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STIMULUS, EFFECTS ATTENTION  
AND READING PERFORMANCE

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ABSTRACT

This investigation reports an experimental study on the effects different stimulus characteristics have on attention and subsequent reading performance with "good" and "poor" readers.

Forty subjects between the ages of eleven and eleven and a half years at the time of the study (November, 1975) were selected from a typical city school on the following criteria:

- (i) All subjects had to score within  $\pm 1$  standard deviation of the mean on the "Henmon-Nelson Tests of Mental Ability" Group 6-9, Form A. (H.N.)
- (ii) Twenty of them (ten boys, ten girls) had to score between 20-30 raw score points on the "Progressive Achievement Test: Reading Comprehension" and have a Teacher rating of 3+ or 2.
- (iii) Twenty of them (ten boys, ten girls) had to score 18 or less raw score points on the "Progressive Achievement Test: Reading Comprehension" and have a Teacher rating of 3- or 4.

These two groups were then referred to respectively as "good" and "poor" readers. Intelligence was being held constant to prevent it being an independent variable in this study.

All forty subjects were tested on the "Concealed Figures Test" (C.F.T.) which was used in the study as a measure of "attentional style".

Each subject was then presented with a series of slides and his responses recorded. In the first instance six slides, containing three real and three novel animals, were presented in a typical setting. Each slide had a coloured border surrounding it. After viewing each slide (their viewing time being recorded) they were asked to select from two multiple choice questions the setting in which the animal appeared and the colour of the border. This was repeated with the same animals in atypical settings and different coloured borders. Responses to the setting were recorded as "intentional" learning while the border colour was termed "incidental learning".

Each subject was then presented with a slide containing a "mutilated" text (where the first letter of each word had been changed) on each of the animals viewed previously. Each text was presented three times - with a picture, without a picture, without a picture but surrounded by a coloured border. The "on task" time and number of word errors was recorded for each presentation.

The same procedure was repeated only with a different six animals as the subjects for the text (again comprising of three novel and three real animals). "On task" time and word errors were again recorded.

Finally, five slides about one novel and four real animals were presented in traditional orthography as a control measure. These were presented as text only, text and picture, text and border, text and picture and border.

On analysis of the data it was found that "incidental" learning was no greater with bright coloured borders than it was

with dull coloured borders.

"Intentional" learning too was tested out not significantly different with novel animals or settings than it was with real animals or typical settings.

On the "attentional style" test boys were found to have significantly less errors than girls ( $p < .005$ ). However, predicted differences in the number correct between boys and girls, "good" and "poor" readers showed no significance on a one tailed t-test.

The "on task" time of high scorers on the C.F.T. as compared with low scorers did not differ significantly in the reading of the "mutilated" texts.

"Good" readers though spent less time "on task" when the text was presented with a picture than did "poor" readers ( $p < .05$ ). The same significant difference existed when they were presented with a text only. However, no difference was found when they were presented with a text surrounded with a coloured border.

Reading performance of "poor" readers was increased when presented with a text only as compared with a text and illustration ( $p < .10$ ). A one tailed t-test also showed a significant improvement in the performance of "poor" readers when the text had a coloured border around it ( $p < .05$ ). The bright colours showed a very significant improvement in reading performance of "poor" readers as compared with the text only ( $p < .005$ ).

Stimulus materials such as texts with a coloured border seem to assist "poor" readers in particular into focusing their attention on to the relevant cues and increase their success in reading.

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## CHAPTER I

THE RESEARCH ISSUEINTRODUCTION

The investigation reports an experimental study of the relationship between selected stimulus material and its attention raising properties in relation to the learning outcome measured by reading performance.

The attention variable was assumed to be an individual difference factor, varying levels of which would produce differential responses relative to the presentation of the selected visual stimuli. Because such a reaction may be influenced by intelligence it was held as a constant.

A measure of "attentional style" was employed to enable the relationship between this, the stimuli and reading performance to be explored.

From existing research the expectation was that there would be differences between individuals in their response to the stimuli because of "attentional style" and whether they were male or female.

A further expectation was that stimulus materials which gained greater levels of attention would also lead to improved levels of reading performance with both "good" and "poor" readers as well as male and female.

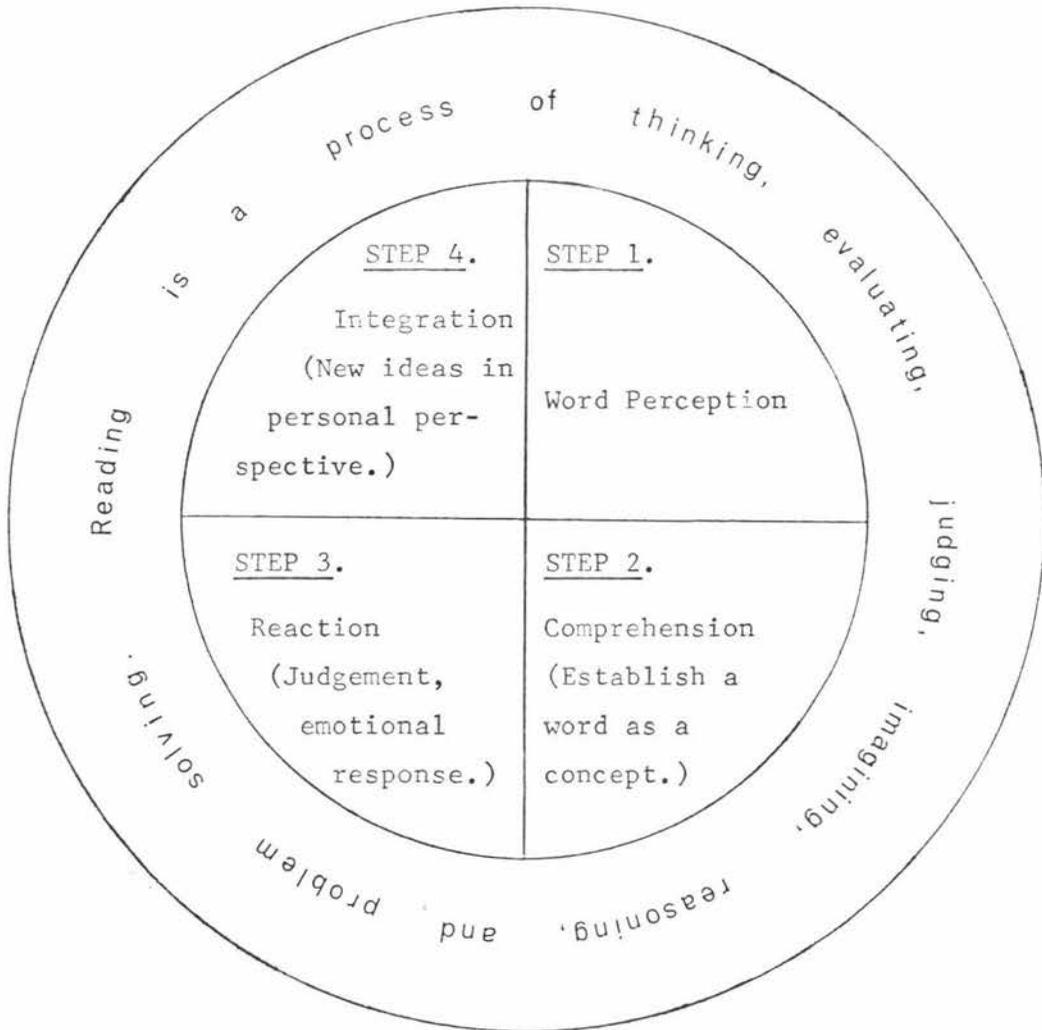
REASONS FOR THE STUDY OF THE PROBLEM

Throughout many countries of the world, and in particular New Zealand, there seems to be an evergrowing percentage of the school aged population experiencing difficulty and consequently low levels of achievement, in learning to read. These children provide a large percentage of early school dropouts. In turn this has an effect on the composition of our society. Positions requiring a reasonable level of scholastic performance either remain unfilled or are filled by individuals of sub-scholastic standard. On the other hand the unskilled and semi-skilled positions are able to be more selective in their choice because of the large numbers wanting such jobs. Such a problem is not unique to New Zealand, of course, other English speaking countries such as the U.S.A., Britain, and Australia are experiencing a similar situation and have been conscious of it for a greater duration than New Zealand.

To combat an ever increasing problem as this, in the last half century, and in particular since World War II, a tremendous amount of literature both theory and research has been published in the field of reading. One such publication which helped lead teachers into a better understanding of the complex process of learning to read, was that published by Gray (1948).

Gray conceptualised the nature of reading as a four step process which highlighted the complexity of the process in terms of physiological, sensory, cognitive, cultural and environmental factors on which learning to read is dependent. Up until this era learning to read had been looked upon as a natural developmental process like walking and talking.

Gray's conceptualisation of the process of learning to read can be illustrated by the following diagram:



Previous and subsequent attempts to describe the reading process, although in some cases superficially different, can, on analysis be seen to fit into one or more of the steps outlined above. The difference being mainly in emphasis as may be illustrated by the linguistic view put forward by Goodman (1972) where his emphasis lies in steps 2. and 3.

A more recent look at the reading process, which summarises most of the successful literature in this topic, was published by Spache and Spache (1964). They saw it as involving skill development, a visual act, a perceptual act, as reflection of cultural background, a thinking process, information processing and associational learning. A very comprehensive coverage, but by no means does it deny Gray's model. The areas mentioned by Spache and Spache fit into one or more of Gray's four step process, and indeed, in his book he deals with these when he expands in detail each of the four steps.

The first step, that of word perception, which incorporates a visual act, is the "launching pad" for the reading act. As visual perception of words is the "launching pad" to reading a cursory glance at perception is less than adequate. Early writings in this field, in particular, the period from 1850-1920, like those of Sir William Hamilton (1859), G. E. Miller (1873), Lange (1888) and others used the concept of "attention" as playing a major role in the psychology of perception. For a period of time following this, publications in the area of attention differed only in terminology rather than the phenomenon being described.

Recent writings in the field of perception, such as Bruner (1966) describe it as "the individuals attempts to make the sensory inputs meaningful". He views also perception, concept formation and category formation as very closely related. Ausubel (1969) another cognitive theorist, sees perception being facilitated through capturing the individuals interest and ensuring that they are attending.

The process of learning seems to involve the following: sensory stimuli, sensation, perception, concept formation and cognition, in that order. Perception being an integral part of learning and the "launching pad" to reading. It is surprising that the literature published on reading shows a glaring omission in that most of the texts do not include learning theories and relate them to the reading process.

The relationship of learning theories to reading is referred to in some recent texts as "The Psychological Foundations of Reading Instruction" and has occurred in only a small number of books written and published since 1970.

Hilgard (1966) suggests that theories of learning might be expected to answer questions one might ask about learning in everyday life. Any theory then, according to Hilgard may be appraised in terms of its attention to measuring:

- capacity
- practice
- motivation
- understanding
- transfer
- forgetting

all of these factors are important in the learning to read act. Two in particular though, stand out as factors which are extremely important and require further analysis; namely, motivation and understanding.

Motivation, for example, has an arousal and directional component in it and is also seen as a major factor influencing perception. Understanding, on the other hand is dependent upon

the individual being motivated which will facilitate perception: a necessary forerunner to understanding.

Theories of motivation such as those put forward by Hull (1943), Murray (1938), Maslow (1954), McClelland (1953), as need theorists; Festinger (1957) on cognitive dissonance; Piaget (1938) on equilibration; Bruner (1966) on curiosity and competence; Berlyne (1960) on arousal, have a common underpinning of stimuli from one source or another (i.e. internal or external) causing the organism to be thrown out of its state of biological, physiological, emotional or cognitive balance. Further the assumption being that when the organism is aroused, there is a natural reaction on its part to seek a new state of equilibrium.

However, the human organism is being bombarded with stimuli continuously, some of which are above the lower threshold for sensation and thus have the necessary properties to bring about this state of arousal and the concomitant of a drive for equilibrium.

It seems then to be of educational worth to investigate the nature of stimuli presented in learning situations, such as reading, which will have a greater chance of arousing the organism to indulge in exploratory but selective type behaviour to achieve a new state of equilibrium. There is a great deal of literature published about stimulus characteristics and their ability to arouse the organism to a state where it selects from the cues available to overcome any ambiguities of the environment. Such literature discusses this property of stimuli and the organism reaction under the concept of "attention"; the most significant publication being that edited by Mostofsky (1970), where significant

findings on "attention" in the last two decades are discussed.

As far back as William James (1890), the concept of "attention" has been known but to a large extent has been included in terms such as motivation and perception.

A greater contribution to teacher knowledge would be the results of research which has been focused around the relationship of stimuli to attention and the similar relationship of attention to learning.

NATURE OF THE PROBLEM

If reading performance is to be improved, effective research needs to be carried out on the variables which have an inhibiting or facilitating effect on the learning to read process. Improved performance in reading does not envisage a shift for all to the top of the achievement scale: a more realistic view than this is held. Instead, it envisages providing for the individual to maximise his learning in terms of his abilities. A goal such as this can only occur once those involved in "educating" gain an increased knowledge of the differential ways in which learning may be facilitated according to the individual's particular learning "style".

In the past a great deal of work has been done in the area of "cognitive styles", e.g. Witkin (1954), Kagan (1965), Wallach and Kagan (1965), Hudson (1966) to mention only some of the more prominent in this field. Research and theory of this nature has provided much valuable information for teachers. Nevertheless, knowing an individual's cognitive style does not ensure an increase in learning. In fact referring to "cognitive style" infers that there is a degree of understanding already taken place to enable cognition to occur. Yet looking at the field of reading, concern must be given to the earlier stages which will ensure the occurrence of cognition.

Focus then needs to be on perception, previously seen as the "launching pad" for the reading process. There is no denial that "cognitive styles" have some influence on the learner in respect to how he thinks his way through a problem but some styles identified such as field dependent - field independent, (Witkin, 1954).

Levellers - Sharpners (Kagan, 1965) seem to be looking at the stimulus, its nature and context.

Cognitive styles seem then to fall into two major categories:

- (i) those focusing on the thinking strategies used by individuals in problem solving situations e.g. impulsivity-reflectivity (Kagan 1965).
- (ii) those focusing on the selection strategies used by individuals during the initial contact with stimuli.

It is the latter of these two which is a part of the perceptual process and important in the act of reading. Such styles, because the individual is aroused by certain stimuli and commences selecting among the stimuli in the field, yet ignoring others, may be referred to as "attentional styles".

In a recent study by Denney (1974) "attentional style" (as measured by the "Fruit Distraction Test") was found to be more effective in differentiating between poor and good readers than the measures of cognitive style used by him. An indication from this study is that knowledge of "attentional styles" may be of considerable value to teachers in helping them facilitate and enhance reading performance especially of poorer readers.

GENERAL RESEARCH QUESTION

A major consequential problem then, is to investigate those stimulus characteristics which may have differential effects on the gaining of attention with individuals. Assuming such differential effects, a related task problem is both the incidental and intentional learning outcomes.

For any study in this field, variables such as age, intelligence and sex all need to be controlled as previous studies have shown that all three operate some control over attending behaviour: c.f. Zeamann-House (1963), Silverman (1967), Harper and Graham (1974), Mostofsky (1965).

In this particular study as the focus is on reading performance some classification and control of levels of reading achievement would be necessary. That is, classification would be necessary in two distinct groups such as below average, or average to above to enable the effects of stimulus material and the related task problem of incidental and intentional learning to be measured.

With such classification it would then be possible to determine whether or not there is a difference in the "attentional styles" of the two groups. In addition the differential means of stimulus presentation, and their effects on reading performance could also be measured.

The question then to be researched in this study may be stated as follows:

"Do stimuli effect attention and reading performance?"

EDUCATIONAL SIGNIFICANCE

Children passing through the educational system in New Zealand are presented with printed material in ever increasing amounts, all of which is of a similar format. For example, in the beginning stages of learning to read children are exposed to the "Ready to Read" series published by the Education Department. In addition to the "Ready to Read" series many supplementary books are available, published by independent publishers to parallel each stage in the Education Department's series. However, the basic series and published supplementaries are of a very similar format, especially in the beginning stages, with a picture on one page and a brief text on the adjacent page. Books at subsequent levels only differ in that the number of illustrations reduce and the amount of text increases. In spite of what is available a large number of children still have difficulty, or experience complete failure in learning to read. Because a large number do learn to read successfully the basic materials used, along with the teaching strategies, would seem to be appropriate for these children. However, those who experience failure or difficulties of some sort, scrutiny of both the materials and teaching strategies is necessary.

It is the purpose of this study to focus on the former of these in terms of their classification as stimulus materials.

The results of such a study may have implications not only for publishers but also and most certainly for the teacher of reading.

The latter is of major concern, in particular the guidance it may provide for assisting poorer readers.