduction in tendency to respond following punishment. Problems can be caused also by inadvertent maintenance of error responses, and by the often nonspecific and random behaviours associated with avoidance. While recognising that these problems are not necessarily insurmountable, Skinner's conclusion was inescapable given a simple punishment perspective:
"We can avoid troublesome consequences of the punishment inherent in being wrong by constructing programs in which the student is almost always right." (1968, p. 189)

The theoretical question concerning tendencies to repeat or transfer errors (which was originally formulated by Thorndike) has received some attention in the literature. There was early support for the contention that error responses, even though immediately corrected, tended to recur. However, Elley (1966) neatly demonstrated a limiting factor. The repetition effect occurred primarily on rote learning tasks, as compared with 'logical meaningful tasks'. In Elley's research, as in many others in this area, error attention took the form of knowledge of results.

The influence of task characteristics is implicated in some more contemporary research. d'Ydewalle and Buchwald (1976) have demonstrated that repetition of an error response is more likely to occur when a response but not its outcome is recalled. Given that rote learning tasks do not allow attention to meaning it can be predicted from other data (e.g. Craik and Lockhart, 1972) that task parameters including feedback will be more easily forgotten. Thus errors will be more likely to be repeated in rote tasks because the total task context is not easily remembered. In a low meaning task (e.g. paired associate) the effects are further determined by the
patterning of feedback on early trials (d’Ydewalle and Buchwald, 1976). Under conditions of a high proportion of 'right' feedback more error responses will be repeated.

A further elaboration is present in a study by Kulhavy, Yekovich and Dyer (1976). These writers examined the relationship between college students' ratings of confidence in a response and the effectiveness of feedback. Errors on frames of a programmed text were much more likely to be corrected following knowledge of results when confidence in the error response was high. If confidence is related to generation of meaning then the possibility of meaning determining effectiveness of error attention receives further support. In general terms this outcome again implicates task characteristics interacting with learner repertoires, especially in the area of complex or concept learning. Additionally, there are interesting parallels with Norman's (1975) model of functional learning of concepts. During conceptual elaboration a critical learning step occurs in a 'near miss'. What appears to be important however, is that "meaning" includes being able to use the information to make a correct response.

The area of complex verbal learning and concept learning is one of two research traditions which have directly investigated the dimensions and parameters of error correction. Kulhavy, et. al. (1976) note in their introduction that there are substantial data to indicate
that feedback acts primarily to correct error responses rather than to reinforce correct responses in the associationist sense of strengthening. Guthrie (1971), for example, reports a study of sentence learning which shows feedback after correct responses did not make a difference to retention but did have a significant effect on the change from incorrect to correct responding.

Summaries of the role of information feedback in concept learning emphasize that the primary function is response correction (e.g. Bourne, Ekstrand and Dominowski, 1971). Early, uncritical comparisons in this area suggested that error feedback under some conditions was more effective than feedback to correct responses. The more careful conclusion now is that learning is connected in approximately equal degree with both positive and negative feedback. Feedback to correct and incorrect responses can have similar effects, although providing different types of information (Hulse, Deese and Egath, 1975).

Whatever the framework, the dimension of provision of information and information load on the learner appears to have general explanatory power. Research in various concept learning and associate learning tasks has shown the importance of the amount and type (completeness) of information contained in feedback statements, and the importance of spatio-temporal characteristics of feedback,
including frequency, timing and separation (Atkinson and Wickens, 1971; Estes, 1976; Bourne et. al., 1971; Hulse et al., 1975; Lindell, 1976).

Just as Skinner largely ignored the informational or cueing functions of error consequences, the foregoing research includes one largely undiscussed issue.

This issue concerns the possible operation of reinforcement and punishment effects in feedback. The presence of uncontrolled reinforcement histories provides consequent events with idiosyncratic significance. This could help to explain some enigmatic attempts at comparisons between feedback types (e.g. Nelson and Hay, 1976). An additional area of confusion has been identified in learner differences. Children have been found to differ in their ability to use error information (Bourne et. al., 1971; Hulse et. al., 1975).

The influence of reinforcement history and other learner characteristics is seen in feedback studies of visual discrimination learning. This is the second research area directly involved in analyses of error correction. Research with children has often found reward plus punishment, or, punishment for errors alone to result in better discrimination performance than reward alone (Bitgood, Segrave and Jenkins, 1976; Vasta, 1976).

Bitgood et. al. note that this finding has been obtained
with verbal and nonverbal consequences but tends to disappear when children are explicitly told the meaning of no-consequence for errors (i.e. as in the reward alone condition). Their own research indicated that explicit feedback following errors on a more complex conditional discrimination facilitated performance when added to feedback following correct response. These authors interpret their data in terms of subjects misinterpreting absence of feedback following errors as implied positive feedback. An equally plausible interpretation might be that positive feedback alone may sometimes inadvertently reward attention and use of irrelevant cues (this explanation is suggested by Ausubel (1968), and is also present in d'Ydewalle and Buchwald's, 1976, data).

There is an area of visual discrimination learning that provides data on effects of reducing and often eradicating errors during discrimination training. Terrace (e.g. Terrace, 1969; 1972) developed a procedure with pigeons for programming errorless discrimination training (detailed below). Errorless discrimination can be used to train complex visual discriminations without any errors occurring. Terrace's procedure has the effect of reducing emotional behaviour and anxiety associated with making unreinforced responses to a negative stimulus. Errorless discrimination training sometimes leads to more rapid learning and superior performance in comparison with traditional training procedures (e.g. Egeland, 1975).
There are, however, observed inappropriate outcomes of the errorless procedure. When errorless discrimination training has been followed by discrimination training that has involved errors, the original perfect discrimination has been disrupted. Similarly, extinction following continuously reinforced errorless discrimination has interfered with the previous errorless performance (see Terrace, 1972). This feature of not being able to deal with subsequent errors has been found in children's learning. Chapin and Dyck (1976) have noted that the occasion of error can be seen as producing a partial scheduling of reinforcement leading to greater resistance to extinction. In their study, problem readers persisted longer at reading when errors were interpolated with successes compared with success only experiences. Occasional failure during acquisition may effect resistance to the disruptive effects of extinction or changes in the difficulty level of the task.

It is this parameter of change in stimulus conditions and context which has not been directly dealt with by errorless paradigms. There is often no check on what features of the stimulus array are actually being attended to (e.g. Ray and Sidman, 1970) and there is no measure of effects of even simple dimensional changes in the stimuli after training. From the foregoing discussion it appears there is a question about the long term usefulness of errorless training with complex discriminations,
especially those tasks which might involve conditional elements and contextual variability.

Thus, attention to errors can have positive effects on learning in a number of different learning tasks. Effects are to some extent determined by the 'meaningfulness' of the task and the response made by the learner. Effects are also determined by the amount of 'information' contained in the attention and available in the mode of presentation. Finally there are motivational attributes to any error consequence. These determinants operate in interaction with certain learner characteristics, such as ability to use error information.

The following framework attempts to present parameters of error attention such as 'information' in terms which will make functional analyses of error attention in oral reading possible. Possible properties of attention to errors are examined from a functional or behaviour analysis perspective (Baer, Wolf and Risley, 1968; Day, 1976a). In this perspective experimental ability to control behaviour is a criterion for explaining behaviour. Thus empirical demonstrations of causal relationships are of primary concern.

The following section adds an important dimension to the outline of reading provided earlier. The elements of a small scale theory of attention to oral reading errors
lie in the integration of concepts of acquisition trends in oral readings and concepts of functional properties of error attention.

2. **Possible functional properties of error attention.**

   a. **Description of response antecedent learning mechanisms.**

   Errors occur in oral reading as a result of inappropriate use or an inability to attend to cues. Error attention could function to teach appropriate attention and use. In this analysis, error attention cues the correct response and is in this way seen as antecedent to that correct response.

   Instructional episodes following errors attempt to enhance the (inadequate) control that aspects of the stimulus array have over responding. Facilitation of control by relevant stimuli could be achieved in two ways. Attention might operate to enhance the salience of contextual and/or visual cues and thus attempt to affect the use of cues. A second, closely related facilitation effect might result from error attention aiding the selection and performance of an appropriate response.

   The dual possibility has a basis in a distinction between acquisition of discrimination control, and, perceptual learning. (See Riley, 1977a; and, Whitehurst and Vasta, 1977). The distinction is made between learning to emit a particular response in the presence of a
particular stimulus, and, acquiring knowledge about features of stimuli or acquiring discriminative capacities. There are also connections and formal similarities with two stage analyses of complex discrimination learning problems (Hulse, Deese and Egeth, 1975; Riley, 1977a).

It is assumed that in learning to read, both discriminative capacities (perceptual learning) and appropriate responding (discriminative control) are learned. Attention to errors could operate to facilitate learning in either or both areas. The operation of these two processes would imply that readers will differ in the extent to which (i) features of stimuli are already discriminable (i.e. discriminative capabilities are already developed), (ii) the extent to which responses are already differentiated, (iii) and the extent to which relevant cues can be attended to and used (i.e. responses are under the control of the appropriate cues). Differences within these three areas will pose different instructional problems.

Having distinguished two processes which lead to three distinct objects of instruction, it is somewhat confusing to note that in many oral reading settings both processes will be operating, and indistinguishable at a gross behavioural level. The task here then is to outline a conceptualisation upon which predictions concerning instruction can be based.
(i) Instructional functions: Stimulus attention and selection prompts.

Error attention as instruction in oral reading provides additional discriminative stimuli, adjuncts to the cues which will ultimately control responding. Conceptualised in this way instructional processes are similar to the experimental paradigms of stimulus shaping, transfer of stimulus control and perhaps stimulus fading (Marholin et. al., 1976; Ray and Sidman, 1970; Terrace, 1972).

The essential process logic behind these paradigms is simply stated. Stimulus X which reliably controls the response R is added to stimulus Y which initially does not reliably control R. The compound stimulus XY which reliably controls R is modified over time by the gradual removal of X. An end point is reached in the sequence where X no longer appears in the stimulus and Y alone reliably controls R. X can be any stimulus including a verbal direction (e.g. "Look at that letter") or a dimensional change in Y (e.g. in a simple discrimination task a very large test stimulus which reduces over time to criterion size).

There are some major differences between oral reading instructions and these training paradigms. For example, instructions follow errors while 'fading' for example often involves errorless discrimination. But the features
they do have in common are basic. They both involve an additional, extra criterion discriminative stimulus and instructional effectiveness depends on a process of transfer of control by 'instructional' stimuli to control by the primary stimulus.

There are two points at which variables will affect instructional effectiveness. The first is the control which instructions as discriminative stimuli have over R. The second is the timing and sequencing of transfer from X to XY, and from XY to Y. Logical requirements can be delineated for instructions to achieve the transfer aim. Instructions would need (i) to control behaviour reliably in the first instance, (ii) to be modified progressively in steps which do not reduce control by the changing complex XY, (iii) to be associated with a stimulus Y which was minimally discriminable, and, (iv) to be associated with a compound stimulus in which the essential features of Y (that distinguish Y from not Y) are discriminable and gain control. (See Fields, Bruno and Keller, 1976; and, Ray and Sidman, 1970 for elements of these requirements.)

The experimental paradigms can involve processes of both perceptual learning and acquisition of discriminative control. It would be of interest to separate the two processes in these paradigms in order to examine questions about differential effects of conditions. If discriminative
capabilities have already been acquired the problem in the training programmes has been one of bringing responding under appropriate stimulus control.

At this point the conceptual framework provided by Shiffrin and Schneider (1977) of 'automatic' and 'controlled' processing offers some explanatory concepts. Error attention which functions as a stimulus prompt may direct controlled processing to features of the stimulus complex. To the extent that controlled attention results in refinement of attention and selection responses, error attention influences perceptual learning (automatic processing). Over time, the extra stimulus support changes and controlled attention changes so that the reader is able to respond independently and automatically. Thus error attention could function to orient controlled attention and so to determine what automatic processing (perceptual learning) can develop.

(ii) Instructional functions, Response productive Prompts.

These instructions emphasise a slightly different aspect of stimulus control. They function to change a low probability weak response so that it becomes more probable and generalisable or 'differentiated'. In these situations, error attention again operates as a discriminative stimulus. The functional emphasis is on reducing the time taken for the criterion discriminative stimulus to control behaviour by making response require-
ments more obvious (e.g. "sound it out", "say them together"). This is similar to experimental training paradigms such as 'putting through' (Baer, Petersen and Sherman, 1967). Unlike those procedures oral reading situations typically place heavy reliance on verbal stimuli. However, the instructions are dependent on the addition of extra discriminative stimuli and a transfer to independent responding. The prompt still functions to increase control by the textual stimuli, the emphasis being on the oral response component.

(iii) Modelling functions.

An extreme form of instructional (discriminative) control by error attention occurs when the attention directly demonstrates part or all of the appropriate behaviour to emit. This control can be conceptualised in modelling terms (e.g. Bandura, 1977). In this paradigm, a model (here of response topography) sets the occasion for an immediate or delayed imitation.

The function of a model in the oral reading situation is to increase the control by graphic and contextual cues. No direct information about the stimulus is contained in the model. Rather, full support is provided for the oral response (e.g. given a text word CAT, the attention takes the form "The word is cat"). The transfer task the reader is faced with is to acquire both independent response production and discriminative capabilities for graphic and contextual cues.
When a model is only a part of the oral response needed by the reader then both a model and an 'intraverbal' cue occurs. The model provides a stimulus context for responding to the remainder of the visual stimulus. This situation has formal similarity with the training technique entitled 'backward chaining' and Skinner's sequence of primes and fading prompts (Skinner, 1968, p.215).

In initial stages of such a training programme all steps in the response sequence, except those which the organism can perform, are provided by the instructor. This supported response completion brings the reader immediately into contact with response consequences. Over time the instructor increases the number of response components which are required of the reader to complete the response in a direction away from the criterion response. In oral reading this situation would apply where successive models reduced the amount of the oral response they contained (e.g. "Cat" .. "Ca" .. "C" ..).

Bandura (1977) claims the processes involved in observational learning include attentional, retention, motor reproduction and motivational processes. These processes imply conditions which determine the effectiveness of a model. Such conditions demand that the reader attend to and perceive accurately the significant features of the modelled behaviour, and that the observation be retained over time. Such conditions demand also that
the reader has the repertoire to reproduce the response and that the consequences of imitation are positive (Bandura, 1977, pp. 24-29).

In learning to read a further requirement must be added. Control over responding must transfer to graphic and contextual stimuli. This is, the reader also must attend to and learn to use the appropriate graphic and contextual stimuli in imitating the response.

Provision of the appropriate verbal form of the initial error is not the only possible model arising from error attention. It is entirely possible that the form of the error attention could provide a model of what to do when an error occurs. A reader may imitate the format which modelling or instruction takes. For example, error attention may function as a model for rereading the preceding context. This would be more likely if rereading is consistently the form that error attention takes (e.g. a partial model which provides the preceding context as well, "Meow said the C...?").

b. Analysis of response antecedent learning mechanisms.

Error attention may be conceptualised as adjunct discriminative stimuli operating as an antecedent learning mechanism. Attention may emphasise either or both stimulus discrimination/use and response production aspects of oral reading.
An important attribute of feedback is the amount and type of information directly provided for the learner in the feedback (e.g. Atkinson and Wickens, 1971). From the foregoing discussion it is possible to examine the dimension of information in error attention. There are two types of information carried in adjunct stimuli; response topography information and stimulus attributes information. It would seem possible to establish, on the basis of generalisations from groups of readers and specific functional analyses, what the most functional bits of information are in graphic and contextual stimuli.¹

For the individual reader, however, specific definition of information needed and provision of that information are matters for individual analysis. Information bits and the effectiveness of information depend on specific dimensions of each individual’s response repertoire. Thus questions about conditions affecting the usefulness of antecedent learning mechanisms fall into five general areas.

(i) What responses are actually controlled by the instructions and models? This includes questions about whether the reader has the required repertoires.

¹ An example of this sort of investigation is contained in the extension of Gibson’s (1969) work on letter features (graphic cues) by Tawney (1972).
(ii) What is the relationship between the criterion responses of proficient reading and the response under adjunct stimulus control?

(iii) How is the transfer to be achieved most effectively and what should be the timing of the sequential changes across time and across words and different texts?

(iv) What are the effects on general reading acquisition trends of specific response or stimulus enhancement by instructions?

(v) What specific setting conditions are operating? This includes questions about availability, contingency and temporal change of reinforcement, type of text, and instructional programme.

c. Description of response consequent learning mechanisms

In addition to acting as an antecedent influence controlling the appropriate response, error attention could act directly on the error response. From this perspective error attention is contingent on error production and can be considered to influence the probability of responses occurring subsequently. The direction and magnitude of influence is assumed to be a product of the type of attention.

There is a traditional dichotomous conceptualisation of the function of consequent events into reinforcement
and punishment functions. The prior identification of an event as a reinforcer (and to a lesser extent punisher) is typically only a 'reasonable expectation' (e.g. Boakes and Halliday, 1970) and is only accurately identified in a post hoc, circular fashion. This situation arises from the relative nature of reinforcement and punishment. An event is reinforcing relative to an organism's history of consequent events and the contemporaneous distribution of such events (Premack, 1971). Thus a reinforcement analysis is necessarily grounded in idiophenomena. In fact some current writers suggest that given enough information about an individual it should be possible to greatly increase the accuracy of predictions about which events will reinforce or punish particular behaviours (Bandura, 1977; Premack, 1971). The importance of this perspective for an analysis of error attention is that specific error attention can be either reinforcing or punishing, depending on the relative status of the attention.

Current writers conceptualise consequent events as having both motivational and informational functions (Bandura, 1977; Atkinson and Wickens, 1971). These conceptualisations indicate the informational nature of reinforcement or punishment can act in two ways. Feedback can affect knowledge about the appropriateness of a response to particular stimuli and can also affect which stimuli are attended to. Thus the informational function parallels the discriminative control and perceptual learning functions.
associated with antecedent learning mechanisms. When error feedback provides information directly about the appropriate responses, or the appropriate cues, then its consequent function is indistinguishable from its antecedent function.

d. Analysis of response consequent learning mechanisms

Information on the adequacy of the error response is critical to a reader. Oral reading involves several response systems and, as outlined earlier, feedback could be simultaneously contingent on the operation of each. An error can include several appropriate responses as well as inaccurate or inadequate components. The effects of feedback to oral reading errors will be determined by how much information the reader has about which response components were inappropriate. This is essentially the reader's contingency awareness (e.g. Bandura, 1977). This information also will determine the motivational effects of feedback (i.e. what response components are punished and/or reinforced).

The information in an error contingent event might not be only verbally descriptive. The spatio temporal qualities of feedback also indirectly carry information. Spatio-temporal qualities of feedback will effect the availability of contingency information by determining the informational load on the learner (Estes, 1976). Feedback at the end of a sentence or on an intermittent
schedule may restrict the extent to which the reader can relate the feedback to particular response components and stimuli.

The question of the motivational dimensions of error attention is no less significant in oral reading. It might be, for example, that a highly positive informative instance of error attention acts inadvertently as a reinforcer for error production because of the past and contemporaneous patterns of consequent events for that reader. This situation has been reported in mathematics learning (Hasazi and Hasazi, 1971).

A similar situation might occur where a complex chain of responses is built up and maintained by externally assisted error solution. In this situation an error sets the occasion for error attention which then provides additional cues leading to error solution with concomitant reinforcing effects. Little change towards accurate and independent responding occurs under these conditions. The possibilities of this occurring are built up under extensive experiential histories of failure and well learned behaviours for avoiding or minimally attending to specific learning task cues (Cohen and Heller, 1975).

Thus error attention as feedback can have:

(i) Reinforcement (motivation and information) functions.
(ii) Punishment (motivation and information) functions.

Low level empirical generalisations about conditions which determine effectiveness and outcomes of reinforcement and punishment are assumed to operate also in oral reading settings (see Glaser, 1971: Hulse, Deese and Egeth, 1975; Marx and Bunch, 1977).

In the oral reading setting, questions about conditions affecting the usefulness of consequent learning mechanisms will fall into five general areas.

(i) What are the distributions and patterns of attention for appropriate (i.e. correct) and inappropriate responses?

(ii) What are the contingent relationships actually in operation, and the spatio-temporal qualities of those contingencies?

(iii) What is the relationship between the criterion responses of proficient reading and the responses under consequent event control?

(iv) What are the effects of specific response probability changes caused by reinforcement and punishment on general reading acquisition trends?

(v) What are the specific setting conditions operating, including additional events signalled by error
attention, availability of appropriate responses, and information about appropriate responses?

e. Setting conditions: General considerations

The present framework is not meant to suggest each occurrence of error attention must inevitably fulfill only one function. Indeed, it is difficult to separate the two functions when both antecedent and consequent events are considered to carry information about appropriate responding. Error attention can operate as an antecedent and/or consequent learning mechanism. Thus the timing and spacing of attention probably will have both instructional and motivational properties. Similarly there is no relationship implied between the intention of error attention and the actual function. The relationships between stated intention, error attention and functional outcomes are separate empirical questions.

The functions of error attention are explicable in terms of individual reinforcement histories. There are common elements to the conditions which determine the effectiveness of each occurrence of error attention. The reader's history of interactions with an instructor will be important. The dimensions of current attention within the oral reading setting will also be significant. Finally, a source of variables lies with the reader, especially the reading response repertoire and the extent to which meaning can be generated from attention to
Often, because of the complex nature of the sequential interactions, there will be unintended consequences of error attention. As with other sequential interactional analyses two levels of analysis are possible (e.g. Bell, 1971; Wahler, 1976). These are analyses of both immediate and long term effects. The two outcomes can either be similar or quite dissimilar in terms of facilitation or inhibition of acquisition trends and generation of meaning. More specific predictions are discussed in Chapter Two.

One further point can be emphasised. From earlier discussions of context and meaning it is possible to claim that contextual cues will have significant effects on the learning process. Previous data suggest that the availability of contextual cues will facilitate visual discrimination and retention of both response-produced cues and the availability of graphic cues. For these reasons the availability of contextual cues is an important setting condition. Contextual cues can include pre-reading discussion surrounding the meaning of a text and familiarisation with experiences described in the text.

f. A note on reciprocal determinism

While the primary concern in this discussion is the effect of error attention on oral reading behaviour, a
complete explication of sequential interactions must adopt a perspective or reciprocal determinism (e.g. Bell, 1971; Bandura, 1977). In this case that perspective would yield insights into the variables controlling an instructor's attention to errors. The reader's behaviour must be the most potent of the several sources of variables controlling the instructor's behaviour.

Reader behaviour produces discriminative stimuli which set the occasion for attention (i.e. to appropriate responses or errors). Reader behaviour is also a reinforcing or punishing stimulus influencing the occurrence of attention. Errors could therefore act as discriminative stimuli, and error solution or non solution could have reinforcing and punishing effects on the instructor. There are a range of possible short-term and long-term outcomes of an error solution. Similarly there is a range of response components in an error which will provide corresponding discriminative stimuli to which the error attention agent could attend. Thus there are many possible functional relations between error behaviour, error attention and error solution. Two such possibilities would be the analogues of Baer or Wahler's concept of a positive and negative reinforcement trap (e.g. Wahler, 1976). A negative trap might occur where the reader's error behaviour is an aversive stimulus which the error attention agent escapes from by correcting. This removal of the aversive stimulus (i.e. the error) reinforces the
instructor for attention, but may also reinforce the reader's error behaviour if the instructor's attention and concomitant effects of correction are positively reinforcing. Thus in the short term the error is dealt with, but in the long term error production is increased. Similarly error attention does not reduce over time but also increases. A positive trap might occur where the error attention agent reinforces errors because error correction is positively reinforcing to both the agent and the reader.

This conceptualisation might also help to explain some spatio-temporal properties of error attention. Highly obvious changes in reader behaviour or obvious correction as a result of error attention could operate as reinforcers. Thus error attention which produces a highly discriminable change in reader behaviour or obvious correction is likely to be maintained. This might be the explanation for the generalised high interest by educational systems (Quirk, Trisman, Weinberg and Nakin, 1976) and researchers (see McNaughton, 1974) in instructing letter and word recognition and graphophonic associations. Instructors are reinforced by rapid acquisition of a highly obvious and finite set of behaviours.

g. **Error types and learning in oral reading.**

It is important to distinguish between no response and response errors, in oral reading. It is apparent that
a response error provides a significant opportunity for learning in oral reading. In the first instance a response error is a necessary pre-condition for self-correction.

The development of a self control, self correcting response system is an attribute of high progress in learning to read. Therefore, making a response is a significant advance on not attempting words, given that it can provide a basis for learning to self correct. Rather than aiming for errorless performance this argument would suggest that error production is to some extent an integral part of learning to read proficiently.

Preceding discussion suggested the importance of error feedback (and thus errors) in simple and complex visual discrimination learning and concept learning. Added to this is the immediately preceding analysis of reciprocal determinism in oral reading. A no-response error is an ambiguous discriminative stimulus for error attention. A response error provides information about response repertoires to a discriminating instructor. While analysis of errors on the run may not be able to yield very fine grained information on which to base correction attention, that information is superior to none at all.
CHAPTER TWO: DIMENSIONS OF ERROR ATTENTION

A. INTRODUCTION

Two explanatory systems were outlined in Chapter One. Together the model of reading and the analysis of learning mechanisms provide a general framework for explaining the instructional effects of attention to errors made during oral reading. From that general framework this chapter predicts the effects of an instructor's attention to oral reading errors on learning reading behaviours. These tentative predictions concern one instructional setting. That setting involves a reader orally reading to another person who interacts with the reader. Interactions around errors are the focus of the present analysis. The other person in such one-to-one interactions could be a teacher, a remedial instructor, a peer tutor, a paraprofessional tutor or a parent.

Attention to errors in such settings can be analysed with the general explanatory framework outlined above. Such an analysis yields several dimensions of attention which one could predict would influence the acquisition of proficient reading.¹

Thus error attention is assumed to vary along several dimensions which are not mutually exclusive. Each

¹. See p. 33.
dimension is functional when an error is attended to. The analysis yields two major groupings of dimensions. Error attention will have, (1) spatio-temporal properties and (2) qualitative, informational properties.

A breakdown of error attention is shown in Figure 2:1. This dimensional analysis provides a systematic basis for the predictions which follow. Each dimension is discussed separately. Nevertheless, it must be emphasised that these are interacting dimensions; each, while separately analysable, contributes to a functional whole. Error attention will reflect the interacting contributions of each dimension.
FIGURE 2:1 Attention to oral reading errors analysed into two general properties and their component dimensions.
B. SETTING CONDITIONS.

Error attention operates within setting conditions. The most significant of these conditions are reinforcement contingencies within the oral reading interaction, and, general features of the reading programme within which one-to-one interactions occur.

The operation of reinforcement as it may affect the functioning of error attention is discussed for each dimension. The relationship between one-to-one interactions and general features of the reading programme raises some important issues. The functional variables in oral reading interactions do not equal reading instruction. All that is claimed here is that the way in which an instructional agent interacts with a reader over errors can effect the acquisition of particular responses and, more generally, acquisition trends. Many other variables are operating within the wider context of the instructional programme. In New Zealand these include small group settings which may have specific functions such as the identification of new vocabulary items (e.g. 'interest' words), practice in word attack or syllabification and cueing the general ideas and content of a particular text. In New Zealand, the relationship between different settings and the effectiveness of each setting in facilitating acquisition trends are questions of contemporary concern (e.g. Kitchen, 1975).
The analyses and research reported here have implications for the general reading programme. A necessary component of instruction would seem to be a one-to-one setting providing an opportunity for beginning readers to read orally, and receive instruction and feedback matched to their own repertoire. If the analyses which follow are accurate, readers could receive instruction which directly facilitates acquisition trends. In fact, it is difficult to see how readers can efficiently learn to integrate both graphic and contextual cue sources and acquire independence in self instruction and correction without opportunities to read orally with individual feedback.

The early use of oral language-based contextual cues, and the acquisition of graphic cue discriminations in a concurrent rather than socially ordered fashion, are features of New Zealand programmes. The description of acquisition trends in Chapter One reflects these general features. Claims concerning the place and function of error attention within oral reading therefore are related to these characteristics.

Nevertheless, the analyses which follow do have general significance in that the dimensions isolated operate in any oral reading interaction. Specific recommendations concerning the functioning of the dimensions may change as a consequence of the sequencing
and aims of the general reading programme.

Oral reading interactions and the dimensions of error attention are described and analysed in general terms. Situations are discussed independently of their 'natural' occurrence in classrooms. It is reasonable to claim that one-to-one reading interactions sometimes occur for some beginning readers and remedial readers in classrooms in New Zealand (Kitchen, 1976; McNaughton, 1974). Descriptive data on the use and operation of one-to-one settings will be important if the present analyses are accurate.

It should be noted that one-to-one oral reading settings can operate both as direct teaching situations and as checking situations. Conceptualised as direct teaching situations one-to-one interactions serve to facilitate acquisition trends towards integrated, interfacilitatory and independent responding. Specific components of reading will need specific teaching in other settings. But the import of the present research is that "putting it all together" requires special instruction. Acquiring sophisticated response systems depends on the opportunities available for producing those responses. The present thesis concerns the claim that the usefulness of these opportunities will be determined in part by the type of error attention provided for the reader by the instructor.
C. DESCRIPTION AND ANALYSIS OF DIMENSIONS:

Spatio-temporal properties.

1. Timing

Attention following an error can be specified in terms of elapsed time from the error. Elapsed time is further analysable in terms of position of attention in the oral response sequence.

(A) TEXT: The house was on the hill.

READER: The horse, was on the hill.

Attention .... a .... b

Two settings, specifiable in terms of position, are shown in the example (A). The reader produces a substitution error on the second word. The error attention agent could immediately attend (i.e. before the next word as in A.) or delay attention (i.e. until after the end of the phrase as in B.). These settings could also be specified by temporal measures (e.g. time elapsed after substitution error). The temporal analysis is an appropriate additional measure in the substitution type response example and is a basic measure in a pause/no response situation.

(B) TEXT: The house was on the hill.

READER: The ..................

(elapsed seconds) 1 2 3 4 5 6 7 8 9 10........

a b
Two timing settings are also shown in example B. Here a text word is read followed by a pause and subsequent error attention; after three seconds have elapsed (as for A.), or, after 10 seconds have elapsed (as for B.).

The timing or error attention could have powerful effects on acquisition trends, in particular the development of self control and self correction. Attention within a few seconds after a response-type error will have very different effects from attention which is delayed until (e.g.) a major linguistic boundary. Immediate attention will have the logical outcome of reducing the opportunity for self correction. In addition there is the reduced availability of post error contextual cues. These two restrictions are predicted to have the effect of decreasing the learning possible from self correction. Learning from self correction was earlier referred to as the tutorial function of self correction. The tutorial function includes the opportunity to become more efficient and accurate, and also, to acquire response systems which are integrated and interfacilitatory. This reduction in learning would effect the use of both graphic and contextual cue sources.

Unavailability of the post-error context in immediate attention decreases the use of contextual cues to self correct the error. Similarly, the interruption of post-error context may reduce opportunities for sustained
attention to meaning. Finally, the successful use of context, which leads to delayed mismatches, is less likely to occur. The reduced opportunity to refine and successfully utilize contextual cues would generally inhibit the development of attention to contextual cues. The continuing outcome of these effects would then be to reduce accurate use of graphic features, given that successful context use facilitates visual discrimination processes (as argued in Chapter One).

Immediate attention to an error response will probably have an effect on the general response strategy adopted by the reader. If attention has even minimal aversive qualities, and, if any attention interferes somewhat with responding (including the generation of meaning) then a strategy of tentative "guesing" and responding to units larger than a single word would be inappropriate. The appropriate strategy under immediate attention conditions would be more like word-by-word responding. There is another behavioural strategy likely to emerge. Immediate attention (i.e. within a few seconds of an error) is likely to create conditions which mean error responses are reinforced. With appropriate setting conditions there may be more reinforcement available in not attempting tentative responses or attempting to reduce the incidence of errors. This is especially likely where error attention typically provides enough further information for error solution, and reinforcement is available
for such error attended corrections. The combined effects of all the preceding response outcomes should mean, in the extreme case, that independent responding will be difficult to acquire.

These outcomes are much less likely given attention which is delayed until, for example, the end of the phrase which contains the response error. A phrase or short sentence is chosen here to represent the optimal timing setting. A phrase, as a grammatical boundary, is likely to be the place where proficient readers pause and fully attend to grouped semantic cues (Eagen, 1975). A phrase or short sentence is likely to contain the appropriate post error context necessary to correct the error. Shorter delays, within a phrase or short sentence, are likely to reduce the salience of specific contextual cues and therefore be less effective. In comparison with the most immediate form of attention described above, appropriate delay should provide the opportunity for facilitative effects on acquisition of proficient reading responses, in particular self control and self correction.

A pause or no-response error needs a somewhat different analysis. Several different covert events may be occurring during the 'silent' intervals of time. It is, for example, possible that a less overt form of self correction is occurring (Clay, 1972; Holdaway, 1976) or that extended covert cue analysis is occurring. In both
of these instances an interval of no response may be highly appropriate. Alternatively, an extended length of time may mean integrated and accurate responding has broken down. With elapsed time, earlier cues would have reduced salience if controlled attention is being directed towards the immediate problematic visual cues.

Thus there is probably a criterion length of elapsed time, before which error attention to pause or no-response errors will tend to have interference effects similar to the immediate situation with response errors. After that time error attention will tend to have facilitative effects if other conditions operate to support learning from the error attention. With further delay past this point preceding cues rapidly fade. Given that readers learn to refine abilities and to maintain attention to contextual cues then the criterion period of elapsed time will differ from reader to reader. Similarly readers will differ in cue analysis skills. Thus early readers are likely to have shorter elapsed time criteria and error attention would be more effective earlier.

There are, therefore, some relatively specific predictions to be made about timing of error attention. (1) Compared with optimally delayed attention, immediate error attention will tend to produce fewer self corrections during oral reading. To the extent that error attention is consistently immediate this reduction
in self corrections will tend to generalise over time and texts. (2) Immediate error attention will also tend to produce fewer words read accurately. Again the effect will also tend to generalise given continued experience. An increasingly limiting cycle is likely to be set in motion where attention and use of context is limited which then limits attention and use of visual cues. This further limits the availability of context because more attention to visual cues is needed and the lowered accuracy also reduces meaning. (3) Error attention which is consistently immediate is likely to produce more errors. Of these errors there will be a greater number which are semantically and syntactically inappropriate and a greater number of no response errors. Responding would be more like word-by-word analysis.

These predicted specific outcomes will be influenced by setting conditions. One obvious condition is the number of errors occurring. The effects of differential timing will be exacerbated when readers make many errors as, for example, with a difficult text. Differential effects are also likely to be more pronounced when a high percentage of errors are attended to.

While these predictions for oral reading are incipient in at least one other major source (Smith, 1975), the area has received no specific research attention. The correlational descriptive data which reports that high
progress beginning readers also have well developed self-correction systems (e.g. Clay, 1972; Weber, 1970), does not count as strong evidence. Data are needed which clearly show reduced self correction is causally related to lower progress in acquisition of reading behaviours.

Specific experimental investigations into delay of feedback have not examined oral reading and are therefore problematic. The complex interactional nature of responding in oral reading markedly reduces comparability of most other experimental tasks. Thus, although delay of feedback up to an optimal setting facilitates the learning of attributes of difficult concepts (Bourne, Ekstrand and Dominowski, 1971) this may have little relevance for the learning to read situation.

Finally, the predicted characteristics of timing may provide a useful technique for examining a major theoretical issue. By manipulating the acquisition or use of self correction through variation of timing the conceptualisation of reading presented earlier could be directly examined. If, in fact, accuracy and general acquisition trends are tied to the development of self control in reading then manipulation of self correction should have predictable effects on accuracy. Chapter Four reports an experiment which used timing control to make that examination.
2. Frequency

Attention to errors can vary in terms of number or frequency of errors attended to by an instructor. Progressively finer analyses can be made of the frequency of attention to errors.

<table>
<thead>
<tr>
<th>TEXT</th>
<th>The mouse ran into the house. The cat ran too.</th>
</tr>
</thead>
<tbody>
<tr>
<td>READER</td>
<td>The ..... ran fast the home. A cat ran too.</td>
</tr>
<tr>
<td>ERROR ATTENTION</td>
<td>↑ ↑</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEXT</th>
<th>The cat was too fat for the door.</th>
</tr>
</thead>
<tbody>
<tr>
<td>READER</td>
<td>The cat is too ... for a hole.</td>
</tr>
<tr>
<td>ERROR ATTENTION</td>
<td>↑</td>
</tr>
</tbody>
</table>

Example (C) describes oral responses to three text sentences. Error attention (noted with an arrow) is shown in terms of the error specified in the attention. No attributes of other dimensions (e.g. timing) are indicated in the example. The most general level of analysis is in terms of number of errors attended to. In this case four of the eight errors were attended to. This could be expressed as a percentage.

More specific analyses can provide details concerning the relationship between attention and error types. Thus in example (C), two out of two no-response errors were attended to, while two out of six substitution errors were attended to. Miscue analyses (e.g. Goodman and Burke,
1972) would provide a basis for even finer analyses of the features of error contingencies (e.g. error attention in the example is quite clearly more likely to occur with errors of low contextual appropriateness as indicated by no attention to home or hole).

Two further frequency measures are possible. The frequency with which the same error is attended to could be examined. There were, for example, five occasions on which the text word "the" could have been incorrectly read. It was twice read incorrectly, one of these errors was attended to. Secondly, error contingency analysis can be augmented by measures of words read correctly. The somewhat exaggerated illustration yields an extremely low accuracy measurement of about 56% words read correctly (ten correct words in 18). The frequency of error attention can be considered from the perspective of distribution within a stream of correct words. (In the example one instance of error attention occurs for every 2.5 correct words.) This measure may have significance when attention is analysed by effects of repeated interruption in a sequence of correct responses.

The concept of repeated interruption provides a workable framework for analysing possible frequency effects. Frequency effects on oral reading can be examined from the extent to which the reader's generation of meaning is interfered with or facilitated. Although all errors could
be considered to alter or interfere with the meaning contained in the text, errors differ in the extent to which meaning is altered. There are classes of errors which are entirely appropriate in terms of the context of the sentence, and even the whole text passage (Goodman and Burke, 1972). The substitution of "home" for "house" above is an example of an error which minimally alters the meaning of the text. It is possible that error frequency will depend on the distribution of types of reader errors.

Given that the goal of reading is to gain meaning, then errors interfere most when the intended meaning of the current text segment is altered. An error which substantially alters the intended meaning produces contextual cues discrepant with the sense of following text. Altered meaning and confused sense are not the only outcomes of inexact or inappropriate attention to cues. Practice effects are likely. Inaccurate responding may generalise to similar situations if the error is not corrected by the reader or the instructor. The extent to which meaning is interfered with and practice of inappropriate responses occurs should both be considered in an analysis of frequency.

The facilitative effects of error attention occur in its operation as a learning mechanism instructing appropriate and independent responding. These facilitation
effects are considered more specifically in the sections on the level of prompting and change sequence. In the following discussion potential facilitation effects due to these instructional properties are assumed so that frequency effects can be considered in isolation.

There are two sources for explaining how differences in frequency of attention may interfere with acquisition. These are the structural characteristics of reading response systems (see p. 24) and the motivational properties of error attention (see p. 56). It must be emphasised that the following effects are claimed solely on the basis of a spatio-temporal property of attention. These immediate interference effects could be moderated and completely superseded by the informational properties of the error attention.

Structural features of response systems limit the number and type of cues that can be attended at any one time. Limits also exist on how long cues remain salient when new stimuli are attended to. General effects of error attention can be assumed on the basis of both these structural features. Each instance of error attention which places an attentional demand on the reader will have two outcomes. It will reduce the amount of attention possible to all cues that are being used at the moment of intervention. It will also reduce the salience of immediately preceding cues. This latter effect, at the
beginning of attention, will be strongest on specific visual cues (i.e. specific word and letter features) but also will rapidly affect the availability of contextual cues.

The nett outcome could be a reduction in possible attention to meaning as current and immediately preceding contextual cues are interfered with. Active interference of meaning is also possible under two other conditions. The first condition is error attention having aversive properties. The second is a condition in which a high percentage of contextually appropriate responses receive such error attention. Under these circumstances the appropriate use of contextual cues may be punished. The effect of this punishment would be to reduce the reader's attention to contextual cues and thus reduce the generation of meaning.

From the data in Chapter One this reduction in use of contextual cues could be predicted to reduce discrimination of visual cues under conditions of increased text difficulty. Similarly, acquisition and performance of self correction responses would be reduced. Other likely dysfunctional outcomes would include generalisation of the aversive stimuli to other aspects of the oral reading situation such as other instructor responses, or reading texts.
Finally, there are a set of possible effects of frequency of error attention which are not directly related to interference with, or facilitation of meaning. These involve an interaction with the acquisition of self correction and self controlled reading. Development of independent self-controlled reading would be interfered with if: (1) high frequency of error attention which is consistent over time and which does not reduce the information provided occurred, and, (2) the instructor's error attention had reinforcing properties. This outcome is assumed to occur in a fashion analogous to animal learning phenomena encapsulated in the 'matching law' (e.g. Mazur, 1975). Essentially a situation may arise where there is less pay off for acquiring independent skills in reading. Thus weak reading responses are maintained through consistent reinforcing consequences. This was discussed earlier in the sections on response consequent learning mechanisms and reciprocal determinism (see p. 62). It was noted that analyses of similar situations have used terms like 'learned dependence' and 'positive reinforcement trap' (e.g. Wahler, 1976).

Combining these separate possibilities into more precise predictions poses difficulties given the conditional and interacting nature of the analyses. The direction of specific predictions can be made clearer by a generalised example. Proficient early readers might make 15 errors per 100 text words. Of those 15, they might self correct
five. Most of the remaining ten errors are likely to be highly appropriate to the text context. Weaker readers might make 20 errors per 100 text words. Of these 20, they might self-correct two. Only some of the remaining 18 errors are likely to be highly contextually appropriate. Taking extreme frequency settings it can be seen that error attention will have different effects for the two types of readers. For the proficient readers, meaning will not be interfered with greatly under zero frequency of instructor attention to errors. Under these conditions the proficient reader's self control system may still operate and the errors made may tend to be corrected over time. The weaker readers higher frequency of contextually inappropriate errors will have marked interference effects. Thus, for the weaker readers under zero frequency conditions, the generation of meaning may break down entirely so that very little progress is possible.

High frequency attention (e.g. 100%) could have inappropriate outcomes. As argued above, continued attention to all of the proficient reader's errors may have interference or even punishment effects on attention to contextual cues. Here then, there is a possibility of reduced attention to context which might be apparent in more word-by-word analysis, reduced self-correction and possibly (depending on the reader's repertoire) decreased accuracy over time. Other attention attributes notwithstanding, the same setting for the weaker readers is likely to be associated with low progress towards independent self
improving reading skills. Complete attention to errors would mean many instances of intervention during reading. Again, appropriate attention to contextual cues may be punished.

Thus the predictions about frequency effects depend very much on the type and distribution of error responses. Given that learning was possible from the informational properties in other dimensions some error attention is likely to have facilitation effects. It would seem likely, however, that there is an upper limit setting on the facilitation effects. This is especially likely where contextually appropriate errors are present. Similarly it is possible there will be lower limit settings on facilitation effects. While not as significant (or perhaps much lower) for proficient early readers, low frequency of attention with weaker readers will leave too many errors interfering with the generation of meaning. The picture becomes less clear when readers produce a high frequency of no-response type errors. These errors demand 100% error attention given a necessity to continue oral reading. A crucial demand placed on reading instruction in these situations is to support a move from no-response to response errors. Often this involves careful selection of texts designed to facilitate use of contextual cues (e.g. 'natural language texts') and reinforcement for responding over non-responding (see Clay, 1978; McNaughton, 1974).
There is little experimental research bearing directly on the predictions outlined. From the concept learning literature there are data which indicate that omitting some feedback does not interfere with learning to identify attributes (Bourne, Ekstrand and Dominowski, 1971). Under conditions of reduced frequency of feedback (up to 40%) solution can be achieved in approximately the same number of trials as 100% feedback. These data indicate only that a complex discrimination task does not need continuous feedback. This may bear little relationship to the oral reading situation.

Klein's (1976) manipulated attentional demands on context utilization in adult readers. Readers performed a word boundary task with random or coherent prose and, in some conditions, simultaneously completed additional tasks placing demands on attention. The data support Klein's claim that increasing demand on attention reduces the ability to utilise context. These results are interpreted in terms of attentional demands interfering with operational memory (controlled processing) so that fewer words are available as cues. Outcomes of this interference are that context rules and regularities are more difficult to discover, predictions (i.e. response preselection) are less accurate, and verification procedures will be less accurate. Klein's (1976) data support the structural feature basis of the above predictions but say nothing about the validity of the predictions for early oral reading.
There are some suggestive descriptive data in learning to read which are relevant here. Weinstein (1976) observed reading groups in three first grade classrooms for the first five months of the school year. Among other measures she examined patterns of teacher-reader contact and interactions and measures of reading achievement. The picture that tends to emerge from the data is one of higher attention to the error responses of low progress readers. Thus during whole-class instruction, low-progress readers were more likely to be offered a clue or have the question repeated, teachers spent more time in small group reading with low-progress readers, and low progress readers were less frequently left without feedback. When certain artifacts of measurement, such as differential opportunity to respond, are removed it appears that low progress readers received higher percentages of sustained feedback following wrong or no-response errors.

Associated with these and other descriptive data (e.g. substantially less opportunity for low progress readers to read orally) was the finding that the gap between high and low reading groups widened over the observation period. The differences in teacher attention noted above remained and tended to show a concomitant increase.

These findings are supported by other pieces of evidence. They are consistent, for example, with the learned dependence, or positive reinforcement trap
interpretation of the effects of high frequencies of error attention.

Similarly, Cunningham (1976) has shown that black dialect translations of text passages are much more likely to be corrected than non dialect-specific miscues which also minimally change meaning. Cunningham related this finding to black students' low progress in learning to read. Cunningham's data raise questions concerning teacher knowledge and discriminative cues controlling teacher behaviour. In Cunningham's data teacher error attention was controlled by difference in oral language dialect. This was in turn related to high frequencies of attention to errors of the type which minimally altered meaning.

One final illustration comes from an in-depth analysis of a six-year-old low progress reader in an Auckland classroom. Figure 2:2 shows measures taken from five minute daily oral reading sessions. The subject read a different text each day with a teacher. No instructions were given to the teacher during the 22 days shown, and the teacher interacted with the reader in her "usual" fashion. The first session marked a change from infrequent minimal interactions in an open plan classroom to daily five minute one-to-one sessions. It is assumed this change in opportunity to respond contributed to the change over time in accuracy indicated in the lower graph. The top graph shows frequency of teacher attention to errors
FIGURE 2:2 Percentages of teacher behaviours (upper graph) and reader behaviours (lower graph) in daily one-to-one interaction sessions.
and number of correct words per instance of error attention. The lower graph shows percent words read initially correctly (i.e. total words read minus errors and self corrected errors) and percent errors self corrected.

\[
\text{self corrections} \times \frac{100}{\text{Self correction and errors}} \times \frac{100}{1}
\]

There are several suggestions possible from these data. The first few data points on both graphs are in keeping with the trends noted by Weinstein (1976). This low progress reader was receiving nearly 100% error attention. As accuracy increased, however, frequency was reduced. Error attention frequencies have different distribution outcomes at different points on the graph.

When errors begin to be self-corrected and 90% of words are read initially correctly, then 100% of errors attended means attention occurs after more than 20 correct words. This means there are long sequences of reading which build up contextual cues. During the first few days of oral reading there were less than two correct words per error attention interaction, which suggests very little appropriate context was available to use.

The data presented in Figure 2:2 demonstrate a change over time from instructional dependence to independent self correction. This may have been occasioned by the substantial alteration in opportunity to respond at the
beginning of the observation period. This in turn may have enabled the reader to gain a few skills to break out of the positive reinforcement trap which could have been operating at the beginning of the observations.

As with the dimension of timing of feedback there is very little research which specifically clarifies the questions which arise from the predictions concerning frequency effects. The general issue of appropriate frequency will be solved in terms of conditional statements. The most appropriate frequency will change depending on the reader's repertoire (i.e. the characteristics of acquisition trends) as demonstrated in the errors produced.

3. Duration

Duration, like Timing, has a dual measurement base. Duration refers to the amount of elapsed time from the onset of attention to a specific error, to the completion of that error attention episode. This time is analysable into discrete response units. These response units might be separate types of error attention (see 6 below) or number of words used.

TEXT: The house was blue.

(D) READER: The mouse (pause) No ... h..house was blue. →

ERROR ATTENTION: "Would it be mouse?" "Look at the first letter"

(elapsed seconds) 0 ........ 1 .... 2 .... 3 .... 4
In example (D) the duration of complete error attention is four seconds. The total episode includes two distinct statements totalling nine words. Different outcomes provide criteria for judging the completion of an error attention episode. Typically these are the correction of the error (as in D above) or an imitation of a teacher supplied model (see p.102). Thus duration of attention for each error can be considered from a perspective of how much time is involved and how many separately identifiable instructor responses occur.

As with the other dimensions the question to be considered concerns the possible functional relationships with oral reading. The bases for the predictions are similar to those for frequency. Duration effects are again a summation of several interacting variables which, in the extreme case, interfere with the reader's attention to contextual cues. The interference effects on reader attention have to be balanced against the possible learning outcomes from the instructor's attention to the error. From data discussed earlier it can be assumed that the longer the duration of error attention the less salient cues become. Again the data suggest specific visual cues from preceding stimuli will reduce in salience, followed by syntactic and semantic cues, proceeding from the more specific to the more general.

There does not appear to be a lower limit setting for effectiveness. If each additional teacher response
adds to the attentional demands, then the shorter the 
duration the better, if contextual cues are to remain 
utilisable. What is likely is that there will be an 
upper limit defining a point of diminishing returns. It 
has been noted that the availability of context facilitates 
visual discrimination and recognition, especially under 
difficult conditions. After a (potentially) specifiable 
duration, context will not be available to facilitate 
recognition. Recognition after this point would become 
more difficult, demanding sustained controlled attention.

Thus the ideal would seem to be minimal duration. 
There should be just enough error attention to provide 
sufficient information to strengthen the inexact, or 
redirect the inappropriate, cue selection. Again, ideally, 
this would seem to demand only the provision of that 
information and nothing else. Correction which involved 
minimal durations would also facilitate the development 
of integrated responding given that contextual and visual 
cues remain partially salient. Continued need for error 
attention within an episode suggests that cues the reader 
has provided in the error response are not discriminable 
by the instructor.

Reader cues are not always readily discriminable. 
The complexity of Goodman's miscue analysis is indicative 
of what instructors might need to do during the few seconds 
following an error. In some interactions durations are
going to be longer than aimed for. Nevertheless, appropriate learning might take place, even after the point is reached where context is no longer available. It is argued below that appropriate learning will often depend on the consequences following error attention (see nine below, p.125). What happens after error attention may enable the response system used and the perceptual learning involved, to be integrated with other response systems. This has been the assumption behind requirements for readers to repeat the sentence containing the error which occurs in some programmes. Thus, increased durations may reduce context, but if important integrated learning takes place long term effects may be positive.

Extended interactions could function as inappropriate models of error attention. The reader may learn that context cannot be used in solving oral reading difficulties. Finally, continued long durations mean acquiring integrated and efficient responding could be made more difficult. This follows if it is assumed that accurate and integrated cue selection responses are more easily learned when some contextual cues remain available from immediately preceding responses, rather than in continued reliance on a consequence sequence.
4. Change Sequences

Thus far the analysis of spatio-temporal dimensions of error attention has been in terms of static settings within the dimension. The effects of variation in these settings over time on oral reading responses can also be examined. It is possible that change in timing, frequency and duration may be a source of additional functional properties of attention to errors.

Some general effects are likely if other conditions operate to support acquisition trends. Given interactions where the timing of attention is typically immediate, then change to appropriate, longer delays could have facilitative effects on acquisition. Conversely, change from delayed attention to immediate attention would reduce rates of acquisition. In general, change from very high or very low frequencies of attention to all errors, to attention primarily to errors which substantially alter meaning, could have facilitation effects. Again reduction in rate of acquisition is likely from changes in the opposite directions. Finally, change from long to short durations will also make other learning variables more effective. These effects are likely to be greatest with less proficient readers.

Figure 2:2 shows changes in frequency of teacher attention to errors as a reader developed greater accuracy and began to self correct. The teacher matched this
change by reducing the number of errors attended to from session six to 16. It is possible to speculate whether the acquisition trends illustrated in Figure 2:2 would have been as pronounced, or in fact maintained, if the frequency of attention had not changed. The extent to which an instructor's frequency or timing match the developing competencies of the reader so that longer delays and more variable frequencies of attention occur it is an important consideration.
D. DESCRIPTION AND ANALYSIS OF DIMENSIONS:

Informational properties.

The dimensions of error attention examined as Amount, Type, Level Change and Consequent sequence are analyses of the informational properties of error attention. There appear to be two distinct meanings or experimental uses of the term information. These correspond to logical versus functional analyses of stimuli. In error attention, for example, a model (see p.102) logically provides a great deal of information. Functionally, however, little of that information might be usable in the acquisition of specific behavioural strategies of proficient reading.

Given understanding of the relationship between particular skills and proficient reading it is possible to begin an explanation of what is functional for a particular reader at a particular time. The explanatory basis lies in the development of concept of "match".

The concept of match has several features. Error attention has to be considered in terms of the information necessary for a particular reader, both to solve a problem word immediately and to acquire independent skills of proficient reading. Thus attention is required to provide bits of information which are appropriate to the skills able to be learned at that moment, and not to provide information which is redundant or too discrepant.
5. Amount of Information

Other dimensions (e.g. Level and Type of information) deal with qualitative aspects of information. The dimension of amount requires a quantitative analysis. Not what information, but how much, is considered here. In an attempt to isolate the dimension for analysis it will be assumed that the other qualitative aspects of attention are appropriately matched in the senses noted above.

It cannot be stated simply that the more information contained in the attention episode the more effective it will be. The concept of match demands statements which are conditional on the reader's response repertoire. In terms of amount of information, a match will be achieved when the possibilities for solving the error word immediately and acquiring significant skills for proficient reading are maximised. Two quantitative possibilities can be stated. Considerations of attentional demands suggest that it could be possible to have too much information. Alternatively, considerations of attention to appropriate cues of the stimulus array also suggest it could be possible to have too little information.

With simple comparisons a close relationship could be expected between functional and logical analyses of information. This would be the situation with a comparison between minimal feedback with little information (e.g. "No").
or "That was wrong".) and attention which had at least some information which was matched on qualitative dimensions. From earlier discussion in Chapter One it could be predicted that error attention with some matched information would be more effective than minimal feedback concerning the accuracy of a response. This effect should be observable in all readers. It would be noticeable especially where error attention had aversive properties.

The other simple extreme would be the situation where error attention provided a great amount of (qualitatively appropriate) information. Error attention would emphasize several important cues either simultaneously or sequentially. This analysis is most applicable to a single episode of error attention (i.e. error attention over a single instance of an error). An instructor could, for example, provide several prompts (see p.102) in sequence following an error (e.g. "Look at the first letter, sound the letters out, and remember the story is about Harry the horse.").

Predictions from Chapter One can be tentatively stated. Early readers are likely to progress at lower rates with error attention that contains several cues. A figure is meaningless here because the interference effects of several attention events will be idiosyncratic. Assuming that all error attention events could control
responding and be matched with the reader's repertoire then more than one cue would probably be inappropriate and lead to interference effects with young readers. In those situations in which it is difficult for the instructor to discriminate reader behaviour the more sequential information provided the more difficult it will be for the reader to solve the error immediately and learn skills for proficient reading.

Data on the former extreme comparisons of amount of information, are relatively consistent in studies of discrimination and concept learning (outlined in Chapter One). Some research with skills related to reading fit with those conclusions. Several studies have compared minimal feedback (e.g. "No" or "Wrong", and, "Yes" or "Right") conditions with training procedures which supply at least moderate amounts of information. Unfortunately the training procedures have involved fading and errorless discrimination procedures (see p. 44) and are therefore not directly comparable with error attention situations. These studies indicate that minimal feedback with young readers is far less effective than use of prompts or informative additional stimuli in training letter discriminations (Egeland, 1975; Schreibman, 1975). Research which directly examines the amount of information contained in error attention in oral reading interactions has yet to be undertaken.
6. Type

Error attention which has instructional functions can also be conceptualised in terms of the type of information provided. Stimulus and response prompts and models were described as antecedent events which provided slightly different cues for the oral reading situation. In an important sense all prompts contain response cues given that the conceptualisation of attention and cue utilisation outlined earlier was of response systems. The binary classification into stimulus or response type served only to note that prompts can provide specific cues which range from how to use the textual array, to which aspects of the text to attend to. Models provide extreme forms of response cues. The possible range of prompts is considered further below.

| TEXT:   | The mouse lived in a hole |
| READER: | The horse lived in a hole |
| PROMPTS: | "Look at the first letters"; "Would it be a horse?" |
|         | "Sound out the syllables"; "What does OU say?" |
| MODELS: | "The word is mouse"; "the mou...?" |

Example (E) illustrates the use of prompts and models. The criteria which can be used to distinguish between prompts and models are differences in provision of direct response information and in the amount of topographical versus behavioural process information. A model provides direct information about the topography of the response
required. The reader is required to imitate the topography of the verbal stimulus provided. There is no direct information in a model about the relationship between verbal stimulus and the textual stimulus. Prompts provide direction information about the cue source to attend to or use but little or no direct information about the topography of the response required.

The effectiveness of prompts or models will be determined by reader response characteristics. Effectiveness questions are concerned not only with specific error solution but also with what is learned about responding in other situations. A model will have the general attribute of rapidly providing a response which can be integrated with an available context. In contrast it is likely that all prompts will place greater demands on attention than a model. For weaker readers the attentional demands will be correspondingly even greater. But a prompt, if matched with a reader's response repertoire and emphasising important aspects for learning to read, will provide more information about how to respond.

Thus there are two important qualities of prompts to consider. The first, the features of the response system controlled by different levels of prompting, is considered below (7). A second quality however, concerns the information combined in the prompt and the possible and actual responses controlled by the prompt. Two
extremes of mismatch between a prompt and reading responses can be described. At one extreme the prompt stimuli may not control any responses. This could arise either when readers are not able to use the cues because they do not have the repertoire, or, when the motivational conditions for instructional control are inadequate (e.g. the reader is unwilling to try). At the other extreme the responses controlled by the cues are redundant or irrelevant to what the reader needs to make a correct response and modify further responding.

These extreme possibilities exist in the three-way interaction between textual stimulus, the specific nature of responses acquired by the reader and attributes of error attention. Thus providing a prompt for syllabification in Example (E) will interact with what skills the reader has and what type of word the textual stimulus is.

The utility of a prompt generally is related to two considerations. These are: (1) important but unused features of the stimulus which should be used if the reader is to acquire proficient reading, and (2) the skills the reader has for attending to them.

An important analysis to be made when comparing models and prompts concerns their differential effects on self control responses. Prompts may have two major effects on this response system. The first is via specific
instructions to use significant cue sources, and hence develop the discriminative repertoires which are basic to self control processes. The second is the provision of a model by the prompt for how to proceed under conditions of difficulty. That is, use of different prompts may operate as a model for strategies involved in self monitoring and self corrections.

Appropriate prompting and fading of those prompts, can be conceptualised as cueing skills which are used in the self tutorial processes of self monitoring and self correction. Given appropriate matching between prompts and discriminative repertoires and appropriate instructions for the behavioural strategies of self control, then prompts will have facilitation effects via acquisition of self control responses. Specific models are less likely to provide the conditions for acquiring the specific discriminative skills needed and would not provide information on behavioural strategies.

One final general point to consider is the possible differences in motivational properties between prompts and models. Models, in providing more information and thus enabling meaning to be generated more quickly with less response cost, are likely to be more reinforcing than prompts. Used continuously and in the absence of reinforcement for independent responding, models are likely to have the unintended function of maintaining and perhaps increasing errors and minimising opportunities to
acquire and practise self control.

Several conditional conclusions about the effects of models and prompts are possible. In terms of acquiring more accurate and efficient responding, prompts will be effective when they match the reader's perceptual skills and when they reliably cue the requisite attentional responses. Given appropriate conditions for learning, prompts are therefore likely to be more effective if they emphasise meaning and the discrimination of simple graphic cues for early readers. Prompts which emphasise meaning and complex visual and/or graphophonic discriminations are likely to facilitate acquisition of accurate and efficient responding for more proficient readers. The distinction between simple and complex discriminations is beyond the present analysis. The basis for the distinction lies in two data sources. They are data on developmental sequences of perceptual learning and analyses of instructional emphases in reading programmes (e.g. Doehring, 1976).

Models are likely to have greater effects on acquisition trends when used to maintain responding to contextual cues. Where prompts are likely to be redundant, or have proven to be ineffective, models may provide an opportunity for progress in acquisition trends. Thus readers with limited skills may benefit from use of models interspersed with simple prompts. Similarly, very
proficient readers encountering technical words or words which have irregular graphophonic associations may benefit from models.

Forrester (1975) reports that oral reading in a Canadian first grade classroom appeared to involve guided modelling and imitation. She claims the processes look very like those described by Brown and Bellugi (1964) of imitation and induction of latent structures in oral language acquisition. Unfortunately, although supposedly behaviourally based, the data are impressionistic and lack any reliability assessment whatsoever. They are also difficult to interpret in the absence of clear descriptions of the reading programme. Nevertheless, these impressions are in keeping with conclusions about possible effective instructional types at this early stage.

Some contemporary American instructional procedures exist which place great stress on modelling and imitation in early reading. Although notable for the rigour of the research validation and the behavioural specification of response components, these sequences are primarily concerned with acquisition of a basic sight word vocabulary out of context. Burdett and Fox, (1973); Knight, Hasazi and McNeil, (1971); LaForge, Pree and Hasage (1975) and Martin (1974) have all demonstrated the effectiveness of modelling and imitation in increasing the rate of acquisition of oral responses to single words with groups of beginning readers.
These studies all included substantial contingencies for correct responding and accurate imitation, and carefully maintained distributed practice within the word lists (Martin, 1974). Martin's study demonstrated that modelling added considerably to the effectiveness of feedback alone.

Experimental evidence for the functional significance of prompts in oral reading is not readily available. Several highly successful reading programmes have included prompts as an unanalysed component in a training "package" (e.g. Berner and Grimm, 1972). Similarly data reported below shows that prompts within a fading sequence can be highly functional in the acquisition of reading responses. Thus, there is no specific demonstration of the functional status of prompts, either compared with no prompts or with models.

7. Level of Prompt

In Chapter One the major behavioural components involved in reading were identified. These were two attentional and cue selection response systems (graphic cues and contextual cues), and, a self control response system. Prompts can be analysed in terms of their function in controlling responses in these complex response systems. Graphic cues and contextual cues represent different levels of stimulus control by the textual stimuli. Prompts which control attentional responses at these two levels are the primary focus of the present section.
Analysis of prompting effects specifically on the self control response system is difficult. There are three sources of prompts which may contribute to acquisition of self control responses. Not considered here is the most general level, instructional sets for the reader to (e.g.) read carefully and solve difficult words independently (cf. Lepatto and Williams, 1976). A second source of influence occurs as prompts affect the discriminative repertoires necessary for accurate monitoring (self observation) and self correction. In reading for meaning self monitoring involves attention to meaning and discrimination of oral response/text word mismatches. Thus self monitoring implies visual discrimination and context utilisation capabilities. Self correction involves abilities to attend to graphic cues and context cues and specific response strategies for isolating and utilising those cue sources. Therefore, prompts which are functionally related to these facets of self control components are likely to be indistinguishable from those which generally affect graphic or contextual attentional responses. Therefore prompts for attention to and utilisation of the two cue sources can operate as prompts for self control.

There is a second group of behavioural processes involved in self control. In addition to the basic discrimination skills are the superordinate control behaviours in self observation and self correction. These are behaviours of independent observation and evaluation of the appropriateness of responses, and strategies for
refining or changing emphases of discriminative capabilities. It is possible that prompts can directly influence these responses. Prompts would act paradoxically, as overt models for behavioural strategies to use in monitoring and correcting errors. For example, a prompt which emphasised rereading the pre-error context to re-emphasise meaning might not only instruct contextual utilisation but also model how to maintain attention to contextual cues under difficult conditions. Again the additional or separate effects of prompts on these self control components would be difficult to examine independently. Example (F) shows two levels of prompting.

**TEXT:** There was the horse.

**READER:** "There was the here"

**PROMPTS I:**

a. What is the second letter?

b. Look at all the letters in the last word.

c. Sound it out.

d. Look at it now with only the last letters showing.

(F)

**PROMPTS II:**

a. Could we see a here?

b. Start from the beginning again and see if it's here.

c. Does that make sense?

d. What was standing in the paddock?

Prompts of level I are intended to instruct attention to and use of graphic cues in the textual array. Prompts of level II are intended to instruct attention to and use of contextual cues. The difference between the two levels of prompting is a difference in which cue sources the
reader is being instructed to attend. Note that the intended function of the prompts may or may not be congruent with actual function. For the purposes of the following discussion it will be assumed intended functions match with actual functions.

If different level prompts function to increase attention and use of the two major cue sources then it is possible to postulate outcomes of differential use. From the framework of acquisition trends it is apparent that a reader learns to attend more efficiently and accurately to both cue sources. Early in the acquisition sequence especially in New Zealand, the reader often relies primarily on contextual cues to overcome limitations on automatic processing of complex visual stimuli. The skills of rapid complex visual discriminations are acquired over some time (Doehring, 1976).

The reader also learns to use the specific skills in an integrated and interfacilitatory fashion. Thus acquiring skills in the use of only one cue source is seen as posing long term problems for acquisition of proficiency. Use of only one cue source would be maladaptive in that proficient generation of meaning inevitably demands accurate use and integration of both cue sources.

A simple conclusion is that over-emphasis on either prompt level will be problematic. This simple conclusion
however will depend on a number of variables. The first variable concerns the relationship between the prompt level and the skills repertoire the reader has acquired. This is essentially a question of what responses are in fact controlled by the prompt stimulus. Specific prompts aimed at complex visual discriminations in attention to graphic cues (Type I above) will not be effective if a reader has not yet acquired some of the requisite component discriminations. A similar question is whether frequent use of Level I prompts would create attentional demands which reduce the amount of attention available for contextual cues. Especially with less skilled readers such sustained controlled attention to one cue source over time would inhibit acquisition trends.

A second more complex variable to consider is the relationship between the discriminations being prompted and acquisition of proficient reading in New Zealand settings. While attention to contextual cues is always appropriate in the generation of meaning, statements about attention to graphic cues are more difficult. Hesitancy in such statements is appropriate for at least three reasons.

1. It is difficult to find consensus on behavioural definitions of skills involved in discrimination, word-attack, pronunciation, sound blending etc. although there are discernible commonalities appearing (e.g. Bradshaw, 1975; Mackworth, Resnick and Beck, 1976; Samuels, 1976).
2. But even given common definitions of skills needed a second problem exists. Reliable experimental data on the function of isolated skills for acquisition of proficient oral reading is limited (as illustrated by studies examined in current reviews of experimental research, e.g. Barr, 1974; Maliphant, Supramaniam and Saroga, 1974). Recent experimental data continues to be largely irrelevant to the question of long term effects on oral reading in context. Hundert and Bucher (1976) and Farmer, Nixon and White (1976), for example, have demonstrated that receptive discrimination training and sound blending training can significantly increase six year olds' accuracy of discriminating vocabulary items. There are not data provided which demonstrate a relationship between that discriminative repertoire and contextually-based oral reading.

3. It is possible that the problems of experimental validation of specific graphic component skills arise from a third problem. The question can be posed, how are these skills best learned? The logically compelling task analyses of what a reader appears to need to do to recognize a word or solve a new word often produce extrapolations about the sequence and method of learning tasks (e.g. Calfee, Chapman and Venezky, 1972; Mackworth, 1972; Samuels, 1976). These extrapolations are usually unwarranted. They remain questionable assumptions because of lack of reference to the instructional milieus which yielded the descriptive data (Barr, 1974), because definition of a skill does not
logically imply anything about how it can be learned, and because definition of a deficit does not imply anything about how it can be remedied.

For these reasons it is difficult to make a general statement about the probable significance of level I prompts. It is likely however that prompts could affect significantly attention to, and use of graphic cues. Given previous conceptualisations it is important that this occurs so that the skills learned are integrated with and facilitate contextually based responding.

A reader may produce errors which are contextually appropriate but are graphically inaccurate. High frequencies of level I prompts for this reader might reduce contextually based responding. With strong positive contingencies on accuracy of responding and error attention having aversive properties long-term inappropriate outcomes might result. In extreme cases this might lead ultimately to reduced acquisition of responses and decreased comprehension. The same reader is likely to benefit from lower percentages of level I prompts (but not level II prompts).

At the other extreme a reader who makes both graphic and contextually inappropriate errors is not likely to benefit from high or even moderate frequencies of level I prompts. Frequent use of these prompts is likely to inter-
fere with the priority for establishing contextually based responding. This is especially likely if error attention also occurs with high frequency when such a reader does make contextually appropriate errors.

Other readers may produce errors which are contextually inappropriate but are based on accurate attention to graphic cues (e.g. substituting "horse" for home). Level I prompts are not likely to be useful with these readers. These readers are likely to make greater progress with error attention emphasising contextual cues. Again, progress is likely to depend on reduced attention to those few errors which are contextually appropriate.

Prompts which facilitate accurate attention to and use of contextual cues are likely to increase retention and accuracy of discrimination/recognition (e.g. Meyer et. al., 1975; Schvanaveldt et. al., 1977). This will occur for all readers producing errors which can be corrected by more efficient and accurate use of contextual cues (e.g.) as in the substitution "horse" for home or "come" for cat etc.

Prompts which interfere with learning and the continued use of context will depress acquisition rates. This is especially likely to occur with over use of prompts which emphasise graphic cues. Sustained demands on attention to graphic cues will limit attention to contextual cues and thus, over time, will reduce acquisition of
integrated and interfacilitatory responding and other acquisition trends.

A distinction has been made between two levels of prompts. It is of course possible to examine forms of prompts within levels. Detailed analyses of forms of prompting within levels pose much more specific experimental questions about the relationship between prompt controlled responses and proficient reading. For example, prompts for context use can take various forms which probably control different response outcomes. In Chapter One it was noted that pre error context provides different information from post error context. An important experimental question concerns the effects of either reading past the error, or rereading when an error occurs on the acquisition of accurate and self controlled reading.

There are no experimental data available to support or counter these expectations, but there are some suggestive data. To the extent that pictures can be considered to be prompts about the meaning of words, instruction which has emphasised use of pictures might provide some useful data. Samuels (1970) has reviewed the effects of use of pictures in learning to read texts. He concludes that the bulk of research data say that pictures interfere with learning to read. At first glance this seems at odds with the argument presented here. These data however are based on acquisition of a sight word vocabulary not contextually-based oral
reading. Samuels rightly notes that the negative effects of picture usage with word discrimination and recognition is probably attributable to lack of adequate fading techniques (or change sequence, p.120) and is really a problem of transfer of stimulus control. More contemporary data on fading would support this argument.

Interestingly, Samuels provides some evidence that use of pictures in oral reading can sometimes aid recall of relevant ideas (i.e. comprehension). Alternatively, Wittrock, Marks and Doctorow (1975) have shown that increasing availability of contextual cues by use of familiar stories facilitated learning and retention of new vocabulary words by fifth and sixth grade readers. If level II prompts operate in an analogous fashion then there is some indication that acquisition of reading responses could be facilitated with these prompts.

The possibility that low progress readers receive relatively high frequencies of error attention has been noted previously. An additional possibility is that the high frequency error attention often involves continued prompts for graphic cues. From descriptions of second, fourth and sixth grade classrooms Quirk (1976) has provided data which show the majority of time spent during reading instruction is on pronunciation and word recognition tasks. When coupled with the frequency data reviewed earlier (e.g. Weinstein, 1976) it is possible
that low progress readers often receive error attention of a kind which prompts use of graphic cues. This emphasis may be functional in the context of American instructional programmes nevertheless continual emphasis even in these contexts may have inappropriate outcomes. With some readers error attention may often be contingent on errors which minimally alter meaning (Cunningham, 1976). The latter author has attempted to explain low progress of black readers in terms of continued use of error attention with contextually appropriate responses.

Further information about over use of level I prompts comes from Barr's (1974) review of influences on early reading of phonic methods and 'sight word' methods of instruction. It is apparent from Barr's description that the distinction between the two approaches is a matter of emphasis. The sight-word approach places more emphasis on comprehension and contextually based responding while phonics methods place more emphasis on letter-sound associations.

Several studies reviewed by Barr show that substitutions made by phonics programme readers tend more often to be non words or grammatically unacceptable words and that they tend to remain uncorrected. They also characteristically produce higher proportions of non-response errors and graphically constrained substitutions. These readers however make relatively fewer recognition
errors and make fewer substitutions. These data suggest that continued use of level I prompts may maintain this sort of responding. Ultimately this may inhibit rapid progress if the reading programme goals call for early contextually based responding.

Finally, several studies indicate that sustained demands to use graphic cues can interfere with acquisition trends. Perfetti and Hogaboam (1975) have shown that a small sample of third and fifth grade skilled comprehenders responded more quickly to printed words than their unskilled peers. The authors relate skill at comprehending to the development of automatic decoding skills, that is, rapid and efficient use of cues. One might argue from those data that if readers were constrained to use less than automatic processing then comprehension and generation of meaning would be interrefered with. This is essentially what Klein (1976) found when clarity of prose materials and presentation of secondary tasks increased attentional demands on college students reading prose passages. These manipulations reduced context use as measured by a special word boundary text. Similarly, Marslen-Wilson and Tyler (1976) found that college students' immediate recall of prose was reduced when availability of semantic and syntactic cues was reduced. If sustained level I prompts limited attention to semantic and syntactic cues then this finding and those discussed earlier concerning context effects on recall and recognition are in accordance with the general expectations.
8. Change Sequence and consistency

Readers acquire proficiency in several response systems. As similar texts are read readers will tend to show some changes in skills. The type of errors made may change, suggesting different discrimination skills are being learned. The conceptualisation of error attention as instructional control raises questions about the transfer of stimulus control from the instructor to the textual stimuli as a reader acquires new response capabilities. Change in the information provided by error attention may be an additional source of variables in the acquisition of proficient reading.

The appropriateness of change in how an instructor attends to errors depends on changes in the reader's repertoire of responses. The information provided should be matched with the reader's skills so that acquisition of efficient, integrated and independent responding is facilitated. This suggests that continued modelling or prompting of already learned skills would reduce progress by unnecessarily increasing attentional demands. Similarly, major changes in the amount or level of attention, irrespective of changes in reader behaviour, would not be maximally useful.

The general expectation from the present framework would be that changes in error attention which matched changes in reader behaviour would be more effective than
error attention which did not. Unfortunately, analysis of this conclusion depends on greater knowledge than is currently available in two areas. They are, data on appropriate sequences of response acquisition and data on the most useful specific cues involved in discrimination of graphic cues.

The latter area has received some attention in the experimental literature on fading. Several researchers have noted that the form of extra stimulus support can significantly alter training outcomes of trials to criterion, retention and subsequent identification. Thus Egeland (1975) Schilmoeller & Etzel (1975) and Schreibman (1975) have noted that prompting stimuli which are criterion-related, or related to distinctive features of the stimuli, are more functional in the fading process.

It appears that the additional cue used must in some way be relevant to the distinctive features of the discriminative stimulus (e.g. Egeland, 1975). This means that the most functional cues (in terms of further discrimination learning and recognition) are in some way appropriately related to the elements of the stimulus complex which come to control responding.

Fading procedures typically have programmed steps which involve errorless training. Data from these programmes are therefore not directly applicable to the
present investigation of attention contingent on error production. Nevertheless they do provide some indication of the desirability or otherwise of change sequences. The data from training programmes using fading techniques are equivocal. Lahey and McNees (1975) studied letter discrimination training with low skill early readers. Lahey and McNees were not able to demonstrate that fading based on emphasis of size of the appropriate letter in a match-to-sample procedure was more effective than feedback alone. Their data however are problematic because of different baseline levels in their comparison groups. Additionally, the dimension of letter size may not be the most useful stimulus cue for gaining appropriate stimulus control, even for isolated letter recognition.

Egeland (1975) was able to demonstrate that fading using a colour stimulus emphasising certain distinctive features of a letter was superior (1) to a coloured strip which generally indicated the correct letter and (2) to no fading. His preschool readers made fewer errors both during training and on immediate and delayed post-tests under conditions of fading based on the distinctive feature of a letter. A similar finding is reported by Schreibman (1975) who compared fading using within-stimulus to extra-stimulus prompting and to no-prompting with autistic children. Learning visual and auditory discriminations was facilitated with the within-stimulus condition which emphasised 'distinctive' features.
Somewhat different data have been described by Corey and Shamow (1975) and Dorry and Zeamen (1975) for word discriminations. In both these cases the fading stimuli used were pictures and therefore might be considered non-criterion related, or extra-stimulus prompts. The authors, however, demonstrated that fading procedures facilitated performance on immediate and delayed tests of word recognition compared with no fading. This finding may be related to the conditions of training and testing which involved recognition of isolated words (and not in a comparison match-to-sample as with the letter discrimination examples). The no-fading condition involved superimposition of the picture with no change and after an equivalent number of trials presentation of the word alone. Thus these data generally agree with the expectation that abrupt change would be less effective than gradual matched change.

Other than these data there are no investigations which bear on the question of changes in error attention during oral reading. A question related to changes in error attention involves the consistency of prompting for use of particular cues. An instructor could consistently adapt instructions to use grapheme-phoneme associations, or use of post-error context as cues to solve errors. Consistency is most appropriately analysed in terms of the match between the error attention and the reader's skills as evidenced by (e.g.) errors and self
corrections. Consistent instruction to use the appropriate cue source is likely to be an important variable.

The functional significance of consistency rests on the conceptual framework provided by Shiffrin and Schneider (1977). Their claim is that consistent training conditions provide the opportunity for automatic processes to develop. Inconsistent demands on attention mean controlled processing has to be used continually.

Consistency in prompt forms would be facilitative given that the goal of early oral reading is to develop automatic responding. Facilitation would however be mediated by the degree of match between attention form and error type. Error type refers to the type of cues the reader is attending to. Similar types of errors indicate consistent use of some cues and consistent misuse or inattention to others. Consistency within error types is more likely to facilitate acquisition of automatic responding. Consistency across error types is likely to reduce acquisition trends because it will often lead to mismatch. Conversely, inconsistency within error types is likely to interfere with the development of automatic responding and inconsistency across errors is likely to be facilitatory if there is consistency within error types. The opposite effect is likely given inconsistency also within errors. There do not appear to be any reading studies relating to this question.
9. Consequent Sequence

Error attention events typically result either in a (prompted) correction by the reader or a model presented by the instructor. It is possible that what happens as a consequence of prompted corrections or a model also has functional properties. The consequent sequence is distinct from specific social or tangible events for a response. It involves tacit or explicit instructions for how the reader is now to proceed.

Casual observations and reviews of some oral reading programmes reveal that readers can be required to respond in several distinct ways following prompted corrections or models. There are two basic sequences following prompted corrections: (1) the reader continues reading from the error, or, (2) the reader is required to reread a specified portion of the pre-error text, repeat the prompted correction and then read on. There are three basic sequences following models. (1) The reader continues reading from the error, or, (2) the reader imitates the model and continues reading, or, (3) the reader imitates the model and rereads a specified portion of the pre-error text, repeats the imitation, and then reads on.

Given that a goal of oral reading is to facilitate acquisition of integrated and interfacilitatory responding
then a prediction is possible. Rereading with repetition of the corrected or imitated word in context is more likely to provide the opportunities for acquiring proficient reading. Continued reading (i.e. reading on) does not provide an opportunity to read the isolated word correctly in context. The pre-error text is likely to provide some contextual cues which can be attended to in conjunction with the corrected or imitated word. Rereading also means contextual cues are more available for attention, and for use in continued reading. After an extended error attention episode the salience of contextual cues may be drastically reduced due to attentional demands. Thus rereading would also affect initial reading accuracy after the error because of the re-presentation of contextual cues.

These effects would be exaggerated under difficult conditions (e.g. new texts) and with weak readers who have not fully developed efficient and accurate visual discrimination skills. The superiority of reread sequences over read-on sequences is also suggested from studies of discrimination learning (e.g. Hulse, Deese and Egert, 1975; Medin, 1975). These studies note the superiority in retention and generalisation when discriminations are acquired within a context.

Production of an imitation is probably more functional than no imitation and only continued reading. A required imitation increases the opportunity to practice the required
response. Practice effects are among the most widely researched and validated of psychological research findings (e.g. Crowder, 1976). Thus a reasonable prediction is that production of an imitation will facilitate acquisition more than no imitation (if other learning variables are operating).

Different types of consequent sequence are likely to have different motivational properties. If the general contingencies provide reinforcement for corrections following instructor correction then 'read on' sequences are more likely to interfere with acquisition trends. When reinforcement is available for instructor-controlled corrections then the closer the reinforcement is to the error, and the less effort needed to correct the error the more likely error production will be reinforced. This will hold for both prompted corrections and for imitations.

Some reading programmes reviewed earlier have included specifications concerning reread sequences following error attention (e.g. Fox, 1973). The reread component has not been analysed in these programmes. The predicted superiority in oral reading for the reread component remains to be examined directly. There are some data which have indirect bearing on this prediction. Both Martin (1974) and Sajwaj and Knight (1971) have reported inappropriate outcomes of different types of consequent sequencing. The Sajwaj and Knight study
involved letter discrimination training with a six year old. Within the match-to-sample procedure errors were corrected by pointing to the correct response (modelling the correct response). The frame was then immediately represented with reinforcement available for accurate responding. The authors demonstrated that this procedure resulted in increased error production. Possible explanations for this outcome included unintended reinforcement of errors through a complex chain involving error attention as a secondary reinforcer. This account is close to the claims above concerning possible inappropriate motivational characteristics of 'read on' sequences.

Martin (1974) contrasted two stimulus sequencing procedures when training first graders' basic sight word vocabulary. Cards with a printed word were presented from a stack of ten. An error resulted in an oral model, and the stimulus card being placed either at the bottom of the stack or immediately following the next card. Verbal feedback alone was available for correct or incorrect responses. The delayed procedure lead to acquisition of more words, fewer trials to criterion and higher retention than the immediate representation. In this study both procedures were superior to no error correction procedure.

Martin interprets his data in terms of distributed versus massed practice. These data could perhaps also be
taken to indicate the inappropriateness of early repetition of the about to be discriminated stimulus as in a reread sequence. However, the immediate representation would typically involve much shorter durations than reread sequences in oral reading. The question of the availability of context is also not dealt with as Martin's study involved single words. Thus Martin's study does not provide contrary data to the general prediction.
CHAPTER THREE: AN EXPERIMENT TO EXAMINE THE EFFECTS OF ERROR ATTENTION TUTORING ON ORAL READING.

A. INTRODUCTION

The previous two chapters have outlined a framework for examining error attention during oral reading. That framework has one basic premise. Under appropriate conditions, attention to oral reading errors can facilitate acquisition of proficient reading.

The analysis of error attention effects took place within a wider study of readers in a Learning Disabilities classroom. The major study aimed to produce an effective 'package' for tutoring oral reading. Trained para-professional tutors used different combinations or procedures in an attempt to establish a maximally useful tutoring 'package'. For two subjects, tutoring was based entirely on error attention procedures. This provided the setting for examining the general premise.

Baer (1977) has suggested that progress in applied behaviour analysis depends on identifying and systematically examining processes which are 'powerful, general, dependable, and - very important - sometimes actionable' (p.171). From the earlier discussion it seems that error attention could be a powerful variable in the acquisition of proficient reading. A clear demonstration of a strong effect could then lead to further systematic analyses of dimensions of error attention.
Two subjects were chosen to represent the range of reading achievement in the classroom. An experiment was designed to answer the major question: can attention to errors during oral reading facilitate acquisition of proficient reading? A further question was also asked: are prompts and models, as different types of attention, differentially effective with different readers? It was earlier predicted that prompts would be more effective with more skilled readers. Conversely models would have greater effects on readers early on in the acquisition sequence. This would be heightened where little attempt is made to 'match' the prompts with the reader's repertoire.

Data from an earlier study was reviewed in Chapter Two. That study suggested increased practice, or opportunities to respond would also facilitate acquisition trends. Practice effects could also have operated in the present study. It was not possible to include a condition of increased practice in the within-subjects design. To provide some indication of the effects of error attention over and above practice effects, three 'contrast' subjects were monitored. Two of these subjects received practice. These subjects received the same amount of extra reading time as the tutored subjects did. They read passages of text to a tutor, but received no error attention tutoring. One subject received no extra Tutoring at all.
B. METHOD

1. Subjects and setting.

Subjects were members of a Senior Learning Disabilities classroom in Kansas City, Kansas. All eight students in the classroom participated in a study of components of effective paraprofessional tutoring of oral reading. Five subjects within the larger study were selected for the present experiment. Two of these subjects ($S_1$ and $S_5$) were the primary experimental subjects. The remaining three subjects served as contrast subjects.

Details of each subject are presented in Table 3:1. It can be seen that subjects were reading at least three grades below their age appropriate reading grade. Contrast subjects receiving Practice Tutoring were matched with the primary experimental subjects on the basis of extent of reading retardation and place in the classroom graded reading series. $S_1$ and $S_5$ read the same texts, three levels above the texts read by $S_2$ and $S_6$.

The classroom reading programme relied heavily on remedial phonics training. The text books used in the study were those used in the daily programme by the subjects. These texts were phonics-based with a carefully controlled emphasis on letter-sound associations and low emphasis on contextual cues. There were two components to the classroom reading programme. One involved daily
### Table 3.1

Characteristics of Subjects at Commencement of Study

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age (years)</th>
<th>Age Appropriate Reading Grade (years)</th>
<th>Actual Reading Grade (years)</th>
<th>Grade Difference</th>
<th>IQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>12</td>
<td>6.2</td>
<td>2.9</td>
<td>-3.3</td>
<td>128  (WISC)</td>
</tr>
<tr>
<td>S2</td>
<td>11</td>
<td>5.2</td>
<td>1.3</td>
<td>-3.9</td>
<td>88   (S-B)</td>
</tr>
<tr>
<td>S5</td>
<td>13</td>
<td>7.2</td>
<td>3.3</td>
<td>-3.9</td>
<td>95   (S-B)</td>
</tr>
<tr>
<td>S6</td>
<td>9</td>
<td>4.2</td>
<td>0.7</td>
<td>-3.5</td>
<td>101  (S-B)</td>
</tr>
<tr>
<td>S8</td>
<td>9</td>
<td>4.2</td>
<td>0.6</td>
<td>-3.6</td>
<td>110  (WISC)</td>
</tr>
</tbody>
</table>

1 Metropolitan Achievement Test.
exercises requiring identification and discrimination of grapheme-phoneme associations. A second daily component was one-to-one oral reading with the teacher. Students read from a standard text. During this reading the teacher attended to errors and praised selected portions of correctly read text. Readers read a new passage of the text each day.

2. **Experimental Procedures**

Two women from the school district served as paraprofessional tutors. These paraprofessionals had been trained in behavioural techniques for remedial academic tutoring with the Juniper Gardens Learning Center. They received further specific training in carrying out the tutoring procedures for the experiment. The paraprofessionals received payment from grants to the Learning Center.

The experimental procedures took place during a morning session. The tutors took individual subjects

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1. Juniper Gardens is an inner city area of Kansas City, Kansas. A large federally funded research project called the Juniper Gardens Children's Project has been working since 1965 in developing procedures for remediating the learning and behaviour problems of children from depriving environments. The Juniper Gardens Learning Center is an associated programme for training paraprofessionals to work in school settings.
out of the classroom into the school corridor and carried out tutoring. The major measures of the effectiveness of tutoring were taken in the usual one-to-one afternoon oral reading session which the teacher conducted.

Thus the effects of error attention tutoring on individual oral reading were; (a) measured two to three hours after tutoring had taken place; (b) measured with the subjects reading to the teacher rather than to the tutors; (c) measured in the classroom setting. The measures could therefore be considered generalisation measures.

Each tutored subject ($S_1$, $S_2$, $S_5$ and $S_6$) received twelve minutes of extra reading each day when experimental phases were in effect. During the twelve minutes there were 60 second tests of uninterrupted reading taken before and after tutoring. For ten minutes tutors carried out either error attention tutoring ($S_1$, $S_2$), or practice tutoring ($S_5$, $S_6$).

The passage to be read to the teacher in the afternoon session was selected for tutoring in the morning. If the passage was completed before ten minutes had elapsed it was repeated using the same tutoring procedures. Both tutors took tutoring daily. The order of taking subjects for tutoring, and the tutor responsible for tutoring varied from day to day.
a. Error Attention Tutoring (subjects 1 and 2)

(i) Modelling Procedures.

Modelling involved the tutor supplying a complete model of the appropriate response whenever an error occurred. The tutor was instructed to point to the problem word and say it. No other attention was given to the error. There was no attempt by the tutor to provide information as to how to solve the word or which cues to use. The tutor required the reader to imitate the model successfully before completing the general tutoring procedures. The tutor typically intervened by saying "This word is ———. Now you say it".

(ii) Prompting procedures

Under prompting procedures the tutor attended to an error by providing instructions or asking questions which prompted attention to and use of specific graphic cues. Again the tutor pointed to the problem word. The tutors were instructed to relate instructions and questions to graphophonic cues in the text word. Examples of such prompts were; "What sound does the word begin with?"; "What sound do these two letters make?" "Sound out the word".

The level of prompting was specifically set at the level of graphic cues, so that there was some similarity between the classroom programme goals and tutoring. If the reader solved the word within five
prompts the tutor requested a repetition and went through other general procedures (see below). After five prompts the tutor requested the reader to carry on reading, missing out the problem word. This was to avoid the presentation of a model and so confuse the experimental comparison.

(iii) General Procedures used with both Modelling and Prompting.

In all conditions all errors were attended to. In Chapter Two it was predicted that 100% Error Attention would not be the most appropriate frequency. Similarly, in Chapter Two data were presented which indicated teacher attention may vary as a result of changes in oral reading performance. Such variation could have been a source of confounding variables. Thus the frequency of error attention was set at the maximum level to provide a more rigorous examination of the effects of error attention, and also to ensure the tutor's consistency across phases and across subjects.

Tutors were instructed to delay attention until the end of a sentence. When readers stopped reading completely the tutor paused for several seconds before attending to the error. Under the modelling conditions each episode of error attention lasted long enough to supply a model. The duration of an episode was more variable under prompting conditions. An upper limit of not more than five prompts was specified. Tutors consistently only used prompts or models depending on the experimental phase.
Following a correction after tutor prompting, or an imitation after modelling, readers were required to return to the beginning of the sentence which contained the error and reread the sentence. If the error was repeated the error attention procedures (either modelling or prompting) were carried out a second time. If several errors occurred before the end of a sentence, tutoring procedures were used with all errors before requiring the reread. The tutor continued to use tutoring procedures if errors occurred during the reread.

Thus, in terms of the framework presented in Chapter Two, particular settings for dimensions of attention were clearly specified for the tutors to follow. Also, detailed instructions were given to the readers for the first few sessions in each phase. The tutor said

"I would like you to begin reading when I say start. I'll be listening and if you have trouble with a word or miss one, then I'll ... (modelling ... tell you how to say it. I would like you to say it after me, and then read the sentence again) ... (Prompting ... ask you some question and give you some hints about the word. I would like you to try real hard to get the word and if you do then I will have you read the sentence for me once again). Then, unless I stop you, just keep on reading and go on to the next sentence. O.K. Are you ready? Start."

If the reader read the problem word correctly when repeating the sentence the tutor interrupted at the end of a phrase or sentence and provided descriptive praise statements, e.g. .. "That was real fine! You re-read that word again just like we practised it" or, "Very good! You used the sounds this time." No other praise statements were given.
b. Practice Tutoring - (Subjects 5 and 6)

Under practice tutoring conditions the tutor ignored all errors. If a subject paused or remained some time on an error the tutor requested the subject to miss the word out and continue reading. The instructions given to subjects differed from those for error attention. The tutor changed the instruction dealing with errors ..

"... if you have trouble with a word, skip it and go on to the next one. Every so often I'll let you know how you are doing ..."

There were two forms of Practice Tutoring. With Contingent Praise (CP) descriptive praise statements were provided at the end of each minute (i.e. FI.60sec schedule). These statements (e.g., "You read those three words just the right way") were made contingent on the first three words correctly read in sequence after 60 seconds. With Noncontingent Praise (NCP) general praise statements were provided noncontingently after three words read at 60 seconds. These procedures operated during the whole ten minutes of tutoring.

Practice tutoring was designed to provide comparison data on two features of error attention tutoring. In addition to feedback to errors, error attention tutoring provided increased opportunities to respond (practice) and a low rate of descriptive praise statements. Either or both of these additional variables may have been functional. The schedule of
praise statements was designed to match the low frequency of praise available during error attention tutoring. A contrast between practice and error attention tutoring would provide some indication of the effects of error attention tutoring above practice and low frequency praise effects.

A further contrast was available with Subject 8. This subject received no tutoring during the first 67 days of the larger study. $S_8$ was exposed only to the ongoing classroom programme and therefore provided an indication of the possible change over time due solely to that programme.

3. **Observation and data analysis**

a. **Classroom measures**

Tape recordings were made of oral reading interactions between subjects and the teacher during the afternoon, one-to-one reading session. The major measures were taken from these daily sessions. Every day one of the experimenters associated with the major study analysed the tape. Specified reader and teacher behaviours were recorded on a special form (see Appendix A). The responses which were recorded were:

(i) **Errors**

Errors were defined as any mismatch between the appropriate form of the text word and the reader's response. A mismatch occurred with an oral response (a) when one,
some, or all of the usual graphophonc associations of
the correctly read word were missing; or (b) when
graphophonc elements were added which were not part of
the appropriately read text. Deviations in usual
pronunciation, intonation or emphasisc were not counted as
errors. Appropriate form included all of the required
graphophonc elements read together as a single oral
response. One error was recorded for each text word read
incorrectly. The definition covered partial or complete
misreadings, words left out, not attempted or added to the
text.

(ii) Self corrections

A self correction was defined as the correction of
an error by the reader without the teacher intervening
with attention to the error. Self corrections were scored
only when no teacher attention (models or prompts) inter-
vened between the production of the error and the reader's
self correction. To count as a self correction a text
word had to be missed out entirely or read either partially
or wholly incorrectly and subsequently corrected by the
reader. One self correction was recorded for every word in
the text read incorrectly and then corrected by the reader.
Incorrect attempts at self corrections were not counted
as self corrections and several attempts with one text
word which lead to correction were coded as one self
correction.
(iii) Teacher Attention

Teacher attention was also recorded. Error attention was defined as a verbal response contingent on the occurrence of a reader error. Error attention was coded into two types. (a) **Models** were those instances of error attention where the teacher supplied the correct word or part of the correct word. (b) **Prompts** (coded as word attack questions) were those instances of error attention where the teacher asked questions or made statements about the phonic components of the text word.

(iv) Recording

Errors were recorded by writing the text word misread in the appropriate column of the record sheet. Reader self corrections, teacher attention to errors, and teacher praise statements were also recorded. Time taken and number of text words read were also noted daily. These event records yielded measures of

a. **Accuracy:** Percent words read initially correctly (counting self corrected errors as errors). A criterion of 90% words read initially correctly was taken as proficient responding for the text being read.

b. **Self correction:** Percent errors self corrected. (counting errors and self corrected errors in the denominator). A criterion of 20% errors self corrected was taken as indicating acquisition of a proficient self correction response system (see Clay, 1972).

c. Correct and error rates per minute.
d. Percent errors attended to and types of teacher attention.

b. **Tutoring Measures**

Daily tutoring sessions were also tape recorded. After each session the tutors analysed the tapes for that session. Tutors recorded reader errors during pre- and post-checks and during the first read through during tutoring. They also recorded instances of tutor attention to reader behaviour and appropriate complete use of the experimental procedures. This involved checking that all components had been present with each episode of tutor attention to errors.

c. **Probe Measures**

Starting with the second experimental tutoring phase, additional measures were taken of $S_1$ (Error Attention Tutoring) and $S_5$ (Practice Tutoring). A second text was read to the teacher by $S_1$ and $S_5$ in the afternoon one-to-one session. This probe text was similar in difficulty to their tutored text. It was however untutored and $S_1$ and $S_5$ read a new segment each day. Performance on the probe text provided measures of generalisation between two similar level texts as a function of tutoring compared with no tutoring.

Reading on the probe text occurred on average two out of every three days. Probes were taken only with $S_1$
and S5 as the teacher's time was limited. The teacher considered these two subjects, the most proficient readers in the class, were in need of extra oral reading. Teacher-reader interactions with these texts were also tape-recorded. Recordings were analysed in the manner described for the major classroom measures.

4. Research Design

A within-subjects reversal design was used with subjects receiving tutoring (see Figure 3:1). Repeated measures were taken under three different conditions. For each subject there were two tutoring conditions and a no-tutoring (baseline) condition. During baseline only the usual classroom reading programme operated. During Error attention tutoring general attention to errors procedures, plus modelling (M) or prompting (P) occurred. Baseline and tutoring phases alternated. During Practice tutoring ten minutes of increased opportunity to respond, plus either contingent praise (CP) or noncontingent (NCP) praise occurred.

Within each design Error attention tutoring or Practice tutoring could be compared with no tutoring. This corresponds with standard 'baseline'/'treatment' phase comparisons in typical reversal designs (i.e. ABABABAB). A further within-subjects comparison was devised. Different types of tutoring were consistently varied across 'treatment' phases. Oral reading under these
FIGURE 3:1 Experimental phases for the within-subjects designs, $S_1$, $S_2$, $S_5$ and $S_6$. 

$p$ = prompting  
$m$ = modelling  
$cp$ = contingent praise  
$ncp$ = non contingent praise  
$+$ = probes
different types of tutoring could be compared. The comparison, however, is not direct, in that different tutoring conditions do not occupy adjacent phases. Hersen and Barlow (1976) consider this comparison to be weaker than a comparison between adjacent phases. Successive returns to baseline conditions were used in the present experiment to serve two functions. They were designed to provide measures of generalisation across time from tutoring to nontutoring conditions. Secondly, they were to 'wash out' the effects of preceding tutoring phases and so avoid possible effects of contrast and multiple treatment.

Hersen and Barlow (1976) consider an indirect comparison to provide a weaker comparison than one between adjacent phases. Their argument rests on the possibility of confounding variables operating with extended designs. These confounding variables include order and sequence effects (Kazdin, 1976). A simple counterbalancing between subjects was used as a partial control for these possibilities. Thus pairs of subjects received reversed orders of Error Attention tutoring \((S_1 \text{ and } S_2)\) or Practice Tutoring \((S_5 \text{ and } S_6)\).

The admonitions of Hersen and Barlow notwithstanding, the use of indirect comparisons is assumed to yield adequate data in the present experiment. The use of short reversals reducing contrast effects and counterbalanced sequencing should increase the accuracy of the comparison.
C. RESULTS

1. Reliability of observation measures

a. Classroom measures

Reliability assessments were made using inter-observer agreement measures. On some daily sessions a tutor also analysed the classroom tapes previously analysed by an experimenter. Days were randomly selected, one day per phase and agreement data were computed on all five subjects. Whole session agreement was calculated by comparing the two frequency totals. The smaller total was divided by the larger of the two totals and multiplied by 100.

Mean percent agreement for number of words initially correct for all subjects by phase were 97; 96.9; 99.3; 96; 95; 98.8. Individual percentages ranged from 87 to 100 (median = 98%). Agreement on errors was measured in the same way. Percentage Agreement for errors is smaller due to the smaller totals involved (a difference of one or two errors between observers is more significant). Percentages across phases were: 84.7; 80.7; 93.3; 70.1; 70.2; and 85. Individual percentages ranged from 20 to 100 (median = 80%). Individual percentage agreements on number of minutes in session which is the basis for rate measures were all above 95%.

b. Tutoring measures

Tutors reanalysed each other's tapes every day. Two
assessments of accuracy of carrying out tutoring were made. From the two event records it was possible to calculate agreement between the two tutors on observation of errors. By comparing specific errors observed by the two tutors point-by-point agreement on observation of errors could be gained. The resulting percentage indicates the degree to which observers would observe, and therefore attend, to the same errors. These agreement data show that the tutors achieved a mean of greater than 90% agreement on error occurrence in all tutoring phases for each subject.

The second tutor's record also yielded data on the use of the complete, appropriate tutoring procedure. Using as a basis the error on which both tutors agreed, the second tutor recorded the percent of those errors receiving the complete error attention tutoring procedure. Mean percentages across all phases were 89% ($S_1$) and 78% ($S_2$). There were no consistent or large differences between modelling or prompting phases, and no consistent differences between tutors on use of complete tutoring procedure.

These data show that in the majority of cases tutors carried out the complete appropriate procedure. This would have included modelling or prompting, obtaining imitations or repeated corrections, requiring rereading of sentences, and, providing descriptive praise statements for correctly reread sentences.
2. Classroom reading: standard text.

Daily session data for percent words read initially correctly are graphed in Figures 3.2; 3.3; and 3.4. Phase means for self corrections, and correct and error rates are contained in Table 3.2. Where there were six or more data points in a phase percent words read initially correctly were submitted to trend analyses based on Linear Regression lines.¹

Trend analyses are particularly useful with academic measures where changes in rate of acquisition and trends towards criterion levels of responding are of primary concern.

The regression lines are used to make statements about phase trends and comparisons between phases concerning changes in slope and level (see Jones, Vaught, and Weinrott, 1977, for further description; and Arvidson, 1977; and Kazdin, 1976, for statistical logic). A change in level of responding is said to occur where the last point describing the linear trend in one phase has a different value from the first point describing the linear trend in the following phase.

With this method of trend estimation, a statistical test of the significance of difference between two phases can be used. The regression line of one phase is

¹ Method of least squares
projected onto the following phase. A projected mean at the midpoint of the second phase data is computed. This projected mean is used in a t test of the difference between the two phase means (uncorrelated data). Because of high positive slopes, the 100% ceiling and small numbers of data points these phase comparisons were only possible between the first baseline phase, and the first tutoring phase for all subjects. These tests and other descriptions and analyses are presented below for each subject.

Subject One (Error Attention Tutoring)

Mean data from Table 3:2 show $S_1$ read more rapidly with high accuracy during tutoring phases compared with nontutoring (baseline). Reading in all three tutoring phases was above 95% words read correctly. Three of the four baseline phases were below 90%. Correct rates during tutoring phases were above 70 correct words per minute, and were below 60 correct words per minute during nontutoring phases.

$S_1$ self corrected more than 20% of his errors in all tutoring phases, and in three out of four baseline phases. Taking a grand mean across phases, self corrections were higher during tutoring phases compared with nontutoring phases.

Daily measures of words read initially correctly (Figure 3:2) also indicate marked differences between all tutoring and nontutoring phases. The large negative slope
Table 3.2
Phase Means For Classroom Oral Reading.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Baseline</th>
<th>Tutoring</th>
<th>Baseline</th>
<th>Tutoring</th>
<th>Baseline</th>
<th>Tutoring</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error Attention Tutoring</td>
<td>(P)²</td>
<td>(M)*</td>
<td>(P)</td>
<td>89.5</td>
<td>97.9</td>
<td>91.8</td>
<td>95.6</td>
</tr>
<tr>
<td>Percent correct</td>
<td>93.4</td>
<td>95.3</td>
<td>92.4</td>
<td>95</td>
<td>87</td>
<td>92.6</td>
<td>92</td>
</tr>
<tr>
<td>Percent self correct</td>
<td>20.5</td>
<td>30.8</td>
<td>27.5</td>
<td>31.1</td>
<td>11.9</td>
<td>20.3</td>
<td>26.5</td>
</tr>
<tr>
<td>Correct rate</td>
<td>53</td>
<td>61.8</td>
<td>60.6</td>
<td>79.6</td>
<td>40.8</td>
<td>70.5</td>
<td>53.4</td>
</tr>
<tr>
<td>Practice Tutoring</td>
<td>(CP)</td>
<td>(NCP)*</td>
<td>(CP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₂ (1,2)</td>
<td>Percent correct</td>
<td>82.9</td>
<td>95.4</td>
<td>84.3</td>
<td>85.6</td>
<td>80.3</td>
<td>94.2</td>
</tr>
<tr>
<td>Percent self correct</td>
<td>75</td>
<td>50</td>
<td>26.7</td>
<td>26.5</td>
<td>9.5</td>
<td>43.3</td>
<td>25.4</td>
</tr>
<tr>
<td>Correct rate</td>
<td>14.3</td>
<td>32.9</td>
<td>18.9</td>
<td>21.3</td>
<td>13.3</td>
<td>39.9</td>
<td>18.9</td>
</tr>
<tr>
<td>Practice Tutoring</td>
<td>(NCP)</td>
<td>*</td>
<td>(CP)</td>
<td>(NCP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₆ (1,2)</td>
<td>Percent correct</td>
<td>79.2</td>
<td>87.6</td>
<td>81.6</td>
<td>85.4</td>
<td>78.2</td>
<td>88.7</td>
</tr>
<tr>
<td>Percent self correct</td>
<td>35.6</td>
<td>61</td>
<td>27.9</td>
<td>35.3</td>
<td>26.1</td>
<td>47.2</td>
<td>30.5</td>
</tr>
<tr>
<td>Correct rate</td>
<td>17.0</td>
<td>31.1</td>
<td>25.5</td>
<td>33.4</td>
<td>28.7</td>
<td>51.7</td>
<td>20.1</td>
</tr>
</tbody>
</table>

3. Words read initially correctly ÷ total words read (× 100)
4. Self corrections ÷ errors (including self corrections) (× 100)
5. Correct words per minute.

1. Numbers refer to level of text read
2. P = prompting; M = modelling; CP = contingent praise; NCP = non contingent praise; B = baseline.

* Change in text level.
FIGURE 3:2 Percent words read initially correctly in daily classroom sessions by $S_1$ (upper graph) and $S_5$ (lower graph)
evidenced in the first baseline phase was reversed in the first tutoring (prompting) phase. There is a change in level between the two phases. The difference between the two phases is highly significant as measured by the t test comparison of the projected baseline 1 mean with the first tutoring phase (prompts) mean (see Table 3:3). The second baseline shows a marked drop in level and has a low negative slope. The second tutoring phase (models) has a high initial level in comparison with the preceding baseline, but the regression line associated with the data points has a strong negative slope (-1.01). The estimated last data point of this phase is below that of the estimated last day of the preceding baseline phase. The four data points of baseline 3 are below those of the previous baseline. It should be noted that a change to a more difficult text took place during the modelling phase. Data points in the last tutoring phase (prompts) are relatively stable showing close to zero slope. The baseline 4 phase has a mean close to those of the first and second baseline phases.

The data for $S_1$ generally show marked positive effects of tutoring over no tutoring. A t test of non correlated means between all percent correct data points under tutoring and all percent correct data points under non tutoring is highly significant (see Table 3:3).
## Table 3:3

\( t \) Test Scores for Phase Comparisons Between Actual Means and Projected Means from Previous Phases and Between Fooled Phases.\(^a\).

<table>
<thead>
<tr>
<th></th>
<th>Baseline 1 / Tutoring 1(^b)</th>
<th>All tutoring / all baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>( S_1 )</td>
<td>4.567 ***(^c)</td>
<td>6.083 ***</td>
</tr>
<tr>
<td>df = 20</td>
<td></td>
<td>df = 53</td>
</tr>
<tr>
<td>( S_2 )</td>
<td>4.675 ***</td>
<td>5.407 ***</td>
</tr>
<tr>
<td>df = 15</td>
<td></td>
<td>df = 46</td>
</tr>
<tr>
<td>( S_5 )</td>
<td>3.121 **</td>
<td>2.609 *</td>
</tr>
<tr>
<td>df = 19</td>
<td></td>
<td>df = 60</td>
</tr>
<tr>
<td>( S_6 )</td>
<td>1.11 NS</td>
<td>4.04 ***</td>
</tr>
<tr>
<td>df = 14</td>
<td></td>
<td>df = 44</td>
</tr>
<tr>
<td>( S_8 )</td>
<td>0.561 NS</td>
<td>0.613 NS</td>
</tr>
<tr>
<td>df = 17</td>
<td></td>
<td>df = 48</td>
</tr>
</tbody>
</table>

\( a. \) all \( t \) tests are two tailed.
\( b. \) based on projected mean from the first phase.
\( c. \)  
* \( p < .05 \)
** \( p < .01 \)
*** \( p < .001 \)

NS. not significant at .05 level.
The comparison between prompting and modelling conditions is clouded by the introduction of a new text in session 36. Nevertheless, several measures (see Table 3:2 and Figure 3:2 upper graph) suggest greater positive effects of prompting compared with modelling. The data vary widely during non tutored phases compared with tutoring phases which are close to the 100% ceiling. Baseline responding is markedly reduced in the baseline phase following the introduction of the new text. Responding in the final baseline (four) is more like responding in the first two baselines.

Subject Five (Practice Tutoring)

This subject read the same text passages in the same sequence as Subject One. Data from the baseline phase show S₅ read with higher accuracy than S₁, was self correcting one in five errors and had a similar correct rate to S₁ (see Table 3:2). Tutoring phases (practice tutoring) are associated with greater accuracy and higher correct rates compared with non tutoring phases. Self corrections are, on average, higher during tutoring phases. Except for one baseline phase, mean accuracy in both tutoring and non tutoring phases is above 90% and percent errors self corrected is above 20%.

Percent correct session data in Figure 3:2 (lower graph) show relatively stable responding over the baseline phase with close to zero slope in the regression line. The change from the first baseline phase to the
first practice tutoring (Contingent Praise) phase is limited due to close to 100% responding in the two phases. There is a small change in level up to the estimated first data point in practice tutoring. Daily responding during the first practice tutoring phase shows a minimal trend and is relatively stable. The t test comparison between the phases based on the projected mean from the first baseline phase shows a significant difference (see Table 3:3). Responding in the second baseline phase is within the range of the first baseline phase. The second practice tutoring phase (noncontingent praise) begins at a high level and has a stable negative slope. As with S1, a more difficult text was introduced during this phase. The four data points in the third baseline phase are low as are the mean values for self corrections and correct rate: (see Table 3:2). The third practice tutoring phase (contingent praise) also has low mean values for all three responses. The regression line for these data points indicate a low negative trend with more variable responding than in other tutoring phases. Data in the following baseline phases are indistinguishable from the range, level and trend set in the previous practice tutoring phase.

In summary, the data in Table 3:2, 3:3 and Figure 3:2 (lower graph) show practice tutoring had positive effects on accuracy correct rate and percent errors self corrected compared with nontutoring phases. A t test between the mean percent correct words for all tutoring
phases and mean for all nontutoring phases reaches significance at the .05 level (see Table 3:3). There were no marked differences between responding during contingent praise compared with noncontingent praise.

A comparison between $S_1$ (Error Attention Tutoring) and $S_5$ (Practice Tutoring) indicates that for $S_5$ means for baseline phases are higher for percent correct, and, means for tutoring phases are generally lower than $S_1$ (see Table 3:2). There is a noticeable difference in performance under the tutoring phase which follows the introduction of the new text. $S_1$ read with greater mean accuracy and self corrected a higher mean percentage of errors than $S_5$. Subject One therefore maintained the high percentages of responding previously set under error attention tutoring conditions but Subject Five responded at markedly lower percentages in comparison with other practice tutoring phases.

**Subject Two (Error attention tutoring)**

Mean data for $S_2$ are presented in Table 3:2. They show the same general differences between tutoring and non tutoring phases as $S_1$. More words were read correctly and at a faster rate during tutoring phases. Except for baseline 3 all phase means for self correction data are above 20%. As with $S_1$, self corrections are on average higher during tutoring phases. Mean percent words read correctly is close to 95% in two of the three tutoring
phases (both modelling phases) and below 85% in all non-tutoring phases. Correct rates were above 30 correct words per minute in modelling phases, and below 20 correct words per minute in non-tutoring phases.

Daily measures of words read correctly also indicate marked differences between tutored and nontutored phases (see Figure 3:3, upper graph). Responding in the first baseline phase is relatively stable with respect to slope although data points are variable and have a range close to 20%. The first tutoring phase (models) shows a marked change upward in level. This phase is also relatively stable in having a very low positive slope. The projected mean $t$ test shows a large significant difference between the two phases (see Table 3:3). Responding during the second phase is within the range of the first baseline data points. Mean baseline responding under the prompting conditions in the second tutoring phase is lower than the earlier modelling phase and only marginally different from responding in the second baseline phase (see Table 3:2). The regression line for the percent correct data points has a high positive slope. The three data points in baseline three are within the range of the first baseline phase. Responding during the third tutoring phase (models) is similar to responding during the first modelling phase. There was a rapid increase in percent words correct to 100% at the introduction of a more difficult text on Day 47. Following introduction of the new text responding dropped to around 90%. The regression line has a low positive slope indicating little trend in these data.
FIGURE 3.3 Percent words read initially correctly in daily classroom sessions by $S_2$ (upper graph) and $S_6$ (lower graph).
In general the data for $S_2$ show that tutoring had marked positive effects compared with non tutoring. A t test (of non correlated means) between the mean percent words correct for all tutoring phases and the mean for all non tutoring phases is highly significant (see Table 3:3). There do not appear to be marked trends in responding under baseline conditions across successive baseline phases. There is a noticeable difference between responding under modelling compared with prompting conditions. $S_2$ read more quickly, with greater accuracy and self corrected a higher percentage of errors under modelling conditions.

Subject Six  (Practice Tutoring)

This subject read the same texts as $S_2'$, but was further on in the series. Data from the baseline phase (Figure 3.3, lower graph; Table 3:2) indicate this subject was reading with an accuracy and a correct rate comparable with that of $S_2$ (Figure 3.3) upper graph; Table 3:2). Apart from two data points in the baseline responding by $S_6$ was within the range of that for $S_2$.

Data for $S_6$ show that practice tutoring phases had higher means for percent words read correctly, percent errors self corrected and correct words per minute compared with baseline phases. Accuracy in practice tutoring phases was above 85% but below 90%. During baseline phases accuracy was below 80%.
Daily session data for percent words read correctly is shown in Figure 3.3 (lower graph). Responding during the first baseline phase shows a positive slope. This trend is continued with the first practice tutoring phase (noncontingent praise) with little change in level between the two phases. A t test comparison of the projected mean for the first baseline phase with the mean of the first practice tutoring phase does not reach significance at the .05 level (see Table 3:3). The second baseline phase is extremely variable (range 66.7% to 91.1%) and does not show any marked trend. The second practice tutoring phase (contingent praise) has data similar in range to those of the first tutoring phase. Unlike the first tutoring phase the data do not show a stable accelerating trend. The three data points in the third baseline are within the range set by the previous baseline but have a large range. The final practice tutoring phase (non contingent praise) is more variable than previous tutoring phases (range 77.3% to 96.5%). Percentages are higher during this phase than other tutoring phases. Responding during the last baseline phase is similar to that for the previous baseline phase.

The data for $S_6$ generally show practice tutoring phases to be associated with more accurate and faster responding and a greater percent of errors self corrected (Table 3:2 and Figure 3.3, lower graph). A t test between the mean percent words correct for all tutoring phases and the mean for all non tutoring phases is
highly significant (see Table 3.3). Responding was variable, particularly under baseline conditions and after the introduction of the new text in session 28. There are no marked differences between responding under contingent praise compared with non contingent praise. While there is a strong statistical difference between tutoring and nontutoring it should be noted that mean differences in percent words read correctly are low (average difference between phases is 8%). More importantly, accuracy of responding during tutoring phases did not consistently reach a 90% level. A comparison can be made with S₂ who initially was reading at a similar level and with the same text. For S₂ mean difference between baseline and modelling phases is 13% with responding close to 95% in these phases.

Subject Eight  (No tutoring for first 67 days)

This subject received no tutoring during the time S₁, S₂, S₅ and S₆ received tutoring. Phase boundaries as they related to the experimental subjects have been added to the session graph of percent words read correctly for S₈ (Figure 3.4). These data are easily summarised. There are no differences in responding which are associated with phase changes for the other subjects. A t test of all mean percent correct data associated with tutoring phases compared with data associated with nontutoring phases is nonsignificant at the .05 level. Similarly, a t test comparison of projected first baseline phase mean with
FIGURE 3:4 Percent words read initially correctly in daily classroom sessions by S8.
the first tutoring phase mean is nonsignificant at the .05 level (see Table 3;3). Over the full 57 sessions there is some indication of a decreasing trend in percent words read correctly (the linear regression slope is -.08).

Phase means indicate little difference between means for equivalent phases (Table 3:2). While means for percent words read correctly and correct rates are higher for S₈ compared with S₂ and S₆ during the initial baseline, the mean for percent errors self corrected is markedly different being lower than 10%. S₈ read the same text up to session 14 that S₂ and S₆ read in the latter part of the study.

3. Classroom reading: probe text

The probe text was introduced in Session 38 and measures were taken with the probe text on average, every second day. Accuracy data for the normal text and the probe text are shown in Figure 3.5 for S₁ (Error Attention Tutoring) and Figure 3.6 for S₅ (Practice Tutoring). Phase means for percent errors self corrected are included.

Measures of reading both the normal text, and the probe text were continued after the present study finished (Session 57). Following the study of error attention tutoring, further components were added to the tutoring 'package'. These components were based on
FIGURE 3:5  Percent words read initially correctly in daily classroom sessions, and mean percent errors self corrected across phases by S₁ on the experimental and probe texts.
comparisons of effective components made in the course of the wider study. The SC component (see Figure 3.5) involved instructions and descriptive praise for self corrections. The P/M component was similar to prompting tutoring except that if a correction did not occur after three prompts a model was given.

Session data for $S_1$ (Error Attention Tutoring) up to the fourth non tutoring phase suggest that tutoring phases had little effect on the accuracy of reading the probe text. Under tutoring conditions means for percent errors self corrected are minimally higher and closer to 20% (Figure 3.5). With the addition of the Self correction (SC) and Contingent Praise (CP) components the number of probe data points for percent words read correctly under 85% is markedly reduced. Under the combined conditions most data points are close to 90%. Percent errors self corrected also rose during the last two tutoring phases. It is interesting to note that baseline session data for the standard text show that the ascending baseline trends noted in the final two baseline phases of the present study continued.

It appears from Figure 3.5 that for $S_1$ the facilitative effects of error attention tutoring on words read correctly were specific to the tutored text. The addition of instructions and praise for self corrections and correct responding to the tutoring 'package' was associated with rising probe measures in both words read correctly and
FIGURE 3:6 Percent words read initially correctly in daily classroom sessions, and mean percent errors self corrected across phases by S5 on the experimental and probe texts.
errors self corrected.

For Subject Five (Practice Tutoring) percent words correct up to the fourth baseline phase are similar to $S_1$ (Figure 3.6). There is little evidence for change in probe measures associated with change from tutoring to nontutoring (baseline conditions). Phase means for percent errors self corrected on probe text passages do not show rises during tutoring phases. Percent words read correctly rises markedly with the addition of the Self correction (SC) and Prompting components, for both the probe and standard text. Responding under these conditions is close to or above 90%. Responding to the standard text has a stable positive slope. There is a rise in mean percent errors self corrected on probe text passages from the fourth baseline phase.

Data for $S_5$ show that the effects of practice tutoring were specific to the tutored text. The addition of instructions and praise for self corrections and Error attention tutoring were associated with increasingly more accurate responding in both the probe and the standard text. It should be noted that Self corrections for the tutored text were high under previous conditions and were not markedly different under the last phase. This suggests, therefore, that for $S_5$ the locus of the effect on both probe and standard text responding was the error attention tutoring component which was added in the last phase.
4. Tutoring measures

Mean data for words read initially correctly in pre- and post-tests are presented in Table 3.4. The data show that both error attention tutoring (S₁, S₂) and practice tutoring (S₅, S₆) produced gains from the pre- to the post-tutoring test. Differences between subjects in beginning accuracy, changes in the number of words read in the minute tests, and the ceiling of one hundred percent make inter-subject comparisons difficult to interpret.

Tutoring produced similar post test levels for S₁ (Error Attention Tutoring) and S₅ (Practice Tutoring), even though means for S₁ show a decrease in accuracy on the pre-test. The session data indicate that S₁ tended to become more accurate on the pre-test over time within a phase whereas S₅ immediately showed high percentages.

Error attention tutoring for S₂ had a strong effect in the first phase, was reduced in the second phase and again had strong effects in the third phase. These data parallel the classroom session data (Figure 3.3, upper graph) which show the first and third tutoring phases (Modelling) producing stronger effects on classroom responding. S₂ became more accurate on the pre-test across successive phases. The data for S₆ show that by the third tutoring phase S₆ had reached an acceptable mean accuracy (greater than 90%) on the pretest measure.
Table 3.4

Mean percent words initially correct across phases from pre- and post-test tutoring.

<table>
<thead>
<tr>
<th>SUBJECTS</th>
<th>TUTORING</th>
<th>PHASES</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1 Error</td>
<td>Pre</td>
<td>96.1</td>
<td>90.5</td>
<td>88.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>99.4</td>
<td>98.4</td>
<td>97.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>3.3</td>
<td>7.9</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>5 Practice</td>
<td>Pre</td>
<td>91.3</td>
<td>97.3</td>
<td>97.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>96.2</td>
<td>98.0</td>
<td>98.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>4.9</td>
<td>0.7</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>2 Error</td>
<td>Pre</td>
<td>74</td>
<td>83.4</td>
<td>88.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>96.4</td>
<td>88.6</td>
<td>98.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>22.4</td>
<td>5.2</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>6 Practice</td>
<td>Pre</td>
<td>81.4</td>
<td>79.2</td>
<td>93.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>91.6</td>
<td>88.9</td>
<td>95.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>10.2</td>
<td>9.7</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>
A comparison between $S_2$ (Error Attention Tutoring) and $S_6$ (Practice Tutoring) in the first tutoring phase suggests that appropriate error attention tutoring for $S_2$ (modelling) had a stronger effect on accuracy than did practice tutoring for $S_6$. Stronger immediate effects of error attention tutoring compared with practice tutoring are suggested also in the data on error rates during pre- and post-tests (Table 3.5). For $S_1$ and $S_2$ a large decrease in error rate occurred in the first tutoring phase. Error rates actually increased for both practice tutoring subjects ($S_5$ and $S_6$). A similar increase occurred in the third tutoring phase for $S_6$.

One final area of comparison comes from the change in accuracy from the post-test from tutoring in the morning session to the afternoon classroom session on the same material. These data (from Table 3.4 and 3.2) show that Practice Tutoring subjects dropped considerably more than Error Attention Tutoring subjects in accuracy from the tutoring post-test to the classroom responding. Across all three tutoring phases the differences between the post-test and the classroom measure were 2.1% for $S_1$ and 3.2% for $S_5$; 2.6% for $S_2$ and 3.5% for $S_6$. 
Table 3.5

Mean error rates across phases from pre-and post-test tutoring.

<table>
<thead>
<tr>
<th>SUBJECTS</th>
<th>TUTORING PHASES</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Error</td>
<td>Pre</td>
<td>2.6</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>Attention</td>
<td>Post</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Tutoring</td>
<td>Difference</td>
<td>2.2</td>
<td>3.6</td>
</tr>
</tbody>
</table>

| 5        | Practice        | Pre  | 3.8  | 1.8  | 1.2  |
|          | Tutoring        | Post | 4.6  | 1.7  | 1.1  |
|          | Difference      | Difference | -1.2 | 0.1  | 0.1  |

| 2        | Error           | Pre  | 2.3  | 3.0  | 3.4  |
|          | Attention       | Post | 0.7  | 2.7  | 0.6  |
|          | Tutoring        | Difference | 1.6 | 0.3  | 2.8  |

| 6        | Practice        | Pre  | 3.8  | 5.8  | 2.3  |
|          | Tutoring        | Post | 4.0  | 5.5  | 2.7  |
|          | Difference      | Difference | -0.2 | 0.3  | -0.4 |
5. Teacher measures

Data were taken on teacher behaviour during the one-to-one oral reading interactions in the classroom session. No major differences within and between subjects on important teacher variables were observed. The teacher attended to a smaller percentage of errors during tutoring phases (average difference between tutoring and non-tutoring means for all subjects was 9% errors attended to). The teacher attended to similar percentages of errors for $S_1$ and $S_5$ (60%), and for $S_2$ and $S_6$ (75%). Measures of teacher praise statements per minute did not show differences between or within subjects across phases. Mean teacher praise rates were uniformly low (less than 0.8 praise statements per minute). These data suggest that differences between error attention and practice tutoring subjects on classroom behaviour were not due to changes in teacher behaviour.
Low progress readers were tutored outside their classroom in a 12 minute morning session. The major measures of the effects of tutoring were taken in the afternoon reading session in the reader's classroom. The measures therefore assess generalisation of effects across time and across settings. Contingent attention to errors markedly facilitated words read correctly (i.e. accuracy of oral reading). The effect was educationally significant in that it produced an acceptable high accuracy for the two readers receiving error attention tutoring.

The two practice tutoring subjects provided an important contrast. Practice, or increased opportunity to make responses was associated with increases in accuracy. This finding is in agreement with data reported in Chapter Two of an earlier experiment. In that study a baseline became a treatment, probably because it programmed increased practice. Practice effects are well known in psychological research and are an important learning process variable (Hintzman, 1976). In reading this variable has been used as an intervention strategy by Lovitt in several experiments on 'previewing' (Lovitt, Eaton, Kirkwood and Pelander, 1971; Lovitt, 1976). These data suggest that increased amounts of silent or oral reading can facilitate accuracy and correct rates. In some studies there are difficulties in interpreting
the specific effects of previewing, in that additional instructional variables are temporally associated with the 'previewing' condition (Lovitt, 1976) or phase sequence effects may have contributed to the outcome (Lovitt et al., 1971).

Although practice tutoring had an effect, it was not as powerful or as consistent as error attention tutoring effects were for S_1 and S_2. The data for S_5 and S_6 were less consistent (more variable), and accuracy under tutoring conditions did not reach the same levels. A comparison between S_1 and S_5 also suggests that the effects of introducing a new text were less disruptive under error attention conditions (compare the third tutoring phases). The contrast subject data enable a firmer conclusion concerning the effects of error attention tutoring. Some of the demonstrated change in accuracy is likely to be due to practice effects. However, there are good indications from the contrast that error attention produced stronger and more consistent effects.

The data do demonstrate that practice effects are an ever present source of confounding variables which need to be controlled for in research on academic behaviour. It is interesting to speculate on the possible causal variables operating under practice conditions as the term practice tutoring is essentially a descriptive label. If it is correct that readers acquire self control (self improvement)
strategies in reading and that self correction is a component skill, then practice for $S_5$ and $S_6$ may have provided opportunities for self improvement. As with $S_1$ and $S_2$, these two subjects showed initial high levels of self correction.

Together with $S_8$, the contrast subjects provide an important measure of variables operating outside the experiment. It is, for example, possible that the reduced responding shown by $S_1$ and $S_2$ under models and prompts was due to other variables operating at the time of implementing the second tutoring phase. This argument is made less tenable by the data from the contrast subjects which do not show general reduction in responding during the time of the second tutoring phase. For $S_1$ and $S_5$, however, the data do suggest the possibility that the introduction of a new and more difficult text during that phase may have depressed responding.

No effects on self correction behaviour were apparent from implementation of error attention tutoring. Both error attention subjects had high initial rate of self correction. This indicated both subjects had already acquired some components of self controlled reading. Thus acquisition trends in this area were not directly facilitated by the tutoring procedures.

Nevertheless, the data consistently show that attention to errors not only influenced accuracy, but
also influenced self correction behaviour. This finding is in keeping with the model of self controlled reading suggested earlier. Self correction was seen to be dependent on discrimination capabilities. Given that error attention facilitated accuracy and this implies changes in discrimination capabilities, then change in self correction could be predicted to occur.

The difference between the two subjects in terms of prompting and modelling was in line with expectations. The general comparison between modelling and prompting indicated that modelling was more effective than prompting for S₂, the less proficient reader. S₁, generally performed better under prompting conditions.

The analysis of differential effects of type of attention was a simple comparison without any control over the degree of 'match' between prompting and the readers' responses. As noted earlier in Chapter Two the obtained difference is not likely to hold if prompts can be 'matched'. Nevertheless models were demonstrated to produce greater effects for the weaker reader under conditions where prompting procedures were not precisely delineated in terms of a match. This has implications for other tutoring settings where precision is not possible (e.g. para-professionals with minimal training). Research however is now needed on the question of 'match' between prompts and reader responses.
There was some indication that, after the introduction of a new text $S_1$ showed generalised acquisition in that non tutored reading (baseline conditions) improved (Fig. 3:2, and 3.5). This was not the case for $S_2$. This difference between subjects may be attributable to differential effects of prompting compared with modelling. Prompts were less effective for $S_2$ than for $S_1$. It was possible that the reduced effectiveness of prompts for $S_2$ compared with modelling was a lack of 'match' between the prompts and $S_2$'s response repertoire. In Chapters One and Two it was noted that models may have a different function from prompts and carry less specific information about cues. If this difference operated in the present study then $S_1$ could be expected to learn and generalise more from the 'matched' prompting than $S_2$ could from modelling.

The strengthened conclusion concerning error attention effects is congruent with the data base reported in Chapter One on error feedback effects in concept learning (Bourne, Ekstrand and Dominowski, 1971), and visual discrimination learning (Bitgood, Segrave and Jenkins, 1976). These studies indicate that learning outcomes are associated with error feedback. The post-check data further indicate that error attention may have operated primarily on the correction of error responses rather than on retention and strengthening of
correct responses which is also congruent with the feedback literature (Kulhavy, Yekovich and Dyer, 1976).

Error attention tutoring was seen to be effective in comparison with no tutoring. Data from the third contrast subject, S₈ emphasises the comparison. From this subject it seems that the classroom programme had little effect on general acquisition trends. The initial baseline data from the tutoring subjects support this conclusion. Only S₆ shows any strong indication of an upward trend over the 14 days of first baseline.

The probe data from S₇ and S₅ provide important data on generalisation to a different, non tutored text. For S₇ there was a slight indication in the data that error attention tutoring was associated with generalised self correction behaviour. This possibility is examined in greater detail in the research reported in Chapter Four. In general, however, tutoring phases had little differential effect on the probe text for both subjects while either error attention or practice and praise operated. Interestingly, when error attention and contingent praise and instructions for accuracy and self corrections were combined there was a concurrent rise in both probe and standard text measures for both subjects.

Although these are not directly controlled experimental data the probe measures for both subjects are consistent in one
major respect. The effects of tutoring were specific to
the tutored text until the two tutoring components of
error attention and praise for acquisition of efficient,
accurate and self controlled responding were present.
The implication is that both informational and motivational
variables are significant in learning generalised responding.
This implication is related to questions concerning
properties of feedback. In summarising the literature on
feedback in concept learning Hulse, Deese and Egeth (1975)
have noted that feedback to both errors and correct
responses produce learning by providing different sorts
of information. But that conclusion remains based on a
one-dimensional conceptualisation of feedback, concerned
only with analyses of informational properties of feed-
back. Earlier it was suggested that a two-dimensional
analysis of feedback was needed so that both motivational
and informational properties are considered. Consideration
of both properties may help to explain the equivocal
results of feedback studies (e.g. Nelson and Hay, 1976).
The need to consider both informational and motivational
properties of contingent events has been recently restated
by Bandura (1977).

The present study, however, extends the analyses of
properties of feedback. If the conclusion concerning the
need for contingencies on both correct and error responses
for generalisation is accurate, then there is the further
implication that such attention to both correct and error
responses has similar properties. Thus attention to both correct and error responses may have both motivational and informational properties. This conceptualisation is especially important for explanations where contingent events have unintended results such as error attention events reinforcing error production (e.g. Sajwaj and Knight, 1972).

Earlier discussion would further suggest that both properties could vary freely but are both present in a contingent attention event.

The probe data suggest that this two way conceptualisation of attentional properties and contingencies may be relevant to current concepts of generalisation (cf. Marhold, Siegel, and Phillips, 1976) and the technology of generalisation (Stokes and Baer, 1977). Praise and instructions for the use of self controlled and efficient accurate responding may have supplied motivational and informational parameters necessary for the production of those responses with a novel text.
A. INTRODUCTION

The research reported in Chapter Three demonstrated that a tutoring 'package', based on attention to errors, produced powerful effects on the accuracy of oral reading. The next question to be asked concerns a more detailed analysis of the component dimensions of error attention.

Timing of tutor attention to errors is one component dimension. Attention, delayed until the end of a phrase or sentence was predicted to have greater effects on acquisition of proficient reading than more immediate attention.

The subjects in this study were younger than those in the previous study. Error attention tutoring replaced the usual one-to-one teacher-reader interactions. The experimental procedures were carried out in this tutoring setting by special tutors rather than by the classroom teacher. The use of special tutors facilitated control over the implementation of experimental procedures. The timing of error attention was the only experimental change in tutoring conditions.

On alternate days, in addition to daily tutoring, the subjects read a second, parallel text, to the tutor. No tutoring took place during the reading of the second text. The non-tutored text provided (1) a comparison
of performance on tutored and non tutored texts, (2) a
generalisation measure of the effects of changes in timing
of attention, and, (3) some measure of change in reading
behaviour outside the changes that occurred during tutoring.
This yielded a less ambiguous measure of effects, particularly
of the relationship between accuracy and self correction.

For ease of tutoring and to provide similar conditions
across subjects, the tutors attended to all errors (i.e.
frequency of attention was set at 100%). Also, 100% error
attention could be expected to increase the differential
effects of changes in timing. Specification of prompting
procedures was more rigid than in the previous study. A
general, non-specific prompt was specified to minimise the
differences in match between tutor and reader. Experiment-
al outcomes could be attributed to changes in reader
capabilities rather than changes in the usable information
provided by tutors' prompts.

Predictions concerning effects of timing of
attention to errors are detailed on p.76. They are
summarised as follows.

Compared with Immediate attention to errors Delayed
attention will be associated with:

1. more 'self corrections.
2. greater accuracy of words read.
3. lower frequencies of errors. Errors should reflect
greater attention to contextual cues through lower
proportions of no response error types and lower proportions of response error types which are both semantically and syntactically inappropriate.

4. effects which tend to generalise across time and become more marked under continuing conditions.

B. METHOD

1. Subjects and Setting

Subjects were six year old readers (mean age at commencement of study was 6 years 8 months) from a normal second year classroom in a central Auckland primary school. Six subjects (2 boys, 4 girls) from the classroom were selected on the basis of the teacher's grouping, for reading instruction. The children came from the second of three reading groups based on position in the graded texts (Ready-to-Read series). The teacher was asked to select six readers from across the range represented in the group, who were then placed into two sub-groups so that the range was represented in each sub-group.

The teacher's selection was based on two criteria. These were progress from the beginning of the year (February) to the commencement of the study in March, and a simple criterion referenced test of accuracy of reading a basic text ('Grandma comes to stay'). The accuracy data are shown in Table 4:1. A teacher-constructed test of basic sight word vocabulary from the graded texts was
conducted on Day 23 of the study. Those data confirm the teacher's selection (Table 4:1).

Two subjects, Subject One and Subject Four, came from families which spoke a Polynesian language in the home setting. The teacher administered to all subjects a sentence repetition test designed to measure control over English structures (Record of Oral Language, Clay, Gill, Glynn, McNaughton and Salmon, 1976). Only Subject One did not score above the first of three levels indicating he had not acquired the control over basic sentence structure which the other subjects had.

The classroom was a typical second year junior classroom. There were 20 children of varying abilities in the room. Reading instruction occurred from 10.45 a.m. to 12.00 p.m. The whole class was introduced to a new text at the beginning of the session. Individual and chorus reading took place during this time. Readers then formed groups and completed writing tasks. The teacher took further reading instruction with each group individually. Each group was introduced to a new text appropriate to their level. Individual and chorus reading took place in this small group setting. The teacher instructed readers to attend to, and use all textual cues. For example, she would ask readers to discuss the meaning of text passages, predict what was likely to happen on the basis of contextual cues in the story, and, also to find words beginning with similar letters.
TABLE 4.1. Age and Assessments of reading accuracy of the two experimental groups.

<table>
<thead>
<tr>
<th>SUBJECTS</th>
<th>AGE $^1.$</th>
<th>ORAL READING $^2.$</th>
<th>BASIC SIGHT WORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_1$</td>
<td>6.10</td>
<td>—</td>
<td>90%</td>
</tr>
<tr>
<td>Group A</td>
<td>$S_2$</td>
<td>6.6</td>
<td>91%</td>
</tr>
<tr>
<td></td>
<td>$S_3$</td>
<td>6.8</td>
<td>96%</td>
</tr>
<tr>
<td></td>
<td>$S_4$</td>
<td>6.8</td>
<td>82%</td>
</tr>
<tr>
<td>Group B</td>
<td>$S_5$</td>
<td>6.8</td>
<td>91%</td>
</tr>
<tr>
<td></td>
<td>$S_6$</td>
<td>6.8</td>
<td>100%</td>
</tr>
</tbody>
</table>

1 At commencement of study, February.

2 Percent words read correctly on 2nd Ready-to-Read text.
2. Experimental Procedures

a. Classroom Organization.

The experimenter changed the classroom organisation in order to carry out the investigation of error attention variables. During the mid-morning session each subject individually read a book to a trained tutor at the back of the classroom. Every day each subject read the text which had been introduced to the whole group on the previous day. Within this individual reading setting the tutor attended to errors and carried out the experimental procedures. In addition, on alternate days, a second text was read. This second text was a teacher selected supplementary book, at the same level as the group's main text. This text had not been introduced previously in the group setting. No tutoring took place with this second text. Texts read in both tutored and non tutored reading are listed in Appendix B.

The class was used to having extra adults present for extended periods of time. Student teachers were often present as part of their training requirements. The teacher introduced the two tutors as University students wanting to hear children read. Only one of the tutors was in the classroom during a reading session. Tutors alternated irregularly from day to day so that each experimental group read equally often to each tutor in each phase.
The teacher selected and sequenced both tutored and non-tutored texts for reading. The sequence of texts read with reading level assessments is given in Appendix B. General Reading level has been obtained from the N.Z. Government Department of Education guidelines (Department of Education, 1969) and, where appropriate, from suggested sequences from the publishers.

The reading level used in Appendix B is related to the Ready-to-Read series. Each text read is assessed in terms of being supplementary to a particular text in the graded series. Two days of tutored reading in Phase I and Phase II were deleted because texts had been used on the previous day.


Two different tutoring procedures alternated across experimental phases. The tutoring procedures differed in the timing of error attention. Other error attention variables which are independent of timing were kept constant. Description of these variables follows the specifications for timing.

i) Immediate attention to errors.

The tutor intervened as soon as an error occurred. With substitution or response errors the tutor intervened before the next word was read or within one to five seconds after the substitution had occurred. Errors
which might subsequently be identified as additions were treated as substitutions. Similarly with omissions the actual word read (the word following the error) would not match with the text word to be read and would receive error attention as a substitution. When pauses occurred, the tutor intervened after not more than five seconds had elapsed from the last word read. Hence all pauses of greater than about four seconds were defined as non attempts.

ii) Delayed attention to errors.

Under the delayed tutoring conditions longer pauses were allowed to occur. The tutor intervened after at least five seconds but before ten seconds. With other errors (substitutions, omissions and additions) the tutor waited until the reader reached a major linguistic boundary such as a phrase or sentence. Because the books read contained simple sentences this typically meant intervention came at the end of a sentence. Thus with delayed attention, depending on the position of the error in the sentence, several words could intervene before error attention was programmed. Attention to errors at the end of a sentence was delayed as for non attempts.

c. Tutoring Procedures: Common procedures

Other procedures were common to both error attention procedures. With both procedures every error was attended to (i.e. frequency of attention was set at 100%). Errors
which were self corrected before error attention could occur were not attended to.

The amount, type, level, change sequence, consequent sequence and duration of error attention were also fixed and common to each procedure. These are diagrammed in Figure 4:1

Figure 4:1 Flow diagram of the procedures common to both immediate and delayed tutoring.
(1) When an error occurred the tutor first intervened with a post-error context prompt. This prompt asked the reader to continue reading to the end of the sentence to see what the correct word should be. The errors were pointed to as the verbal prompt was given. Thus the tutor typically said "Read on to the end to see what this (pointing) word should be". This meant that with delayed tutoring the reader often read the post-error context to the end of the sentence twice.

The prompt was selected for three reasons. It fulfilled the requirements of being easily specified but general, thus reducing its potential for differentially affecting subjects. Secondly, casual observations indicated the teacher often used this form of prompting. Using the same prompt might reduce the difference between tutors and the teacher. A final reason was that the method of observation would allow statements to be made concerning the probability that errors would be corrected after this prompt occurred. This would provide a means of making statements about the effectiveness of the prompt. The instructions for teaching reading made by the N.Z. Government Department of Education (1971) stress use of these prompts.

If the reader corrected the error as a result of the prompt the tutor requested the reader to reread the sentence from the beginning. Following the correct reading of the error in context, at the end of the sentence the
tutor provided a simple praise statement (e.g. "That's right this time").

(2) However, if the prompt did not result in a prompted correction the tutor supplied a second prompt which was a question or request specific to a cue source which might aid word recognition and correction. The tutors were instructed to rapidly analyse the original error to determine what cues had not been attended to, or had been incorrectly attended. The tutor prompted on the basis of this analysis. Thus the tutor attempted to provide error attention which matched the reader's repertoire by providing information appropriate to solution and long term learning related to acquisition trends. Examples of such alternatives for a match included emphasising terminal sounds, or letters of a word, or questioning how many objects were involved, if a plural ending was missed.

If the error did not suggest an attentional problem, or, the tutor could not easily make a discrimination on the basis of the reader's error then a general prompt for context was used. For example, if there was a complete mismatch between text and oral response on the basis of all cue dimensions then the tutor asked a general comprehension question such as "Who fell down?" or repeated the sentence up until the error with rising intonation.

If the second prompt resulted in a correction the same procedure operated as for corrections following the
(3) If, however, the reader was still unable to correct the error a model was provided and an imitation was requested (e.g. "The word is ————, now you say it"). Following the imitation the same procedure operated as for prompted corrections.

Infrequently, an error was repeated during the reread requested after a prompted correction or an imitation.

(4) If the error was repeated the tutor followed the same procedures.

(5) With two interventions and the error being repeated a second time the tutor requested the reader to continue reading. Oral reading and recommencement of the error attention procedure began when the reader read past the initial error in a successful reread. Under delayed attention conditions the reader could make more errors between the original error and when the tutor intervened at the end of the phrase or sentence. The tutor did not attend unless the error was repeated during the final reread.

Additional procedures common to both Immediate and Delayed intervention included short descriptive statements of approval, contingent on a successful reread, and a page read without error (e.g. "You read that well, without
any mistakes"). Self corrected errors were not defined as errors for error-free reading. At the completion of the text the tutor sometimes provided two or three comprehension questions (e.g. "What happened when ...?").

d. Non-tutored reading.

On alternate days a reader read a second text to the tutor. On this non-tutored text the tutor did not attend to any errors. All substitutions, additions and omissions were ignored. When a non-attempt occurred the tutor waited ten seconds and then, if the reader did not continue, supplied a model for the correct word. When a page was read without errors (but including self corrections) the tutor made a brief evaluative statement as with tutored reading.

e. Tutor Training.

Two third year undergraduate students in Educational Psychology and Developmental Psychology were selected as tutors. Tutors were trained on both tutoring and observation procedures. Training consisted of three major components.

(1) The experimenter prepared detailed instructions on tutoring and non-tutoring procedures. Tutors read and were formally questioned on knowledge or procedures.
(2) Several sessions of practice with examples of passages of oral reading were conducted. During these sessions different sequences of attention to errors were practised and response categories (e.g. of errors) were refined.

(3) A final component involved actual tutoring in the target classroom. Again procedures were practised until accurate in terms of the written instructions. Each session of tutored and non tutored reading was tape recorded. On selected sessions the tutor who had not tutored the readers analysed the tape of tutored and non tutored reading. Accuracy of tutoring was judged by comparing the second tutor's analysis of the tape recorded interactions with the first tutor's analysis. Reliability data were calculated for accuracy of carrying out tutoring procedures.

3. Observation and data analysis

a. General procedures.

Each session the tutor who carried out the experimental procedures also made a tape of the tutored and non tutored reading. The tutor listened to the tape recording and completed a specially designed event record sheet for tutored reading and for non-tutored reading (see Appendix C). The procedures used for scoring tapes are detailed in Appendix C. They are based on a sequential event record which was designed to provide
data on events which occurred following an error.

Non tutored reading was observed using two procedures. In the major procedure photocopies were made of texts and an observer (a third student) was trained to record from tape-recordings. The training of the non tutored reading observer used written instructions and practice sessions with tape recorded examples of oral reading. Training continued until the observer coded behaviours so that 100% agreement was reached with the experimenter with selected examples. This took two half hour sessions. The observer then recorded and analysed observations of non-tutored reading by coding responses directly onto the photocopied texts. The scoring procedures are detailed in Appendix C.

b. Response definitions and behavioural measures.

i) Errors

An error was defined as any mismatch between a text word and an oral response. A mismatch occurred with an oral response when one, some, or all of the usual letter-sound elements of the correctly read word were missing, or, sounds were emitted which were not a part of the correctly read text. Mispronunciation, incorrect intonation, or incorrect emphasis did not count as errors. Errors were coded according to type and level.
Coding of errors by type was based on a comparison between graphophonic elements in the error and the text word. At one extreme are errors which involve no response at all, while at the other extreme are errors which add to the usual letter-sound elements of the text word. Letters used for coding responses on record sheets are indicated in the brackets.

(N) Non attempt. - With non attempts a text word was not attempted and a pause occurred. During non tutored reading the pause was ended usually by a request from the tutor to continue reading. With tutored reading a no response pause was terminated by tutor attention to the error.

  e.g. Text: The mice ran.
  Reader: "The mice ....."

(O) Omission - A text word omitted during oral reading was coded as an omission. With non tutoring the reader continued uninterrupted reading. On tutored texts the tutor attended.

  e.g. Text: The mice ran.
  Reader: "..... Mice ran."

(S) Substitution - A substitution occurred when the reader made an oral response which was different from the currently attended text word. During non-tutored reading the reader continued reading without interruption. With tutoring the substitution was attended to by the tutor.
(A) Addition - An addition was coded when a word which did not occur in the text was added during oral reading. With non tutoring an addition was identified as an extra word intervening between text words. During immediate tutoring additions were not possible because all response errors were treated immediately as substitutions.

LEVEL

Substitution errors were further analysed in terms of the degree or level of change from the text word. Variance from the text word was measured by coding the extent to which meaning or graphic cues were altered in the oral response. Each error was analysed along these two dimensions of possible changes.

Meaning and Grammar A substitution was analysed in terms of contextual appropriateness. Errors could vary from little change in meaning and grammar to extensive change in meaning and grammar. To consider the level of appropriateness the error was considered within the context of the total sentence. Thus a first step in the analysis was to read the whole sentence replacing the text word with the error under consideration and ignoring other errors. The error was examined to see whether
there was only a minimal or a major change in grammar and meaning in terms or pre- and post-error context. The error did not have to conform exactly with acceptable English grammar to be grammatically appropriate (e.g. "Quick" for quickly). Simple substitution of articles, conjunctions and prepositions did not result in major change to grammar and meaning (except for incorrect prepositions e.g. "under" for over). Common derivatives of proper nouns also did not result in major change in grammar and meaning (e.g. "mum" for mother).

(EP) An error which minimally changed the meaning and grammatical function of the text word was coded an EP.

  e.g.  Text:  He washed the car.
        Reader:  "He hosed the car."

        Text:  Run in, shout the children.
        Reader:  "Run on, shouted the children."

        Text:  It is a bear.
        Reader:  "It is the bear."

(ED) An ED was an error which extensively altered the meaning and grammatical function of the text word.

  e.g.  Text:  They were for Jean.
        Reader:  "The were of Jean."

        Text:  Away they went.
        Reader:  "After they went."

        Text:  They got wet.
        Reader:  "They at wet."

(EM) A third code was used for those errors which were difficult to categorise and involved some change in the
meaning and grammatical function of the text word which was not extensive.

    e.g.  Text:  We went in.
          Reader:  "They went in."

Graphic and graphophonic similarity. A substitution could also vary in the letter and letter-sound features which it had in common with the text word.

(HS) These errors showed high similarity to the text word on the basis of visual and sound features. The criterion used to judge high similarity was that at least half of the letters or sounds from the oral response were the same as those contained in the text word.

    e.g.  Text:  There were two people.
          Reader:  "These were two people."
          Text:  We jumped up.
          Reader:  "We jump up."

(LS) These errors showed low similarity to the text word on the basis of visual and sound features. The criterion of at least half the letter or sounds of the oral response being the same was not met.

    e.g.  Text:  Off we go.
          Reader:  "Off we went."
          Text:  In they came.
          Reader:  "Then they came."
Each instance of a mismatch was counted as an error. Thus if a line of the text was missed out each word in the line is an omission error. Similarly each added word, non attempted word and substituted word was an instance of an error. Each substitution error was analysed in terms of the level of mismatch with the text word on both contextual and graphic dimensions. Thus the substitution "home" for house was coded EP. HS because it varied little in terms of meaning and syntax and graphic/graphophonics features.

ii) Self Corrections

The definition of self correction was the same as in Chapter Three. Three types of errors could be self corrected.

1. An addition was self corrected if the reader correctly reread part or all of the sentence which had contained the addition.

2. An omission was self corrected by rereading part or all of the sentence with the correct text word added.

3. A substitution was self corrected by reading the word correctly either within the context of a reread of part or all of the sentence, or, as an isolated verbalisation after a few words had been read. These are the errors typically self corrected. Non attempts, by
iii) Tutor attention and tutored corrections

1. Timing of error attention. The timing of error attention was defined as Immediate (I) or Delayed (D) in terms of the criteria for the experimental procedures.

2. Type of error attention. Type referred to a general binary classification of attention into models (M) and prompts (P). A model was defined as tutor attention which provided the correct response. Prompts were defined by exclusion as any instance of error attention which did not provide a model.

3. Level of error attention. Level was determined by the text cue referred to by the prompt. There were contextual cue prompts and graphic cue prompts. Three contextual cue prompts were defined.

(1) P.C. Prompts requested the reader to solve the error reading on from the error to the end of the sentence.

(2) PM prompts requested the reader to use the meaning of the story to solve the error.

(3) PR prompts occurred when the tutor repeated with rising intonation, a word or words prior to the error in the text.
Two graphic cue prompts were defined. PW prompts requested the reader to identify the word as in the presentation of the word in isolation. PI prompts requested the reader to identify a letter or specific graphophonic components of the text word.

Error attention was therefore a verbalisation which contained a specific prompt (PC; PM; PR; PW; PI) or a model (M).

4. Prompted corrections and modelled corrections. At some point in an episode the reader emitted the correct response. Following a prompt it was termed a prompted correction (pC). Following a model it was recorded by
coding an M for a complete model.

iv) Tutor attention to appropriate responses.

Instances of tutor attention to appropriate responses were defined as for the experimental procedures.

4. Data Analysis

Major measures taken from the event records were:

(i) Percent words read initially correctly. This measure was gained by subtracting from counts of number of words read during the session the number of errors and self corrected errors. It was expressed as a percentage \( \frac{\text{words read} - (\text{errors} + \text{SC})}{\text{words read}} \times 100 \). This provides a strict measure of accuracy by considering only the first reading of a word.

(ii) Percent errors self corrected. The ratio of potential errors self corrected to total errors was expressed as a percentage. Because all self corrections were errors initially, number of self corrections appears in the denominator also: \( \frac{\text{self corrections}}{\text{self-corrections} + \text{Errors}} \times 100 \).

(iii) Analyses of error type and level. Errors made were classified into behavioural categories of type and level.

(iv) Analyses of tutor behaviour. Several measures of tutoring were taken measuring the accuracy and reliability
of carrying out tutoring procedures. These data are described more fully in the following section on reliability.

(v) Analyses of tutor behaviour and tutored corrections.

5. Experimental Design

The design adopted in the study was a variant of equivalent time series designs where subjects serve as their own controls (Campbell and Stanley, 1966; Paul, 1969). In these designs repeated measures of behaviour are taken under different experimental conditions. When therapy is involved these are usually nontreatment (baseline), and treatment phases. Such designs have been termed 'reversal', (Risley and Wolf, 1973) or 'ABAB' (Mersen and Barlow, 1976) designs. With the present study repeated, non random alternation of experimental conditions also occurred.

A within-subjects design was used for three reasons. The first concern was for maximising internal validity. This design allowed precise analytic control over the process variables operating within the experiment.

Secondly the design aimed to maximise the quality of information resulting from the study. Attention to errors is assumed to involve several dimensions. Several small scale pieces of research could provide precise and well tested information. The information so gained could then be examined in large group studies to establish full
external validity. Such a research tactic might reduce resource and interpretation problems often present in imprecise data yielded in exploratory large sample experiments.

Thirdly the nature of the psychological processes being examined demanded a within-subject design. Group designs may misrepresent individual differences (Sidman, 1960). It was hypothesised that readers with different skill repertoires may interact idiosyncratically with tutoring conditions. Thus the most effective experimental control for a reader would be that reader alone.

The two conditions in the present study could both be considered to be 'treatments' (i.e. two types of tutoring). A traditional baseline condition repeatedly measures the operant or basal level of behaviour under 'typical' conditions. Unfortunately baseline conditions in academic settings may introduce practice effects due to systematic repeated measurement. Together with general acquisition trends from classroom instruction ascending baselines may result making experimental control difficult to demonstrate.

Baseline phases were avoided in an attempt to limit the effects of practice from repeated measurements. Tutoring conditions were compared directly. The absence of baseline conditions meant that the effectiveness of tutoring could not be compared directly with no tutoring. To make
a direct comparison the study would have had to have been longer, and by alternating three phases would have introduced further problems of sequence and contrast effects (e.g. Ullman and Sulzer-Azaroff, 1975) and biasing effects of multiple treatment and testing applications (Paul, 1969). These problems were present in the study reported in Chapter Three.

Nevertheless, an indirect comparison was attempted in the present study. A concurrent no tutoring condition was available with a non tutored text. Every second day subjects read a second text without any tutoring occurring.

The design is shown in Table 4:2. Experimental phases of immediate and delayed tutoring were programmed within the tutored sessions. Two groups were identified. Groups received tutoring phases in counterbalanced order. This was an attempted control for possible sequence and contrast effects.

6. Observer reliability and tutor accuracy

The basic data for tutoring were gained from tape recordings of reading sessions. The tutor for each session also acted as primary observer. On selected days the tutor who had not conducted that day's session also analysed the tape recording of tutored readings. The second analysis of all subjects occurred at a different time and place from the tutoring. It was the basis
### TABLE 4:2  Experimental Design

<table>
<thead>
<tr>
<th>PHASES</th>
<th>7 days</th>
<th>7 days</th>
<th>8 days</th>
<th>8 days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group A</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>(N = 3)</em></td>
<td>Tutored reading</td>
<td>D</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>Non-Tutored reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>(Alternate days)</em></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>(N=3)</em></td>
<td>Tutored reading</td>
<td>I</td>
<td>D</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>Non-Tutored reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>(Alternate days)</em></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

I = immediate attention tutoring

D = delayed attention tutoring
for reliability assessment of tutored reading data.

There were a total of 162 teacher-reader sessions. 27 sessions were analysed twice. These were distributed across all phases. It was planned to have equal numbers in each phase, however observer absence during Phase 2 reduced the number in that phase. Percentages of sessions receiving reliability checks within phases were; Phase 1 - 21%, Phase 2 - 11%, Phase 3 - 14%, and Phase 4 - 21%.

Data for non tutoring were also gained from tape recordings of reading sessions. Again, the tutor for each session carried out observations. The primary data gatherer for non tutored reading, however, was a third observer. Tape recordings coded independently by this observer were used as the primary data. The daily observations conducted by tutors provided reliability checks for all sessions. Reliability of both sets of primary observation were assessed by calculating inter-observer agreement.

a. Tutored Reading

Two types of agreement data were computed for observations of tutored reading.

i) Session Frequency counts of errors and self corrections were compared. The smaller of the two
observers' totals was divided by the larger and multiplied by 100. This method of calculating reliability of observations is potentially inaccurate (Johnson and Bolstad, 1973; Repp, Deitz, Boles, Deitz, and Repp, 1976). A more precise form of reliability assessment examines agreement on the occurrence of specific events (sometimes referred to as point-by-point agreement, Kelly, 1977; Repp. et. al., 1976).

ii) A second check on reliability of observing errors was carried out using point-by-point agreement. Using the primary observer's data as a standard, each recorded error occurrence was examined by noting occurrence or absence in the second observer's record sheet. Agreement was counted if three conditions were met. They were (1) that the exact text word which led to the error was written verbatim in the second observer's record sheet, (2) that it was recorded in the same sequence, and (3) that the type of error coded for that word (i.e. S, A, O or N) was exactly the same. Thus disagreements could occur if a text word was not recorded by the second observer, if the error coded was not the same, and if the errors did not follow the same sequence.

A similar point-by-point method was used to examine the reliability of observing tutor behaviour. Agreement data for tutoring behaviours were based on errors recorded by both the first and second analyses. Comparisons of
observations of specific tutoring behaviour were then made.

An estimate of the accuracy of tutoring was obtained from these agreement data. The event records were examined in terms of the presence of the correct experimental procedure. Measures of the accuracy of attending to errors, the timing of attention and the required initial (post-error context) prompt were taken. For each error episode tutor behaviours were compared with the correct tutoring procedures. Point-by-point assessment of the "correctness" of tutor behaviour was calculated by dividing instances of correct behaviour by both correct and incorrect instances. Incorrect tutoring could be lack of required behaviours (e.g. attention to an error) or inaccuracy in carrying out procedures (e.g. immediate attention under delayed conditions).

The assessment of use of correct procedures by the two observers were averaged. This average provided the final assessment of the accuracy of tutoring. Because the agreement between observers was high (see Table 4:3) the resulting average percentages could be considered to be reliable assessments of the accuracy of tutoring.

b. Non tutored reading.

Two types of agreement data were computed for observations of non-tutored reading.
i) Product moment correlations were made between session totals for the two observers, for both errors and self corrections. This third method was possible because every data point also had a reliability observation. Low numbers of paired observations with phases for tutored texts precluded its use with tutored reading data. This method is useful in dealing with the problem of low session totals. Small differences with low totals yield large percentage differences with the previously used method of dividing smaller by larger session totals.

The resulting correlations have precise mathematical interpretations. The correlation coefficient equals the proportion of total score variance not due to error, and the degree of linear association between the two observers' data (Hartmann, 1977).

ii) While computing correlation coefficients it was noticed that there was a consistent error between observers. The primary observer consistently recorded greater numbers of errors. This consistent error may have been due to the conditions under which the primary observer analysed the tape recordings, or differences in the degree of observer training. In order to show the extent of the difference between observers' agreement was also calculated using session totals, dividing the smaller of the observers' totals by the larger and multiplying by 100.
C. RESULTS

1. Reliability of observations and tutoring.

a. Tutored reading

Percent agreement scores are shown in the first and third column of Table 4:3. Mean percent agreement across all phases was 84.2% for errors (range 60 - 100), and 77.7% for self corrections (range 50 - 100). There were no large differences across phases except for a substantially higher agreement over observations of self corrections in Phase II. This was due to a reduced number of cases exaggerated by the exclusion of one session’s data because one observer recorded zero self corrections. The formula is inoperable if one or both observers record no occurrences. There were no major differences between reliability of observations of delayed and immediate tutoring sessions.

Point by point agreement scores on the error word and type are shown in Column Two of Table 4:3. Total percent agreement, and agreement within phases was above 80%. There were no major differences in reliability across phases or between Delayed and Immediate tutoring phases. This more precise method of assessing agreement indicates there was substantial agreement between observers over the occurrence of types of errors.

Data on tutor behaviour are also presented in Table 4:3. Observer agreement on the Timing and Type of Initial
<table>
<thead>
<tr>
<th>ERRORS</th>
<th>SELF CORRECTIONS</th>
<th>TUTORING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Word &amp; Type</td>
<td>Timing</td>
</tr>
<tr>
<td>Phase I</td>
<td>78.4</td>
<td>74.5</td>
</tr>
<tr>
<td>II</td>
<td>82.4</td>
<td>100</td>
</tr>
<tr>
<td>III</td>
<td>91.5</td>
<td>73.2</td>
</tr>
<tr>
<td>IV</td>
<td>86.2</td>
<td>76.4</td>
</tr>
<tr>
<td>MEAN</td>
<td>84.2</td>
<td>77.7</td>
</tr>
<tr>
<td>Delayed</td>
<td>83.3</td>
<td>82.9</td>
</tr>
<tr>
<td>Immediate</td>
<td>85.0</td>
<td>74</td>
</tr>
</tbody>
</table>

1 Agreement calculated each session by formula \[ \frac{\text{smaller total}}{\text{larger total}} \times \frac{100}{1} \] (Johnson and Bolstad, 1973)

2 Point-by-point agreement calculated each session by formula \[ \frac{\text{Agreements}}{\text{Agreements} + \text{Disagreements}} \times \frac{100}{1} \]
using the primary observer as a basis for agreement on occurrence of events (Repp, Deitz, Boles, Deitz and Repp, 1976).

3 Agreement calculated as for 2 above based on errors recorded by both \( o_1 \) and \( o_2 \).
Prompts were consistently close to, and above 90%, as calculated by the point by point method. Means across all phases were above 95%. Agreement on complete tutoring sequence (from initial prompt through to prompted correction or model) was lower. The mean for all phases was 76.8%. The lower mean is partially accounted for by a low agreement in Phase I. This mean is in turn accounted for by low agreement data in the first few days of the phase. Three sessions resulted in agreements of 50%, 54.5% and 60%. Inspection of these records shows that in all three cases one observer did not code a particular category of tutor behaviour. This observer received further training after the third day. The data generally indicate high agreement between observers on tutor behaviour.

Accuracy of tutoring scores are shown in Table 4:4. The tutors were highly accurate in using the experimental procedures. Phase means, tutoring condition means and total means are above 95% in all but one instance. There were no major differences across phases or between tutoring conditions.

Accuracy in use of the correct initial prompt is both lower and more variable. The mean across all phases was 69.8%. This indicates tutors used the required initial prompt on about two thirds of the total occasions.
TABLE 4:4

Mean Percent Accuracy of Tutoring

<table>
<thead>
<tr>
<th>ATTENTION TO ERRORS</th>
<th>TIMING</th>
<th>INITIAL PROMPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>95.7</td>
<td>64.4</td>
</tr>
<tr>
<td>II</td>
<td>95.6</td>
<td>91.9</td>
</tr>
<tr>
<td>III</td>
<td>96.8</td>
<td>87.1</td>
</tr>
<tr>
<td>IV</td>
<td>98.7</td>
<td>53.1</td>
</tr>
<tr>
<td>MEAN</td>
<td>96.7</td>
<td>98.2</td>
</tr>
<tr>
<td>X for Delayed Phases</td>
<td>97.6</td>
<td>64.1</td>
</tr>
<tr>
<td>X for Immediate Phases</td>
<td>96.4</td>
<td>74.7</td>
</tr>
</tbody>
</table>

1. Accuracy of tutoring calculated each session by formula

\[
\left[ \frac{O_1 \text{ Correct}}{\text{Correct + incorrect}} + \frac{O_2 \text{ Correct}}{\text{Correct + incorrect}} \right] \div 2 \times \left( \frac{100}{1} \right)
\]
b. Non tutored reading

Correlations between the primary observer's data and the data from the reliability analyses are shown in Table 4:5. These data indicate a substantial correlation between observers for observation of errors and self corrections. Table 4:5 also presents data based on the division formula for computing agreements. The consistent error noted reduces the percentage agreement scores. The agreement between observers is higher for self corrections than errors, indicating greater similarity between observers in recording totals of self corrections.

The data show there is close agreement between observers on trends in the data while there was a small consistent discrepancy in frequency totals recorded.

2. Tutoring : Reader Behaviour

a. Self Corrections

Data for percent errors self corrected during tutored sessions are graphed in Figure 4:2 and Figure 4:3. Means for each phase for individual subjects are presented in Table 4:6.

The proportion of errors which are self corrected during reading increases substantially under Delayed Tutoring (DT) procedures compared with Immediate Tutoring (IT) procedures. All subjects show substantial change
TABLE 4:5

Product moment correlation coefficients and inter-observer agreement for tallies of errors and self corrections of non-tutored reading.

<table>
<thead>
<tr>
<th></th>
<th>ERRORS</th>
<th></th>
<th>SELF CORRECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>r</td>
<td>%</td>
<td>r</td>
</tr>
<tr>
<td>I</td>
<td>.94</td>
<td>77.3</td>
<td>.71</td>
</tr>
<tr>
<td>II</td>
<td>.96</td>
<td>69.6</td>
<td>.82</td>
</tr>
<tr>
<td>III</td>
<td>.82</td>
<td>75.8</td>
<td>.90</td>
</tr>
<tr>
<td>IV</td>
<td>.98</td>
<td>60.6</td>
<td>.78</td>
</tr>
</tbody>
</table>

1 Agreement calculated by formula

\[
\frac{\text{smaller total}}{\text{larger total}} \times \frac{100}{1} \quad (\text{Johnson and Bolstad, 1973})
\]
<table>
<thead>
<tr>
<th>GROUP</th>
<th>Phase</th>
<th>% ERRORS</th>
<th>SELF CORRECTED</th>
<th>% WORDS INITIALLY CORRECT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Delay)</td>
<td>(Imm.)</td>
<td>(Delay)</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₁</td>
<td></td>
<td>17.1</td>
<td>3.3</td>
<td>30.9</td>
</tr>
<tr>
<td>S₂</td>
<td></td>
<td>37.2</td>
<td>7.8</td>
<td>51.4</td>
</tr>
<tr>
<td>S₃</td>
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<td>34.5</td>
<td>22.9</td>
<td>50.3</td>
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<tr>
<td>MEAN</td>
<td></td>
<td>29.6</td>
<td>11.3</td>
<td>44.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Delay)</td>
<td>(Imm.)</td>
<td>(Delay)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₄</td>
<td></td>
<td>20.2</td>
<td>41.7</td>
<td>20.1</td>
</tr>
<tr>
<td>S₅</td>
<td></td>
<td>20.6</td>
<td>43.7</td>
<td>11.9</td>
</tr>
<tr>
<td>S₆</td>
<td></td>
<td>23.5</td>
<td>50.6</td>
<td>18.5</td>
</tr>
<tr>
<td>MEAN</td>
<td></td>
<td>21.1</td>
<td>45.3</td>
<td>16.8</td>
</tr>
</tbody>
</table>
across tutoring conditions, indicating that the timing of tutor attention to errors controlled the production of self corrections.

Mean percent errors self corrected by all subjects under IT conditions was 14.6%, and under DT was 42%. There is some intersubject variability in percentages of errors self corrected across phases. $S_1$ and $S_2$ show lower levels during IT phases than other subjects. $S_1$ consistently self corrected at a 20% level (one in five errors self corrected) only during the second DT phase. All other subjects consistently responded above the 20% level in all DT phases.

Subjects also differed in variability within phases. $S_3$, $S_4$ and $S_6$ showed larger variability under IT conditions compared with $S_1$, $S_2$ and $S_5$ and, $S_2$, $S_3$ and $S_5$ were more variable under DT conditions.

Regression lines were calculated for each phase. These tended to be positive for DT phases and negative for IT phases (see Figure 4:2 and Figure 4:3). Data for $S_5$ and $S_6$ show a negative slope for the first DT phase. Visual inspection suggests the increase in self corrected errors and DT conditions were more consistent and more marked for $S_1$ and $S_2$. Data on variability and slopes of data points within phases tended to confirm this conclusion.
FIGURE 4:2 Percent errors self corrected by $S_1$, $S_2$ and $S_3$ in tutored reading sessions.
FIGURE 4:3 Percent errors self corrected by $S_4$, $S_5$, and $S_6$ in tutored reading sessions.
b. Words read initially correctly.

Data for percent words read initially correctly are graphed in Figure 4:4 and Figure 4:5. Means for phases for individual subjects are presented in Table 4:7. Individual data were analysed in terms of mean differences between phases and in terms of phase trends. The latter analyses involved examination of slope, and level differences between phases.

Four subjects \( (S_1, S_2, S_4, \text{ and } S_5) \) show consistent increases in mean words read initially correctly under DT conditions compared with IT conditions (Table 4:6). Comparison between the last two phases for the remaining two subjects \( (S_3, \text{ and } S_6) \) also show increases associated with DT conditions. Except for \( S_1 \), subjects responded close to or above 90\% during all phases. The mean difference between DT and IT phases was less than 3.5\% for all subjects except \( S_1 \) (mean difference was 6.3\%).

Individual subject phase means were compared by pooling data from similar tutoring phases and using a t test for the difference between uncorrelated means. Thus for each subject a single set of DT data was compared with a single set of IT data. Results are shown in Table:4:7. Significant differences between DT and IT responding were found for \( S_1, S_2, S_4 \text{ and } S_5. \)

Two methods were used for making comparisons between phase trends. The major method was based on computations
FIGURE 4: Percent words read initially correctly by $S_1$, $S_2$, and $S_3$ in tutored reading sessions.
FIGURE 4:5 Percent words read initially correctly by S4, S5, and S6 in tutored reading sessions.
t test for uncorrelated means' comparisons between Immediate and Delayed tutoring: words read initially correctly for all six subjects.

<table>
<thead>
<tr>
<th>Subject</th>
<th>df</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_1$</td>
<td>25</td>
<td>4.847 ***</td>
</tr>
<tr>
<td>$S_2$</td>
<td>27</td>
<td>2.453 *</td>
</tr>
<tr>
<td>$S_3$</td>
<td>23</td>
<td>0.033 NS</td>
</tr>
<tr>
<td>$S_4$</td>
<td>27</td>
<td>1.974 *</td>
</tr>
<tr>
<td>$S_5$</td>
<td>23</td>
<td>1.978 *</td>
</tr>
<tr>
<td>$S_6$</td>
<td>25</td>
<td>1.437 NS</td>
</tr>
</tbody>
</table>

1 *** $p < .001$
** $p < .01$
* $p < .05$
NS $p > .05$
of Regression Lines for phase data. Regression lines were used to describe trends within phases and to project trends into following phases in order to make trend comparisons. This method was used for the analyses made in Chapter Three.

A second, subsidiary method followed suggestions made by White (1972) and Kazdin (1976) for the split middle method of trend estimation. Celeration lines are computed to describe phase slopes and levels. White (1972) notes that this method is best used with data, such as rate based data, which are free to vary considerably and can be plotted on semi-log graphs. Oral reading data are, however, more meaningfully analysed in percentage terms. Additionally, responses of most educational interest are those which tend towards the 'ceiling' of 100%.

Although the oral data do not vary considerably and are tied to percentage statements the split middle method was used as a descriptive adjunct because phases had small numbers of data points. With small numbers of data points median based analyses may be more representative or accurate than mean based descriptions (White, 1972). It was decided therefore to use both methods and compare the results obtained. Both methods yielded descriptions of phase gradients or slopes, level differences between adjacent trends and analyses of differences between slopes.

1 The celeration lines yield a slope description based on a common X value (e.g. seven days). The X values at Day 1 and Day 7 are compared by dividing the larger value by the smaller.
Slopes of phases are shown in Table 4:8. There were four occasions of disagreement between the two methods over the direction of the trend (i.e. ascending or descending). These disagreements occurred in phases which had large variability in data points and very low gradients or slopes. Similarly, the values for slopes were most different for phases which had wide variability (e.g. S₁ Phase 4). Slopes resulting from the two methods were uniformly low. There was little indication of direction of slope being associated with either DT or IT.

Further analyses of differences between slopes and levels of adjacent phases are of limited use given the high level of responding for most subjects, the low slope descriptions, and the lack of consistent association between direction of slope and tutoring condition.

In keeping with visual inspection of Figure 4:4 and Figure 4:5 techniques for comparing levels of adjacent phases indicate sizable level differences only for S₁ and S₂ (first two phases only). Higher levels were associated with DT phases.

Similarly, comparisons between phases on general trends of responding by projection of regression lines or celeration lines from phases on to adjacent phases is

---

1 See Kazdin, 1976 and White, 1972 for comparison methods based on celeration lines.
<table>
<thead>
<tr>
<th>PHASES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regression line</td>
<td>Celeration line</td>
<td>Regression line</td>
<td>Celeration line</td>
</tr>
<tr>
<td>delay</td>
<td>immediate</td>
<td>delay</td>
<td>immediate</td>
<td>delay</td>
</tr>
<tr>
<td>S₁</td>
<td>1.186</td>
<td>x 1.09</td>
<td>0.62</td>
<td>x 1.057</td>
</tr>
<tr>
<td>S₂</td>
<td>-0.157</td>
<td>÷ 1.032</td>
<td>0.8</td>
<td>x 1.058</td>
</tr>
<tr>
<td>S₃</td>
<td>NA</td>
<td></td>
<td>0.043</td>
<td>÷ 1.027</td>
</tr>
<tr>
<td></td>
<td>immediate</td>
<td>delay</td>
<td>immediate</td>
<td>delay</td>
</tr>
<tr>
<td>S₄</td>
<td>0.54</td>
<td>x 1.048</td>
<td>0.025</td>
<td>x 1.02</td>
</tr>
<tr>
<td>S₅</td>
<td>0.439</td>
<td>x 1.02</td>
<td>0.806</td>
<td>x 1.05</td>
</tr>
<tr>
<td>S₆</td>
<td>0.060</td>
<td>÷ 1.02</td>
<td>-0.657</td>
<td>÷ 1.005</td>
</tr>
</tbody>
</table>

1 Gradients from regression line
2 Based on the split middle method of trend estimation (Kazdin, 1976; White, 1972)
limited. Visual inspection of the data using regression and acceleration lines indicates strong differences between phases in favour of DT conditions for $S_1$ and $S_2$. The trends established in Phase 1 and Phase 3, when projected on to the following IT phases, show trends to be facilitated by the DT conditions.\(^1\) Projections with other subjects are restricted by the 100% ceiling and the low slopes.

Thus, for $S_1$ and $S_2$ responding during DT phases was markedly facilitated compared with IT phases. Higher levels were obtained and the acquisition of accurate responding was greater with Delayed tutoring.

3. Tutoring: Tutor and reader behaviours during tutoring episodes.

a. Distribution of attention to errors.

Inter-observer agreement data indicated that the accuracy of carrying out tutoring procedures was high. There may however have been consistent differences across subjects which may contribute to differences in responding

\(^1\) Statistical comparisons based on projected regression or acceleration lines confirms these conclusions for $S_1$ and for the projection of phase 3 and phase 4 for $S_2$. t test comparisons were significant at the .01 level\(^2\) (two tail) and the binomial test (recommended by Kazdin, 1976) was significant at the .01 ($S_1$) and .05 ($S_2$) levels for the last two phases only.
between subjects. A further analysis of tutor attention (percent errors attended to) did not differ markedly across subjects. For all subjects more than 90% of errors were attended to.

The aim of the study was to examine the effects of timing of error attention on self corrections and accuracy of reading. It is possible that any error attention may interfere with ongoing reading. If this is the case when reading is highly accurate, and many errors are self corrected, there will be less interference caused by error intervention. This suggests that if DT had a direct effect on accuracy and self corrections, then changes in these responses would have further reduced the interference characteristics of error attention. The same percentages of error attention would hide the fact of less frequent intervention, and more words being read before tutor intervention.

Figure 4:5 shows phase means for number of words read per error attention. In general, mean number of words read per intervention rises during DT phases. Additionally, there is a general increasing trend across all phases. Figure 4:6 shows that as readers read more accurately and with more self corrections longer passages were read before tutor intervention.
FIGURE 4.6  Mean number of words read per tutor intervention with errors across phases for all subjects.
b. Effectiveness of prompts used by tutors.

Relevant tutor and reader behaviours are shown in Table 4:9. For all subjects except $S_1$, more than 60% of all error attention episodes led to a prompted correction (i.e. the reader corrected the error following prompting by the tutor). Because only imitations or prompted corrections resulted from an episode this meant less than 40% of error attention episodes led to a model. The reverse is true for $S_1$.

The second column of Table 4:9 is a measure of the effectiveness of the post-error context prompt. The scores are the mean percent of post-error context prompts which led immediately to a prompted correction. Again, there is some difference between $S_1$ and the other subjects. Other than $S_1$, the post-error context prompt resulted in a prompted correction in 60% of the occasions it was used ($S_1$ was 30%).

The final column in Table 4:9 shows what percentage of prompted corrections were accounted for by successful post-error context prompts. Subjects are more similar on this measure, although the scores for $S_1$ are lower than those for the other subjects.

These data show that for subjects 2, 3, 4, 5 and 6 the post-error context prompt was relatively successful, leading to immediate corrections in six out of ten errors.
TABLE 4.9

Mean percentages of reader behaviours following post-error context prompts for all subjects for all phases

<table>
<thead>
<tr>
<th>Subjects</th>
<th>% Prompted Corrections</th>
<th>% Post-Error Context Prompts Producing Prompted Correction</th>
<th>% Total Prompted Corrections Which Follow Post-Error Context Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>S₁</td>
<td>37.8</td>
<td>29.7</td>
<td>48.5</td>
</tr>
<tr>
<td>S₂</td>
<td>64.5</td>
<td>60.7</td>
<td>57</td>
</tr>
<tr>
<td>S₃</td>
<td>80.6</td>
<td>68.9</td>
<td>58.4</td>
</tr>
<tr>
<td>S₄</td>
<td>69.4</td>
<td>56.4</td>
<td>68.2</td>
</tr>
<tr>
<td>S₅</td>
<td>64.2</td>
<td>54.2</td>
<td>60.9</td>
</tr>
<tr>
<td>S₆</td>
<td>78.8</td>
<td>65.4</td>
<td>62.3</td>
</tr>
</tbody>
</table>
Most of these subjects' errors were prompted to correction (seven out of ten errors). Subject One has a much lower performance in all measures. The data suggest S₁ did not solve many errors on the basis of the post error context prompts and many corrections had to be modelled.

The discrepancy between the final two columns in Table 4:9 is due to less than complete use of a post-error context prompt as the first prompt used by the tutor. Table 4:4 gives only phase means. The means for individuals show that about seven out of ten errors were attended to initially with appropriate, post-error context prompt.

The data in Table 4:9 are mean data for all phases. An analysis of all phases for S₁ shows that this subject was gradually increasing percentages of prompted corrections, and prompted corrections following initial prompts, across phases. The last phase yielded percentages of about 50% of errors being prompted correct, and about 50% of all post-error context prompts producing prompted corrections compared with less than 30% in the first phase.

4. Non-tutoring: Reader Behaviour

a. Self corrections

Figure 4:7 and Figure 4:8 show session data for percent errors self corrected during non-tutored reading. Phase means are presented in Table 4:10. Results for S₁, S₄, S₅ and S₆ are clear compared with IT conditions, when
FIGURE 4:7 Percent errors self corrected by $S_1$, $S_2$ and $S_3$ in non tutored reading sessions.
FIGURE 4:8 Percent errors self corrected by S₄, S₅, and S₆ in non tutored reading sessions.
TABLE 4:10  Mean percent errors self corrected per phase in non tutored and tutored reading for all subjects across all phases.

<table>
<thead>
<tr>
<th>Subject</th>
<th>1 (Delay)</th>
<th>2 (Immediate)</th>
<th>3 (Delay)</th>
<th>4 (Immediate)</th>
<th>( \bar{X} ) Difference (DT - IT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1 T</td>
<td>23.0</td>
<td>3.0</td>
<td>33.4</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>S1 NT</td>
<td>21.8</td>
<td>18.8</td>
<td>35.2</td>
<td>12.3</td>
<td>+ 12.9</td>
</tr>
<tr>
<td>S2 T</td>
<td>36.8</td>
<td>7.5</td>
<td>56.5</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td>S2 NT</td>
<td>8.6</td>
<td>16.5</td>
<td>32.8</td>
<td>25.8</td>
<td>- 1.0</td>
</tr>
<tr>
<td>S3 T</td>
<td>25.9</td>
<td>24.7</td>
<td>47.3</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>S3 NT</td>
<td>13.7</td>
<td>15.4</td>
<td>27.6</td>
<td>40.8</td>
<td>- 7.4</td>
</tr>
<tr>
<td>GROUP B</td>
<td>(Immediate)</td>
<td>(Delay)</td>
<td>(Immediate)</td>
<td>(Delay)</td>
<td></td>
</tr>
<tr>
<td>S4 T</td>
<td>23.3</td>
<td>34.7</td>
<td>17.3</td>
<td>57.3</td>
<td></td>
</tr>
<tr>
<td>S4 NT</td>
<td>26</td>
<td>27.8</td>
<td>20.7</td>
<td>65.2</td>
<td>+ 23.1</td>
</tr>
<tr>
<td>S5 T</td>
<td>21</td>
<td>40.8</td>
<td>7.3</td>
<td>45.2</td>
<td></td>
</tr>
<tr>
<td>S5 NT</td>
<td>14.1</td>
<td>26.8</td>
<td>6.3</td>
<td>75.4</td>
<td>+ 40.9</td>
</tr>
<tr>
<td>S6 T</td>
<td>19.7</td>
<td>48.1</td>
<td>21.6</td>
<td>58.9</td>
<td></td>
</tr>
<tr>
<td>S6 NT</td>
<td>25.3</td>
<td>39.4</td>
<td>32.6</td>
<td>48</td>
<td>+ 14.7</td>
</tr>
</tbody>
</table>

T = tutored reading
NT = non-tutored reading.
DT conditions operated during tutored reading, these subjects self corrected a higher percentage of errors in their non tutored texts. The mean difference between DT and IT phases for these subjects is above 10% errors self corrected. All DT phases have means above 20%.

For $S_2$, session data show (Figure 4:7) an increasing trend across the first three phases which is partially continued by two data points in the final phases. These data suggest that the trend across phases towards higher percentages of errors self corrected was reduced or interrupted during IT phases. An increasing trend is also apparent in the data for $S_3$ (Figure 4:7). There do not appear to be reduced trends or means associated with type of tutoring condition. Mean difference between Delayed and Immediate phases favours IT phases (Table 4:10).

b. Words read initially correctly.

Figures 4:9 and 4:10 show session data for words read initially correctly. Means for each phase are presented in the bottom line of each row in Table 4:11. The effects of changes in tutoring conditions on the tutored text are most marked and consistent for $S_1$, $S_4$, $S_5$ and $S_6$. For these subjects correct responding under DT conditions is at a higher level than under IT conditions (mean difference between conditions is greater than 4.5%). Except for $S_6$, these subjects also show mean increases across IT phases and, all four subjects show mean increases across DT phases.
FIGURE 4:9 Percent errors read initially correctly by $S_1$, $S_2$ and $S_3$ in non-tutored reading sessions.
FIGURE 8:10 Percent errors read initially correctly by $S_4$, $S_5$ and $S_6$ in non-tutored reading sessions.
<table>
<thead>
<tr>
<th>Subject</th>
<th>1 (Delay)</th>
<th>2 (Immediate)</th>
<th>3 (Delay)</th>
<th>4 (Immediate)</th>
<th>ΔX Difference (DT − IT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>88.4</td>
<td>80.5</td>
<td>88.4</td>
<td>83.7</td>
<td></td>
</tr>
<tr>
<td>S₁  NT</td>
<td>84.8</td>
<td>77.3</td>
<td>87.1</td>
<td>78.2</td>
<td>+ 8.2</td>
</tr>
<tr>
<td>S₂  NT</td>
<td>92.7</td>
<td>88.1</td>
<td>93.5</td>
<td>91.3</td>
<td>4</td>
</tr>
<tr>
<td>T</td>
<td>93.5</td>
<td>93.7</td>
<td>96.7</td>
<td>97.4</td>
<td></td>
</tr>
<tr>
<td>S₃  NT</td>
<td>93.5</td>
<td>92.2</td>
<td>93.4</td>
<td>93.1</td>
<td>+ 0.8</td>
</tr>
<tr>
<td>GROUP B</td>
<td>(Immediate)</td>
<td>(Delay)</td>
<td>(Immediate)</td>
<td>(Delay)</td>
<td></td>
</tr>
<tr>
<td>S₄  NT</td>
<td>94.7</td>
<td>95.8</td>
<td>94.7</td>
<td>96.3</td>
<td></td>
</tr>
<tr>
<td>S₅  NT</td>
<td>87.1</td>
<td>92.5</td>
<td>91.5</td>
<td>95.3</td>
<td>+ 4.6</td>
</tr>
<tr>
<td>T</td>
<td>91.6</td>
<td>92.2</td>
<td>90.9</td>
<td>93.9</td>
<td></td>
</tr>
<tr>
<td>S₆  NT</td>
<td>78.3</td>
<td>88.8</td>
<td>78.7</td>
<td>89.5</td>
<td>+ 9.7</td>
</tr>
<tr>
<td>T</td>
<td>90.3</td>
<td>91.5</td>
<td>91.5</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>S₆  NT</td>
<td>85.7</td>
<td>89.7</td>
<td>84.4</td>
<td>93.1</td>
<td>+ 6.3</td>
</tr>
</tbody>
</table>

T = tutored reading  
NT = non tutored reading
These data suggest that the effect of IT phases during tutored reading was to reduce rate of acquisition of accurate responding, and that conversely, acquisition of accurate responding was facilitated by DT phases.

The differences between tutoring conditions on acquisition trends are less marked for $S_2$ (Figure 4:9). This is especially so if the first data point in the final (IT) phase is treated with some caution. All Group A subjects read the first text in that phase with marked reduction in accuracy compared with other texts read in the same phase. Inspection of Appendix B indicates that this text was unusual in that it is rated as somewhat more difficult than other texts read during the phase. With less emphasis on this data point for $S_2$ it appears that the final IT phase was not associated with lower levels of responding. Similarly, it would seem responding during this phase continued the trends set from the second and third phases. For $S_2$ however, the first IT phase was associated with marked reduction in accuracy compared with the first DT phase.

A related pattern is apparent with $S_3$. With less emphasis on Session 13 the data following Phase 2 are better described as having a gradually increasing trend. Even with removal of the first data point in Phase 4, the data for $S_1$ in that phase (Figure 4:9) show a decreasing trend. The conclusion concerning general effects of IT phases therefore is not qualified for $S_1$ by consideration of Session 13.
C. Self corrections and words read initially correctly.

The mean data and session data for words read initially correctly and errors self corrected during non tutored reading can be compared. For $S_1', S_4', S_5'$ and $S_6'$, changes in phase means in percent words read correctly are similar to phase mean changes in percent errors self corrected (Table 4:10 and Table 4:11). Under UT conditions, phase means for both behaviours are higher than those for IT conditions. Successive increases in phase means are also highly similar.

The session trends (Figure 4:7, Figure 4:9) and mean data (Table 4:10 and Table 4:11) for $S_2$ and $S_3$ tend also to show a relationship between accuracy and self correction which is marked for the other four subjects. Increases in errors self corrected are generally accompanied by increases in words read initially correctly. For $S_2$ the second phase has a higher mean percent errors self corrected than the first phase. However, there is no corresponding rise in mean accuracy. Nevertheless, data points for errors self corrected are low and stable, and do not show large increases over the first phase (Figure 4:7). The marked acquisition trend towards higher numbers of errors self corrected shown in the last two phases for $S_2$ was reduced in this phase. This was associated with low accuracy data (Figure 4:9). The relationship between self correction data and words read initially correctly data is more apparent for $S_2$ and $S_3$ if the first data point in the fourth phase is again disregarded.
In summary, for all six subjects there appears to be a close relationship between self-corrections and accuracy in non tutored reading. Higher accuracy in words initially correct is associated with higher self correction rates.

d. Comparisons with tutored reading.

Responding during non tutored reading can be compared with responding during tutored reading for the same sessions within a phase. This comparison provides information about the effects of tutoring compared with non tutoring on oral reading. Means and percent errors self corrected and percent words initially correct for both tutored and non tutored texts are given in Table 4:10 and Table 4:11. Responding on tutored texts, particularly self corrections, was inhibited by the timing conditions operating in IT phases. Thus the most meaningful comparisons for self correction data are between same-session responding in DT phases.

Mean data for percent errors self corrected in DT phases indicates that $S_2$, $S_3$ and $S_6$ had higher means in both tutored DT phases (mean difference in self correction rates between tutored and non tutored reading was $S_2:26\%$, $S_3:16\%$, $S_6:9.8\%$). For the other three subjects responding was higher for tutored reading only in the first DT phase. In the second DT phase, higher percentages occurred in the non tutored texts (mean difference between tutored
and non tutored reading was, $S_1 = -0.4\%$, $S_4 = -0.5\%$, $S_5 = -8.1\%$).

The mean data indicate that there were large differences in responding in tutored and nontutored reading for $S_2$, $S_3$, and $S_5$. High self correction rates were limited to the specific context of error attention tutoring (i.e. the tutored text), especially for $S_2$ and $S_3$. This difference tended to decrease over phases.

The mean data for percent words initially correct shows that all phase means are higher on the tutored text (Table 4:11). A t test for the difference between correlated means over pooled sessions was used to compare the accuracy of reading on tutored and non tutored texts. Results are shown in Table 4:12. Five out of the six subjects show significant differences in words initially correct between tutored and non tutored reading (at the .05 level).

e. Attention to contextual cues

Following the predictions made errors on the non tutored text were analysed in terms of type (whether they were response or no response type errors) and level (difference with text word in graphic and contextual appropriateness). Data are presented in Table 4:13.
### TABLE 4:12

T test for correlated means' comparisons between tutored and non tutored reading: words read initially correctly all subjects across all phases

<table>
<thead>
<tr>
<th>Subject</th>
<th>df</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>15</td>
<td>1.669 NS</td>
</tr>
<tr>
<td>S2</td>
<td>15</td>
<td>3.582 **</td>
</tr>
<tr>
<td>S3</td>
<td>13</td>
<td>2.359 *</td>
</tr>
<tr>
<td>S4</td>
<td>15</td>
<td>2.226 *</td>
</tr>
<tr>
<td>S5</td>
<td>15</td>
<td>3.596 **</td>
</tr>
<tr>
<td>S6</td>
<td>14</td>
<td>2.27 *</td>
</tr>
</tbody>
</table>

** p < .01 two tailed  
* p < .05 two tailed  
NS p > .05 two tailed
All subjects except S showed lower percentages of no response errors during DT phases (lower line Table 4:13). Pooled session data indicate for S, S and S the difference between phases was greater than 9%. S had similar percentages for both DT and IT conditions.

The data for differences between phases in terms of level of errors is anomalous. S, S, and S showed minimal increases in percentages of error which were contextually inappropriate during IT phases (middle line Table 4:13). S, S, and S show decreases. These latter subjects however show increases in percentages of errors which were highly similar in graphic cues in DT phases. S produced lower percentages of errors which were similar in graphic cues during DT phases. The remaining two subjects showed little difference between phases on this measure. Thus S, the weakest reader was the only subject showing change in level of error in keeping with the predictions.

Increases in errors that show greater similarity with graphic cues in the text word could indicate greater attention to contextual cues was facilitating discrimination of graphic cues. The reduced percentages of errors showing contextual appropriateness shown by some subjects is similarly difficult to interpret. The measure of contextual

1 Using total errors during similar phases as denominator and type count totals from similar phases as the numerator.
TABLE 4:13  Percentages of no response errors and errors showing similarity with graphic cues, and errors inappropriate to context for Delayed and Immediate Phases for all subjects.

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
</tr>
</thead>
<tbody>
<tr>
<td>% ERRORS SIMILAR ON GRAPHIC CUES</td>
<td>DT</td>
<td>54.1</td>
<td>49.0</td>
<td>60.5</td>
<td>77.8</td>
<td>53.2</td>
</tr>
<tr>
<td></td>
<td>IT</td>
<td>65.2</td>
<td>46.8</td>
<td>65.5</td>
<td>69.7</td>
<td>46.7</td>
</tr>
<tr>
<td>% ERRORS INAPPROPRIATE TO CONTEXT</td>
<td>DT</td>
<td>65.7</td>
<td>54.8</td>
<td>43.4</td>
<td>72.7</td>
<td>64.0</td>
</tr>
<tr>
<td></td>
<td>IT</td>
<td>69.6</td>
<td>56.0</td>
<td>51.0</td>
<td>61.8</td>
<td>48.6</td>
</tr>
<tr>
<td>% ERRORS NO RESPONSE</td>
<td>DT</td>
<td>35.6</td>
<td>25.2</td>
<td>15.1</td>
<td>34.4</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>IT</td>
<td>47.0</td>
<td>34.8</td>
<td>19.7</td>
<td>45.6</td>
<td>22.7</td>
</tr>
</tbody>
</table>
appropriateness used was very stringent and less sensitive than other measures that have been used (e.g. Goodman and Burke, 1972). Reduced percentages in contextually appropriate errors may have reflected maintenance of adequate levels of attention to contextual cues while greater facility in discriminating graphic cues was being acquired.

Similarly if appropriate levels of attention to contextual cues were already established, the predicted effects of immediate attention in decreasing use of contextual cues and increasing attention to graphic cues could be expected to take some time. A longer time would be needed with more proficient readers.

A less ambiguous measure of attention to contextual cues was taken. Percentages of contextually inappropriate errors self corrected under DT or IT conditions were calculated. The extent to which these errors were self corrected is an indication of how closely readers were attending to the contextual cues available. Substitution errors which were coded as contextually inappropriate (i.e. EDHS and EDLS errors) provided the basis for the comparison.

Percentages of contextually inappropriate errors self corrected are shown in Table 4:14. \( S_1, S_2, S_4, S_5 \) and \( S_6 \) self corrected higher percentages of contextually inappropriate errors in DT sessions. The differences
TABLE 4:14

Mean percent low contextually appropriate errors self corrected in non tutored reading for all subjects over all phases

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Immediate Tutoring</th>
<th>Delayed Tutoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₁</td>
<td>35% (80)¹</td>
<td>40.4% (52)</td>
</tr>
<tr>
<td>S₂</td>
<td>38% (71)</td>
<td>39.6% (53)</td>
</tr>
<tr>
<td>S₃</td>
<td>48% (25)</td>
<td>42.9% (21)</td>
</tr>
<tr>
<td>GROUP B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₄</td>
<td>46.9% (32)</td>
<td>80.7% (41)</td>
</tr>
<tr>
<td>S₅</td>
<td>25.4% (59)</td>
<td>63.3% (49)</td>
</tr>
<tr>
<td>S₆</td>
<td>52.8% (53)</td>
<td>71.9% (32)</td>
</tr>
</tbody>
</table>

¹ total contextually inappropriate errors in both phases.
between tutoring sessions are very large for the second group of subjects.

Phase mean percentages are graphed in Figure 4:11. All subjects shown an increasing trend across phases which is reversed by the second IT phase. It is apparent that for all subjects DT phases facilitated the acquisition of attention to contextual cues compared with IT phases.

The small tutoring condition differences for $S_1$ and $S_2$ and the negative difference for $S_3$ (Table 4:14) are accounted for by the sequence of tutoring conditions. The first IT phase for these subjects follows a DT phase. Similarly the second IT phase occurred after the second DT phase. Superimposition of the tutoring sequence on an acquisition trend meant that the first IT phase had higher means than the first DT phase. The reversal in the fourth phase (Figure 4:11) adequately demonstrates the facilitatory effects of DT compared with IT and indicates the effects on rate of acquisition under the two conditions.
FIGURE 4:11 Mean percent errors which were contextually inappropriate in non tutored reading sessions across phases for all subjects.
D. DISCUSSION

The study addressed three major questions. These were: 1. predictions of effects of the timing of error attention on oral reading, 2. the relationship between self corrected reading and accuracy, and 3. a general comparison between reading which was tutored by error attention procedures and reading without any error feedback.

These questions were examined in two reading settings. Subjects received error attention tutoring every day, and, every second day, read a novel text without any tutoring. These separate conditions served two purposes. First they provided a less ambiguous, more sensitive measure of change in timing of error attention. Secondly they allowed a comparison to be made between reading under the two conditions. Greater sensitivity and precision in measures was gained by non tutored reading because the lack of error feedback did not supply additional usable information during reading to maintain accuracy. The novel text produced difficult conditions where proficiency in using all cue sources was needed. Any effects of error attention tutoring on acquisition trends were unambiguously apparent under non tutoring conditions.

The first question examined the predicted effects of the timing of error attention. As expected, during tutoring, changes in the timing of error attention directly affected the incidence of self corrections. All subjects increased
levels of self-corrections during delayed attention conditions compared with immediate attention conditions. The increased opportunities to self-correct which were available as a tutor delayed intervention were used by all readers. This suggests that all the readers had acquired some self-control skills prior to the commencement of the study.

Five subjects showed similar changes in self-correction associated with the tutoring conditions on non-tutored texts. The effect of timing on self-corrected reading on the tutored text generalised to the non-tutored text. One explanation is that immediate timing reduced the opportunities for acquiring self-correction behaviour. Self-correction would become more proficient as more opportunities to successfully self-correct were used. Success in correcting significant numbers of errors over time could have reinforced proficient self-correction. Reinforcement may have been available in the increased meaning gained from self-corrected reading. This reinforcement would be available on tutored and non-tutored texts.

The non-tutored data indicates all subjects were becoming more proficient in self-correction over time. Except for $S_3$, changes in tutoring on the tutored text resulted in changes in acquisition rates. The lack of consistent tutoring effects on the self-correction behaviour of $S_3$ may have been due to this subject's high accuracy with the texts used. Few errors occurred during tutored
reading which \( S_3 \) could self correct, and changes in tutoring conditions did not allow many more errors to be self corrected so that greater proficiency could be gained. Thus it is possible that the tutoring conditions did not significantly alter the opportunities for acquiring self corrected reading.

The sequencing of tutoring conditions may have confounded the demonstration of tutoring effects. If a general acquisition trend for self corrected reading was occurring then facilitation effects early on in the study could be expected to produce more independence from external error attention and correction. This follows from the conceptualisation of self controlled reading outlined in Chapter One. With greater proficiency and independence changes in the timing of tutoring could be expected to have reduced effects. Group A had a delay condition in the first and third phase and only one subject (\( S_1 \)) showed strong consistent effects of tutoring. \( S_1 \) was the least accurate of all subjects and could be considered to be more susceptible to tutoring conditions. Conversely, all Group B subjects showed marked consistent effects, even though \( S_4 \) had similar accuracy levels to \( S_3 \) in the first two phases.

Changes in timing of tutoring on oral reading might also affect accuracy. This raises the important theoretical question about the relationship between self correction behaviour and accuracy. In this study by timing error
attention to reduce the opportunity of self corrections to occur it was possible to examine correlated changes in words initially correct.

During tutored reading only one subject ($S_1$) showed consistent large changes in words read initially correctly. This trend was apparent but weaker with the remaining five subjects. The weak changes are attributable to 'ceiling' effects. These five subjects were responding close to 100% accuracy in all phases of tutored reading. Thus there was little opportunity for facilitation effects of increased self correction behaviour to be measured. Effects of changes in self correction behaviour on accuracy were measured more adequately under non tutored reading conditions where ceiling effects were less obvious.

Accuracy data under non tutoring conditions closely parallels data for self correction. Five subjects show changes in accuracy associated with changes in self correction behaviour, as determined by the timing of error attention. Under delay conditions, where more errors were self corrected, subjects showed greater levels of accuracy. These changes were marked and consistent with four subjects and somewhat less consistent with a fifth subject ($S_2$). Accuracy in reading non tutored tests varied directly with the percentages of errors self corrected as controlled by the timing of attention on the tutored text.
$S_3$ shows the same association between self correction and accuracy. For this subject accuracy generally increases along with the general increase in self correction behaviour.

The explanation for the relationship between change in self corrections and change in accuracy centres (1) on interference by immediate timing on accurate and efficient attention to contextual cues, and, (2) the tutorial function of self corrections. Immediate attention is hypothesised to reduce the salience of contextual cues primarily by interfering with opportunity to self monitor and self check responses against ongoing reading for mismatches. Consistent interference in opportunity to successfully emit self correction responses is assumed to inhibit continued monitoring and self check or restrict opportunity to refine those behaviours.

Immediate attention conditions are also assumed to interfere with the tutorial function of self correction. This opportunity for refinement of specific cue attention systems is severely reduced under immediate attention conditions. Thus the acquisition trends were expected to be reduced under immediate attention tutoring compared with delayed attention. This was found in the present study.

The interference effects of immediate timing on use of contextual cues is supported by the data on the self
correction of contextually inappropriate errors. For all subjects delayed attention during tutored reading facilitated attention to contextual cues during non tutored reading. During delayed attention phases, a higher percentage of errors which were contextually inappropriate were self corrected. This greater attention in turn is likely to have facilitatory effects on discrimination. In this way accuracy is further enhanced (Broadbent, 1977; Klein and Saltz, 1976; Marslen-Wilson and Tyler, 1976; Meyer, et.al., 1975; Schvaneveldt, et.al., 1977).

The tutorial function of self corrections was supported in the data on accuracy. The effect of delayed timing which increased self corrections was to facilitate acquisition trends relative to immediate timing of attention to errors. This does not specifically demonstrate the operation of the hypothesised tutorial function. That remains to be examined in depth.

The increased accuracy could be due to either or both assumptions noted above. A further variable must be taken into account in interpreting the data. It is possible that there were additional effects associated with changes in the frequency of error attention. During delayed attention phases the number of words read per error intervention was higher than immediate attention phases. This frequency effect could have supplied
additional effects by interfering with attention to context during immediate phases. These effects could not be separated from effects entirely due to changes in self correction behaviour and should be studied independently in further research.

**Error attention tutoring**

Comparison of accuracy in reading under tutoring and non tutoring yielded significant differences between tutored and non tutored reading for five subjects and a trend towards a significant difference for the sixth. Reading was highly accurate under tutoring conditions and was less accurate without any attention to errors (under non tutoring conditions). The trends with self correction data were not as consistent. For some subjects self correction frequencies were similar under both conditions and for other subjects an initial difference in favour of tutored reading tended to disappear across phases.

These data are consistent with those reported in the previous study. Again, instructor attention to errors was associated with higher accuracy than no attention. S2 and S3 initially showed higher frequencies of self correction in the context of external feedback to errors by the tutors. Over the course of the study these two subjects showed increases in self correction outside of the external feedback setting.
This suggests self correction behaviours (e.g. self monitoring) may be cued by instructors through error attention, and acquisition of proficient reading involves becoming independent of external cues for self monitoring. This further suggests that the reason why $S_2$ and $S_3$ did not show the same levels of effects as the other subjects was because they were acquiring independent self correction.

The error attention tutoring was based on a general prompt. This general prompt was intended to not cue attention to graphic cues. It was unlikely to operate directly on discrimination of graphic cues. The general use of contextual cues however may have been affected by the use of the post-error context prompt. All subjects (except $S_1$) were able to use this prompt to solve most errors.
A. FUNCTIONS OF ERROR ATTENTION IN LEARNING TO READ

Error production and the possible functional significance of attention to errors has received little attention in the literature on the behaviour analysis of academic behaviour. Only a few academic programmes have used error correction procedures (e.g. Berner and Grimm, 1972). Skinner (1968) has stressed the inappropriate motivational attributes of attention to errors. The literature on classroom learning has several powerful demonstrations of the unintended and educationally disruptive outcomes of attention to inappropriate social behaviour (Hall, Lund and Jackson, 1968). There are similar demonstrations of inappropriate outcomes of error correction procedures in reading (Sajwaj and Knight, 1972) and mathematics (Hasazi and Hasazi, 1972).

From an analysis of reading behaviour and the theoretical functions of error attention it was however claimed that learning to read could be directly affected by the informational and spatio-temporal properties of error attention. The claim was supported by data in two experiments.

An error occurs from inexact or inappropriate attention or use of graphic and contextual cues. Ideally error attention can function to effect three sorts of learning.
These are (1) perceptual learning, (2) acquisition of appropriate discriminative control, and (3) acquisition of attentional and problem solving strategies. These three areas of learning are basic to acquisition trends in oral reading (pp. 33-38). Oral reading can become more accurate, more integrated, and more automatic as a result of appropriate error attention. Self corrected reading which enables reading to become independent and self controlled is similarly acquired.

Self controlled reading is especially significant because it may maintain learning independently of the instructor's error attention. The basis of this independent learning stems from the tutorial functions of self correction. Thus properties of error attention determine the rate and course of acquisition of independent self controlled reading. The basic conceptualisation is shown in Figure 5:1. The model represents acquisition under ideal conditions.¹

Chapter Three examined the positive effects of an error attention tutoring programme on oral reading. The differential effects of models and prompts and the relative contribution of practice within tutoring were examined. Attention to errors was demonstrated to be a

¹ Ideal conditions include
a. the reader will make errors rather than not attempt words.
b. appropriate dimensions of error/attention are operating.
c. reading is a positively reinforcing activity for the reader.
reader:
inappropriate, inexact attention to cues → error
self-correction
perceptual learning
discriminative control
attending + problem solving skills
accurate
integrated
automatic
informational + spatio-temporal properties
error attention

instructor:

a model of the functions of error attention under ideal conditions.

FIGURE 5:1
strong variable in the learning process. Also, prompts were shown to be more effective with the more proficient reader, and models to be more effective with the less proficient reader.

Chapter Four examined predictions that changes in the timing of error attention would affect oral reading. These predictions were supported. Delayed timing of error attention was associated with greater proficiency in self correction and reading accuracy. A subsidiary finding was that error attention tutoring produced increases in accuracy compared with no tutoring. This supported findings from the research in Chapter Three.

These findings are consistent with an established data base in complex learning and concept learning. Data from these areas generally show feedback to errors to be effective in learning 'meaningful' tasks (Bourne, Ekstrand and Dominowski, 1971; Hulse, Deese and Egeth, 1975).

Findings in the literature concerning the wider question of differential effects of attention to correct events and incorrect events are equivocal (Kulhavy, Yekovich and Dyer, 1976; Nelson and Hay, 1976). Effects of feedback seem to be determined by the extent to which the feedback event carries information about the behavioural components of correct/incorrect responding which can be used by the learner (Estes, 1976; Lindell, 1976). Thus
both positive and negative feedback can have important effects depending on characteristics of the feedback and on the competence and motivation of the learner.

In some tasks feedback to errors may make for more efficient and effective instruction than attention to correct responses alone. In oral reading, error attention may provide specific and more usable information concerning appropriate responding at the point of the incorrect response. Oral reading was considered to involve complex conditional discriminations among several cue sources. Errors provide a crucial opportunity for either an external instructor or the reader to specify which response processes have been inappropriately or inexacty used or even not used at all.

The concept of 'controlled processing' may be useful in clarifying the specific and usable nature of error attention (Shiffrin and Schneider, 1977). Instructor attention to errors may operate to focus active or controlled attention to significant cues in the textual array. This instructional control over a type of attention is the basis for appropriate stimulus control being assumed by the cues in the text. Controlled attention is claimed by Shiffrin and Schneider to produce perceptual learning and automatic responding. The accuracy effects reported in the first study occurred in the absence of a strong descriptive praise or token programme. This does suggest that
substantial discrimination learning can occur from error feedback alone.

The demonstrations in the two experiments of the facilitation effects of error attention are an important first step. Additional studies could be designed to focus on other specific dimensions of error attention, for example, the match between the repertoires of different readers and the type of error attention they receive.

The findings reported in Chapter Three should alert readers to the dangers of making comparisons between partially understood variables. Comparisons between conglomerates of variables (as in 'packages' or large instructional programmes) are difficult to interpret without detailed understanding of the operating characteristics of each variable (Sidman, 1960). This is especially true of areas such as prompting and modelling in oral reading. Thus, analyses within the dimension of level of prompt should precede comparisons between prompting and modelling.

Findings reported in Chapter Four fit with research data in the learning of 'meaningful' tasks. Immediate feedback is often not as effective as delayed feedback on learning and retention (Bourne, Ekstrand and Dominowski, 1971; Pound and Bailey, 1975). This has been termed the Delay-retention effect (e.g. Markowitz and Renner, 1966). Explanations associated with these effects are often in
terms of greater opportunities for covert responding and rehearsal associated with delayed feedback (e.g. Brackbill and Kappy, 1972).

A more complete explanation might include the effects of added context under delayed conditions. Added context may increase the effectiveness of the feedback by increasing meaning and thus retention (e.g. Craik and Lockhart, 1972; d'Ydewalle and Buchwald, 1976; Estes, 1976; Kulhavy, Yekovich and Dyer, 1976). This is more directly applicable to a situation such as oral reading where delay can add relevant context.

The corollary of the effects of Delayed feedback would be the interference effects of immediate feedback on use of context. Under immediate feedback conditions contextually based and integrated responding would be reduced, so that both accuracy and acquisition of proficient self correction would decrease. Both these effects were suggested in the data from Chapter Four.

Parameters of timing and the question of timing with no response errors need careful analysis.

Generalisation of behaviour change is a question of current concern to behaviour analysts (Baer and Stokes, 1977; Marholin, Siegel and Phillips, 1976). Reviewers note that generalisation is associated with several
procedures and processes, notably, (1) contingencies placed on mediator responses (usually language) (2) generalisation responses exemplified in a rule or principle (3) instructional control, usually by an external agent and (4) similarity between the acquisition setting and the generalisation setting.

In the first study of effects of error attention (Chapter Three), the effects on reading accuracy generalised across time from the tutoring setting to the one-to-one setting with the teacher. It is likely that this was aided by the use of the same text by both tutor and teacher. However, there was no generalisation to a probe (non tutored) text until specific descriptive praise for correct responding and for self corrections was added to the error attention. Generalisations may require specific instructional control and specific reinforcement.

In the second study the effects of timing on accuracy generalised to new non tutored texts read shortly after the experimental texts. In this case accuracy was directly controlled by the opportunity to emit self correction behaviours. Again, the generalised effect may have been aided by similarity between settings such as the presence of the same tutor, and may have been further supported by the short delay time.

However, an important insight into training generalised acquisition of accuracy is provided. Generalised ability to
accurately read texts may be based on self corrected reading. Error attention by an instructor can function both as instruction for acquiring perceptual capabilities and for bringing behaviours under discriminative control. The resultant capabilities are basic components of behavioural repertoires involved in the complex discriminations of reading.

Discriminative repertoires are basic to the observational processes involved in self control (Bandura, 1976; Lopatto and Williams, 1976; Wilson, 1977). With the acquisition of self monitoring responses in reading, readers are able to observe matches and mismatches between their responses and cues in the text. Secondly, behaviours analogous to the tutor's instructional control behaviours can be acquired (cf. Skinner, 1953, 1968). Acting in concert with discriminative repertoires and self monitoring, the reader is able independently to use instructional strategies to self correct. Thus part of the instructor's role in attending to errors may also be to provide a model for when and how to self instruct.

Training which enables this self controlled reading to be acquired and operate could also be considered training for generalisation of accurate responding. In the second study properties of Error attention were shown to be related to the production of self corrections. Self corrections were in turn demonstrated to be associated with generalised high acquisition rates.
Hence both studies indicate that error attention affects the acquisition of accurate responding in two ways: (1) through direct instruction in appropriate attending to cues and (2) through instructing use of self control strategies. These two possibilities are shown in Figure 5:1.

B. METHODOLOGICAL ISSUES IN THE BEHAVIOUR ANALYSIS OF ORAL READING

Three major methodological issues arose in the two experiments. They comprised (1) problems in the measurement of accuracy of oral reading, (2) problems caused by the superimposition of a within-subjects repeated measures research design on a general acquisition trend, (3) problems in controlling textual difficulty as a major source of variability with relatively unknown characteristics.

In both experiments accuracy was measured by taking the number of words read initially correctly. By using only initially correct words self corrected words were excluded from the count. If accuracy had been measured by inclusion of self corrected errors with words initially correct then the measure of effects of self correction on accuracy could have been artificially biased. With self corrected errors included increases in accuracy could be due to more errors being self corrected, or, more words read initially correctly, or both. Although increases in self corrections are considered to be of major importance
in proficient reading so too is efficient, and integrated responding which results in fewer errors in the first instance.

The second issue concerns the possible confounding of results by interactions between research design and acquisition trends. In both experiments a repeated measures reversal design (Hersen and Barlow, 1976) was used which attempted to control for these possibilities.

It is possible that in many functional analyses of academic behaviour general acquisition trends are present. These trends may be due to the effects of variables operating within the experiment (e.g. reactive effects of repeated measures) or to variables operating in the general classroom instructional programme. Such trends probably are confounded by research which involves component analyses, or when reversal phases are actually a different form of treatment.

Interpretation of change against these ongoing trends will depend on the sequencing of phases. In the second experiment, for example, some of the tutoring effects might have been more obvious because the most facilitative condition operated in the second and fourth (last) phase. All subjects could have been gradually learning behaviours across phases due to the general characteristics of the tutoring procedures and the classroom instruction.

Given that this acquisition could have had (e.g.) a curvilinear function then the more effective conditions
would have been most noticeable in the second and fourth phases. Subjects in the opposite sequence with the facilitative conditions in the first and third phases would show smaller effects. In comparison with the second and fourth phases these phases may have similar means and some data points which are lower primarily because of the general trend across phases.

It is at this point that trend analyses, control over phase lengths, and contrasting groups of subjects receiving opposite sequencing of phases became important. The trend analyses identified the differences in acquisition levels and rates between some phases. The phase length controls allow for more appropriate rate comparisons, and the contrasting sequencing gives some indication of the operation of general acquisition trends.

Baer's (1977) admonition concerning the dangers in exaggerating the importance of effects of weak variables should be recognised. Additionally, interpretation of the magnitude of effects in academic change programmes should take into consideration the design context. In the second experiment there were strong noticeable effects in the two groups receiving opposite sequences of conditions. Also there were other possible interpretations for the lack of completely consistent replication for two subjects in Group A.
Several discussions of problems in reversal designs have noted the possibility of 'order' or 'sequence' effects (e.g. Kazdin, 1973; Hersen and Barlow, 1976; Ullman and Sulzer-Azeroff, 1975). The above explication of acquisition trends could be interpreted as producing 'sequence' effects. In the case of academic behaviour these effects are probably better controlled with multiple baseline designs which have brief reversals built in, or multiple reversal designs which have opposite sequences across subjects. Similar suggestions are made by Hersen and Barlow (1976) and Kazdin (1973).

A final methodological question concerns problems of controlling a major source of variability in reading research. The problem of textual difficulty is both more obvious and more easily controlled for in repeated measures research. The greater opportunities for sampling texts within levels and thus reducing the significance of any one comparison between texts is a definite strength.

Behaviour analysis procedures could be used to make clear statements about the functional variables in texts which contribute to difficulty of reading. An important area for research would be the examination of traditional indices (e.g. noun counts etc.) of difficulty to determine their functional significance. Lovitt has conducted some beginning research on related questions concerning the 'phonics' dimensions of different texts (Lovitt, 1976) and
about placement in graded texts based on how individual readers perform on text samples (Hansen and Lovitt, 1976).

A behaviour analysis of textual attributes opens out the possibilities of a consumer advocacy role for educators using these procedures. With theoretical statements concerning reading and reading behaviour repertoires it is possible to predict difficulty for different groups of readers. A match between text and reader will involve knowledge of oral language repertoire and familiarity with the meaning of the text's message.

C. INSTRUCTION FOR LEARNING TO READ

The present research has implications for organising instruction in learning to read. Specific procedures for error attention were delineated in the two experiments and in the general model. Apart from these procedures the conceptualisations of error feedback and acquisition trends implicate (1) selection of appropriate texts and (2) individualised oral reading with an instructor as priorities for instruction.

1. Selection of appropriate texts

Texts contain variables which control reader responses. The completeness of control lies in the match between reader behaviours (including oral language repertoires) and specific textual stimuli. Gross standardised predictions
of this match are often attempted in assessments of the 'difficulty level' of texts. From the functional analysis perspective difficulty level is related to the number of errors made by a particular reader on a given text (cf. Hansen and Lovitt, 1976).

Errors have been seen as opportunities for learning. Error correction, both from an instructor and from the reader in self correction, can be used to promote accuracy. The amount and distribution of errors through a text will limit the amount of learning possible. Too few errors with an 'easy text' reduce the opportunity for learning. Motivational problems such as boredom may also arise. Too many errors with a difficult text reduce the availability of contextual cues, so that attention to graphic cues increases and a self-limiting cycle develops (see p. 30). There are possible interacting motivational problems in the latter case, such as increasing anxiety or the tutoring session becoming aversive for reader and tutors.

There are several ways in which instructors can approach the matching of text with reader. One way is to use any available texts and find a placement level for individual readers based on error production (Hansen and Lovitt, 1976). The question needing attention is what accuracy of reading is an appropriate 'instructional' level? Hansen and Lovitt (1976) point out that Betts' (1946) original recommendation of 95% word recognition
which educators have generally adopted (Roberts, 1976) has never been validated.

Hansen and Lovitt placed their retarded readers at the 90% accuracy level and did not find the predicted inappropriate motivational outcome of frustration and associated low progress. Similarly Roberts (1976) found that a majority of her sample of above average second and third year readers had been placed below the 95% 'instructional level'. Several behaviour analysis programmes reporting significant outcomes have explicitly opted for 90% accuracy levels as a criterion for advancement to more difficult texts (Berner and Grimm, 1972; Gray, Baker and Stancyk, 1969; McNaughton, 1974).

Another way of achieving match is to attempt to specially select texts or to modify setting conditions so that a certain level of accuracy is easier to obtain. This can include familiarising readers with the vocabulary and content of texts, or specifically using oral language repertoires to construct texts. Early reading instruction in New Zealand employs these techniques.

Several researchers have demonstrated that use of contextual cues (and thus accuracy of reading) can be affected by manipulating the familiarity and predictability of textual material (Schavanaveldt, Ackerman, and Semlear, 1977; Wittrock, Marks and Doctorow, 1975). Poorer readers
and retarded readers can use contextual cues given the appropriate textual conditions (Schavanaveldt, et. al. 1977; Streib, 1976).

2. Individualised Oral Reading

Appropriate effects of error attention depend on the operation of specific attributes (such as timing and type). The use of error attention is likely to be more effective in a one-to-one individualised setting.

In order to provide appropriately matched information and to regulate attention appropriately, the instructor needs to conduct oral reading without interruption. The reader needs to read for several minutes in order to obtain maximum opportunity to use contextual cues for full generation of meaning and to have sufficient opportunity to self correct. These conditions are not likely to be met in group settings especially where individual reading is intermittent or group chorus responding occurs.

This is not to argue against group instruction or group reading. Rather, the argument is that instruction which involves error correction in contextual oral reading is more appropriately carried out in an individualised setting. Group settings may have different instructional purposes (e.g. Kitchen, 1976). It may, for example, be appropriate to train isolated letter and word discrimination or word attack skills in such a setting. It may
also be more appropriate to carry out related oral language activities and familiarisation with the story and meaning of a new text in such a setting. The relationship between instructional settings is a matter for further research.

An additional reason for advocating the importance of individualised reading comes from the analysis of acquisition trends in reading. In order to learn to use accurately all textual cues and use them in an integrated interfacilitatory fashion which becomes increasingly self controlled readers must have the opportunity to make these responses. Practice effects are among the most well documented of psychological phenomena (e.g. Hintzman, 1976).

In several studies undertaken by the author the effects of increasing opportunities to make oral reading responses appears to have had powerful effects on acquisition trends. Data reported in both studies illustrate this point. Casual observations suggest that there are reduced opportunities to make and practise appropriate responding in group settings.

From previous discussions it would seem that oral responding is simply an instructional necessity in the acquisition of reading. Oral responding (1) makes the reader's behaviours observable to the instructor, thus enabling appropriate attention to errors (and correct responses) and (2) makes available for the reader the
opportunity to hear and see matches and mismatches between oral responding and written language.

It should finally be emphasised that the recent analysis of error attention is not presented as a substitute for reinforcement contingencies on appropriate responding. It is assumed that the most functional instructional programmes will involve both shaping procedures with reinforcement contingencies and error correction attention (analogous to positive and negative feedback).

D. EXPLAINING THE FUNCTIONAL STATUS OF ERROR ATTENTION IN ORAL READING

A conceptual framework was outlined which explained how predicted error attention could be functionally related to oral reading. Unpredicted results, especially in Chapter Four, would have seriously questioned the validity of either, or both of the analyses which contributed to the general framework. One set of positive results does not directly prove the validity of any conceptual system. Nevertheless, the account of the functional dimensions of error attention was supported by the data. This account has extensive applicability in oral reading contexts and research is now needed to examine the implications fully.

The predictions made in Chapter Two were the result of the analyses in Chapter One of the acquisition of reading behaviours and the learning variable status of
attention to errors generally. Integration of these two analyses allowed predictions to be made about the causal relationship between specific properties of attention to oral reading errors and acquisition of proficient reading. Specifying a combined conceptual framework therefore meant the functional analyses of Experiment One and Two resulted from a hypothetico-deductive process (e.g. Popper, 1969; Ryan, 1970).

Overt specification of conceptual bases greatly increases the usefulness of a functional analysis. The variables used in the present research controlled the accuracy of oral reading and therefore certainly explain that behaviour (Baer, Wolf and Risley, 1968; Sidman, 1960; Skinner, 1953). The present analysis attempted to explain why the variables controlled the behaviour. If the conceptual framework is accurate then extrapolation to other oral reading settings could be said to result from something more than a 'reasonable expectation'. It means also that some of the setting conditions and the operation of variables can be accurately specified in advance. Thus the increased usefulness is in terms of more precise applications and greater generality.

The relationship between structural accounts of behaviour (e.g. information processing models) and functional accounts (e.g. radical behaviourism) is an important issue for psychology. Some authors consider the
two accounts as necessarily belonging to two different 'paradigms' (Catania, 1972; McGinnies, 1974; Overton and Reese, 1973; Reese and Overton, 1970) and, following Kuhn's (1970) analysis of paradigms in the history of science, are therefore incompatible. Other authors have suggested that integrating aspects of the two perspectives may be necessary to a full account of behaviour (Boneau, 1974; Kuhn, 1978). Rather than produce a theoretical amalgam both Salzinger (1976) and Day (1976a, 1976b) have used and interpreted cognitive and phenomenological concepts of human behaviour within a radical behaviourist perspective.

The framework developed in the present work also used and interpreted structural concepts within a process account. Concepts of the behaviours involved in learning to read were outlined. The concepts provided specification of behavioural systems and the relationship between behavioural systems over time. These behavioural systems were in turn claimed to have operating characteristics, which defined the information processing capabilities of the behavioural systems. Information processing concepts such as memory, however, were not used as separate prior explanations for behaviour. Such use can lead to epistemological and ontological problems (Bransford, McCarrell, Franks and Nitsch, 1977; Ryle, 1973; Skinner, 1953, 1974). Rather, information processing concepts were interpreted as components of the behavioural system. As components of behaviour, they explain behaviour only in a very limited sense.
Structural concepts from 'cognitive' and 'information-processing' descriptions aided the detailed specification of behavioural systems. The fruitfulness of this framework in supplying behavioural predictions may be attributed to the use of concepts from perspectives which are typically outside the frame of reference of behaviour analysis.


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**ADDENDA.**


APPENDIX A.

Observation sheets used in the experiment reported in Chapter Three.
<table>
<thead>
<tr>
<th>Code</th>
<th>Error</th>
<th>A/1G</th>
<th>Conduct R.</th>
<th>A/1G</th>
<th>Model</th>
<th>W/A Ques</th>
<th>Gen. Pr.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>(E)</td>
<td></td>
<td>(N-E=C)</td>
<td></td>
<td>(M)</td>
<td>(Q)</td>
<td></td>
</tr>
<tr>
<td>RATE</td>
<td>(E)</td>
<td></td>
<td>(C/T)</td>
<td></td>
<td>(N/E)</td>
<td>(Q/E)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[\frac{E-C}{E+C} ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[\frac{C \times 100}{N} ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### A. The One Minute Pre-Measure

<table>
<thead>
<tr>
<th>Error Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Words Read</td>
<td>Total Number of Words</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### B. The Ten Minute Procedure

<table>
<thead>
<tr>
<th>First Read Through</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>First Read Through</td>
<td>Errors (Total)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Words in Assignment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Underlined Words</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>

### C. The One Minute Post-Measure

<table>
<thead>
<tr>
<th>Error Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Words Read</td>
<td>Total Number of Words</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Note: The table contains the number of errors and words underlined during the reading.*


<table>
<thead>
<tr>
<th>SESSION</th>
<th>TUTORED TEXT LEVEL</th>
<th>Publisher</th>
<th>Dept.</th>
<th>(Sub-group)</th>
<th>NON TUTORED TEXT LEVEL</th>
<th>Publisher</th>
<th>Dept.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jean's Play House</td>
<td>(Methuen 8a)</td>
<td>A</td>
<td>Locked Out</td>
<td>(Methuen 8d)</td>
<td>(Methuen 8e)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Quacky Duck</td>
<td>(Methuen 8h)</td>
<td>B</td>
<td>Seagull's Breakfast</td>
<td>(Methuen 8f)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Painting the Shed</td>
<td>(Ready to Read 9)</td>
<td>A</td>
<td>Puppy has a Bath</td>
<td>(Methuen 9d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The Naughty Pig</td>
<td>(Playtime Reader 2)</td>
<td>7</td>
<td>Cleaning the Car</td>
<td>(Bobby Book 8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Painting Pictures</td>
<td>(Methuen 9a)</td>
<td>A</td>
<td>Sally at School</td>
<td>(Methuen 9d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sally at School</td>
<td>(Methuen 9d)</td>
<td>B</td>
<td>The Best Cake</td>
<td>(Methuen 9f)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The house in the tree</td>
<td>(Methuen 7g)</td>
<td>A</td>
<td>The Best Cake</td>
<td>(Methuen 7f)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>The Jungle Gym</td>
<td>(Yellow Star 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Cows in the Garden</td>
<td>(Methuen 9b)</td>
<td>A</td>
<td>Horses like Painting</td>
<td>(Animal Playtime 8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Garages</td>
<td>(Methuen 9c)</td>
<td>B</td>
<td>In the Sandpit</td>
<td>(Yellow Star 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>The Christmas Tree</td>
<td>(Methuen 9e)</td>
<td>A</td>
<td>Cleaning the Car</td>
<td>(Bobby Books 8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>The Lion and the Rabbit</td>
<td>(Methuen 9g)</td>
<td>B</td>
<td>Christmas</td>
<td>(Blue Star 7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>The Pots</td>
<td>(Methuen 9h)</td>
<td>A</td>
<td>Christmas Day</td>
<td>(Animal Playtime 9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Susan's House</td>
<td>(McKee)</td>
<td>NA</td>
<td>Father is Home</td>
<td>(Blue Star 7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>A Country School</td>
<td>(Ready to Read 10)</td>
<td>A</td>
<td>The Tree House</td>
<td>(Playtime 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>Quacky Duck</td>
<td>(Playtime 3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Level refers to the publisher's or the Department of Education's (1969) suggested equivalent as a supplental text to one of the 12 Little Books in the Ready-to-Read series.
15. House Hunting
   (Methuen 10c)

16. Donald is Five
   (Methuen 10b)

17. Off to Town
   (Methuen 10a)

18. Bears go to School
   (Animal Playtime 10)

19. School Football
   (Green Star 10.2)

20. At the Gardens
    (Environmental Readers) 12

21. The Pet Show
    (Ready to Read 11)

22. Showday
    (Methuen 11c)

   A. Donald's Puppy
      (Methuen 8b)

   B. I can Drive
      (Green Star 10.1)

   A. Rabbits in the Garden
      (Animal Playtime 7)

   B. Peter and Bobby Paint
      (Bobby Book 9)

   A. Maggie's Baking Day
      (Methuen 7e)

   B. Making Forts
      (Playtime 4)

   A. William the Goat
      (Green Star 11.1)

   B. The First Pet
      (Green Star 11.2)

23. Here Comes the Bus
    (Methuen 11b)

24. At the Camp
    (Ready to Read 12)

25. The Picture
    (Methuen 12a)

26. A Wet Morning
    (Methuen 12b)

27. Going Swimming
    (Methuen 12c)

28. The Missing Cat
    (Commonwealth Readers) 12

29. The Barbeque
    Publisher not available. ?

30. Showday
    (Springboard Readers) 11

   A. In the Holidays
      (Reeds Environmental) 12+

   B. They get Wet
      (Blue Star 8.2)

   A. Naughty Father
      (Blue Star 8.1)

   B. The Bears go Fishing
      (Animal Playtime 11)

   A. The Pets Run Away
      (Animal Playtime 12)

   B. River Fish
      (Green Star 12.1)

   B. Morning Swimming
      (Green Star 12.2)

   B. Morning Swimming
      (Green Star 12.2)
APPENDIX C.
Observation sheet and Scoring Procedures from Chapter Four.

a. Tutored Reading

An unself corrected error marked the beginning of an episode. The text word mis-read and the error (if a substitution) were recorded directly and the error coded by definitions of type and level. Following the error, the tutor's error attention was coded in specific categories. The end of the episode was marked by either a prompted correction or a model, and the appropriate praise statement for a successful reread. The timing of the error attention was also coded. An example of the record sheet and episodes of interactions is provided. Also on the record sheet for tutored reading was provision for recording frequency of self corrections, pages read correctly and tutor verbal attention for pages read correctly.

Thus when tutors analysed the tapes they recorded behaviours involved in an error attention interaction. Tutor attention to errors was defined generally as intervention contingent on a specific substitution, omission, addition or non attempt which was not self corrected. Tutors recorded the occurrence and sequence of an error attention episode, using the behavioural categories. Every instance of prompts, including repetitions, was recorded in the sequence it occurred following an error. A model was recorded only if a reader imitation occurred.
Models were also recorded in sequence. Instances of tutor attention to correct responses such as verbal statements contingent on pages read correctly, or prompted corrections were coded in sequence.

A segment of the sequential record of error attention episodes is shown below. The first error in this particular record involved the text word "have." "With" was coded (S) under Error, type. The level analysis showed this error markedly altered the meaning of the sentence (ED) and had low similarity with the text word (LS). The tutor delayed before attending (D) and prompted with the specified context prompt (PC). The reader corrected the error following this prompt (pC). The tutor praised the reader for rereading the sentence and correctly reading the earlier error (T).

<table>
<thead>
<tr>
<th>Errors</th>
<th>Interaction Record</th>
<th>Tutor Attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text Word + (Substitution)</td>
<td>Type</td>
<td>Level</td>
</tr>
<tr>
<td>have (with)</td>
<td>S</td>
<td>EDLS</td>
</tr>
<tr>
<td>lamb</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>sack (sick)</td>
<td>S</td>
<td>EDHS</td>
</tr>
<tr>
<td>and (an)</td>
<td>S</td>
<td>EPS</td>
</tr>
<tr>
<td>too</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
b. Non tutored reading

(1) Analyses were made directly onto photocopies of the texts. Words read correctly were ticked. Errors were coded by type and level and self corrections were also coded by adding a further notation to the error coding. Error and self correction codes were written directly above words which were self corrected or misread.

(2) The second procedure was carried out by the original tutors as part of their daily data analysis. Simplified record sheets were prepared (see Sheet 2) which the tutor/observers used as event records for self corrections, and errors. Errors (if substitutions) and the text word were recorded directly (verbatim) and all errors coded as with other procedures. This second observation procedure yielded frequency counts of correct and incorrect words and self corrections. These frequency counts provided the basis for measuring the reliability of observation of non tutored reading.
### FREQUENCY RECORD

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Corrections:</td>
<td></td>
</tr>
<tr>
<td>Correct pages:</td>
<td></td>
</tr>
<tr>
<td>Tutor Attention to</td>
<td></td>
</tr>
<tr>
<td>Correct Pages:</td>
<td></td>
</tr>
</tbody>
</table>

### INTERACTION RECORD

<table>
<thead>
<tr>
<th>Text Word + (Substitution)</th>
<th>Type</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O, N, S.A.</td>
<td>EP, ED, EM</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
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<td>3</td>
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</tr>
<tr>
<td>10</td>
<td></td>
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</tr>
</tbody>
</table>

### TUTOR ATTENTION

<table>
<thead>
<tr>
<th>Timing</th>
<th>Type, Sequence, Level, Reader correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>I, D</td>
<td>PC, PM, PR, PI, PW, M, pC, T</td>
</tr>
</tbody>
</table>
Date: ___________________ Reader ___________________ Book ___________________
Tutor: ___________________ No. Words ___________________
Time taken ___________________ Correct Rate \( \frac{\text{correct words}}{\text{minutes}} \) _____________
Self Corrections ___________________ Total _____________
Correct Words (Text words - Errors) ___________________ Total _____________

<table>
<thead>
<tr>
<th>Text Word (+ substitution)</th>
<th>Type</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O, N, S, A</td>
<td>EP, ED, EM, HS, LS</td>
</tr>
</tbody>
</table>

No. Errors _____________

% Error Type 1. O + N _____________

2. EPHN EPLS EDLS EDHS EMHS EMLS _____________

Other _____________