AN INTERVIEW STUDY OF

BLACK SOUTH AFRICAN CHILDREN'S KNOWLEDGE ABOUT MEMORY

ELIZABETH BRIDGET VAN DEN HEUVEL

Submitted in partial fulfilment of the
requirements for the degree of
Master of Social Science,
in the Department of Psychology
University of Natal, Durban
1985

ACKNOWLEDGEMENTS

Declaration of Originality

The author hereby declares that, unless otherwise stated, this thesis represents her own original work.

ABSTRACT

Black South African children's knowledge about memory was investigated using the interview schedule devised by Kreutzer, Leonard and Flavell (1975). Ninety four subjects from class 1, class 2 and standards 1, 2 and 3 were interviewed by a bilingual research assistant in the home language of the subjects (Zulu) and the resultant schedules were utilised in subsequent analyses. For scoring the procedures outlined by Kreutzer et. al. (op.cit.) were followed study. These analyses indicated that:

a.) Older subjects (in std. 1, 2 and 3) generally displayed better metamemory than the younger subjects (in classes 1 and 2).

b.) The lead was not as great as was expected on the basis of American findings (Kreutzer et. al.,1975).

Possible explanations for these results were discussed within the context of cultural factors. Practical considerations in carrying out metacognitive research within a cross-cultural setting were also noted.

CONTENTS

1.00   INTRODUCTION

The Department of Psychology at the University of Natal, Durban, is engaged in a cross-cultural research project into the cognitive development of black children. The aspect chosen for investigation here was the area of metamemory, and its development. There is evidence which relates metamemory to school performance, and this suggests that the observed developmental progression in metamemory is not a purely maturational process, but is associated with increasing education (Wagner, 1974, 1978).

The present research is a cross cultural study to determine whether the developmental trends observed in the metamemory of American children may also be observed in black South African children. If a developmental progression in metamemory is established this could have important implications on the existence of a maturational progression in metamemory independent of culture. This in turn would have practical import in terms of the education of black children in this country.

The interview schedule developed by Kreutzer, Leonard and Flavell (1975) was used as it has been generally acknowledged as one of the better interview schedules (Lawson, 1980; Cavanaugh and Perlmutter, 1982). The use of the Kreutzer et.al. schedule was also seen important in view of the lack of replication studies and poor standardisation evident in the field of metamemory (Cavanaugh and Perlmutter, 1982).

1

2.00 <u>LITERATURE REVIEW</u>

2.10 INTRODUCTION

The question of what people know about their own cognitive process is an old one in psychology, dating back at least to the turn of this century (Cavanaugh and Perlmutter, 1982). Recently interest in this issue has been revived with researchers considering both the nature and the role of introspective knowledge in relation to cognition. In association with the already established body of research literature on memory, enquiry into "knowing about knowing" has focussed primarily on this particular area of cognition, and has become known as metamemory (Lachman, et. al., 1979; Lawson, 1980). This review of metamemory is in two parts. In the first part of the literature survey the parameters and nature of metamemory are considered. This is seen to be especially important in terms of the newness of the term and the associated confusion concerning its useage. The second part surveys aspects of methodology and research findings with the aim of providing a context against which the results of the present study may be viewed.

2.20 THE DEFINITION AND NATURE OF METAMEMORY

The term "metamemory" was coined by Flavell in reference to one's knowledge of and awareness of one's own memory (Flavell and Wellman, 1977). Since its introduction the

term has persisted in the literature. However, Cavanaugh and Perlmutter (1982) note in their critical review that the use of the term metamemory has been somewhat inconsistent in that, in some cases, the term incorporates executive processes, while in other cases it does not. Although Flavell and Wellman (1977) argue that "knowledge about memory" may be too circumspect a definition of metamemory, they clearly do not feel that executive processes fall within the parameters of metamemory. Ceci and Howe (1982), conversely, equate the term metamemory with Hilgard's reference to "the supreme command post", and thereby implicitly include the executive processes within the boundary of metamemory.

In an attempt to elucidate the nature of metamemory Flavell and Wellman (1977) have proposed a taxonomy of memory knowledge. They describe two major kinds of memory knowledge, namely the sensitivity category and variable category. Briefly, sensitivity refers to the awareness of the need to employ strategies for a specific task, while the variable catagory refers to one's knowledge about various aspects that may affect memory (Ceci and Howe, 1982).

a.   Sensitivity Category

This category is concerned with the intentional storage and retrieval of information. Some situations call for planful memory processing whereas others do not. Sensitivity refers to the person's ability to distinguish between these two situations and hence the awareness of those situations that

call for planful memory processing (Flavell and Wellman, 1977).

The inclusion of this category makes the distinction between intentional and incidental preparation of retrieval explicit. As such, the incorporation of the sensitivity category in their taxonomy is indicative of the authors' concern with the relationship between metamemory and awareness, a relationship which, more recently, has interested other authors. Ceci and Howe (1982) have examined the relationships between consciousness, attention, intention and metamemory and suggest that attention may occur under the conditions of automization, semi-automization and under purposivity*. These cases seem to lie on a continuum with automization at one end (where both process and the resultant products being unconscious), and purposivity at the other, (where both the process and products of the latter are at a conscious level of attention) (Ceci and Howe, 1982). Thus the central feature of Flavell and Wellman's sensitivity category is what Ceci and Howe call the "intention to attend".

b.   Variable Category

This category is seen to consist of three variables, namely

* This work suggests that cognisance has been taken of the comment made by Hilgard that "we need a set of adjectives to describe the relationships between information that has been registered and the manner in which that informaton is represented in consciousness" (in Ceci and Howe, 1982, p. 15).

person variables, task variables, and strategy variables (Flavell and Wellman, 1977*). Person variables refer to knowledge about one's own as well as other's characteristics, limitations and abilities as a memorizer. This would include, for example, what Brown has called secondary ignorance (Cavanaugh and Perlmutter, 1982). Task variables concern the knowledge of the inherent characteristics of the problem-solving situation which affect performance. Thus a child's metamemory relating to the task variable would include the understanding that some types of memory material are harder to store and retrieve than others as well as the awareness of the fact that some retrieval demands are harder to accomplish than others. Finally, strategy variables relate to knowledge of mnemonic strategies in one's own repertoire (Cavanaugh and Perlmutter, 1982). This would include being aware that one has different strategies at one's disposal, and knowing what these stratgies are. An example of this would be knowing that one can use rehearsal to remember a telephone number, or that one could write the number down and use this external aid as a memory prompt.

However, this taxonomy has not eliminated the confusion sur-

* Caution is required in treating this taxonomy as if it were exhaustive, since both Flavell (1981) and Paris (1978) have subsequently suggested additional categories. In terms of this study it is interesting to note that the additional categories proposed by these authors relate to the context in which memory processing occurs, with Paris citing the cultural context explicitly (in Cavanaugh and Perlmutter, 1982).

rounding the use of the term metamemory, as is evident when one considers two recent papers dealing with the subject of "knowing about knowing" in its broader sense, ie. metacognition. Both Lefebvre-Pinard (1983) and Kitchener (1983) note that Kuhn elucidated some some subtle but important distinctions in "knowing about knowing". Kuhn made the distincton between "executive 1" and "executive 2" type strategies where the former refers to knowledge about a task or problem and the latter to knowledge of whether a specific strategy is appropriate to apply in a particular problem-solving situation (Kitchener, 1983). The confusion arises in that Lefebvre-Pinard (1983) states that the executive 2 strategies are equivalent in meaning and function to metacognition, while Kitchener (1983) perceives this to be a meta- meta level of cognitive monitoring, and refers to it as epistemic cognition.

The confusion arising from inconsistent use of the term metamemory is perhaps indicative of conceptual difficulties that are encountered in the area of cognition, where distinctions often refer to different levels of awareness which may be hard to separate out. Thus while strategies refer to memory instructions, metamemory includes both being aware that such strategies exist and may be employed (strategy variable), and also to being aware of the need to use strategies in general. This may be distinguished from knowing whether the use of a specific strategy may be appropriate in terms of the given situation, which Kitchener (1983) has

labeled epistemic cognition, and perhaps this type of cogni-
tion may be seen to be a control/executive process.

Accepting the limitations of our current knowledge it is
still possible to work towards clarity on these issues and
with this in view the term metamemory shall be referred to
here as knowledge about memory. This is seen to include
knowledge of different characteristics that may have a bear-
ing on a persons performance on any memory task (variable
category), as well as that knowledge which allows one to
discriminate between situations which call for intentional
and planful memory processing and those that do not (termed
sensitivity). As such metamemory is seen as distinct from
the executive processes with which it may be associated.

Finally, it may be expedient to note that memory and meta-
memory are inextricably linked to other aspects of cognition
and that these terms have been used as a matter of conven-
ience to refer to a traditional subset of operations (Ceci
and Howe, 1982).

2.30 METAMEMORY RESEARCH

2.31 Introduction

The emergence of the subject of metamemory as a focus of
research seems to be associated with the interest and inves-
tigation into various fields and in order to be able to
appreciate the development of metamemory as a topic of some

7

import within the relevant fields, it is necessary to consider the context within which the topic emerged as a potentially exciting and progressive one.

a.   Consciousness and Cognition

Lefebvre-Pinard (1983) has observed that despite the newness of the term metamemory, the concept which the title subsumes is not altogether so recent.   Soviet psychologists, such as Vygotsky, have postulated a direct relationship between an awareness of one's cognitive processes and the ability to control them (Lefebvre-Pinard, 1983).   This led to the interest which has been shown in the effect of knowing about knowing on memory performance, a concern which is currently observed in the research pertaining to the metamemory- memory relationship.

b.   Memory Theory

Conscious attentional processing was recognised as significant in terms of memory performance by Ebbinghaus as early as 1893 (Ceci and Howe, 1982), since which time it has continued to receive recognition in cognitive psychology.   However, it was felt by Tulving and Madigan (1970) that the full significance of people's awareness of their own knowledge had not been sufficiently recognised and that any real breakthough in

the study of memory would at least in part relate to this uniquely human characteristic (in Cavanaugh and Perlmutter, 1982).

Memory theories have in the last quarter century implicitly incorporated the role of one's own knowledge on memory performance into in memory theory prior to the formal introduction of the concept of metamemory (Lawson, 1980). Two notable examples are the levels of processing and the constructivist approaches (Cavanaugh and Perlmutter, 1982).

Within the framework of the levels-of-processing approach, incoming stimuli are seen to be subject to different types of analyses starting from a shallow type and moving towards a deeper, more abstract and hence more complex level of analysis (Solso, 1979). The effect of one's knowledge on memory is incorporated implicitly in various ways, for example it is thought that the individual's knowledge structures influence the the depth at which analysis occurs and more specifically, subject's knowledge about retrieval may affect encoding depth (Cavanaugh and Perlmutter, 1982).

The other approach which implicates the role of knowledge about memory is that of the constructivist and contextualist theories. From this perspective the individual is seen as active - through applying peviously acquired knowledge _ in the interpretation of incoming stimuli (Cavanaugh and Perlmutter, 1982). Thus in understanding memory from this point of view one must account for the effect of knowledge.

Jenkins has reinforced this point through the inclusion of the subject variable (which subsumes abilities, knowledge and interestingly enough, motives, amongst others) along with other variables in his tetrahedral model (1979, in Cavanaugh and Perlmutter, 1982).

c.   Memory Strategy Research

The predominant factor in the stimulation of research directly into metamemory arises from the research on the development of memory strategies (Cavanaugh and Perlmutter, 1982). Results showed that whereas mature memorizers used memory strategies spontaneously, immature memorizers did not necessarily do this despite the availability of the strategy, thus giving rise to the concept of "production deficiency" (Flavell and Wellman, 1977). Thus research sought to discover the factors that may underly spontaneous strategy use, and knowledge about one's memory became a main focus of this inquiry (Cavanaugh and Perlmutter, 1982).

From this point the research gained an impetus of its own and metamemory was given more explicit recognition; Brown for example stated that " one of the most persuasive arguments in favor of studying metamemory development is that there must be close ties between what one knows about memory and how one goes about memorising" (cited in Cavanaugh and Borkowski, 1980, p. 441). Metamemory was also seen to be important in facilitating the understanding of the development of mem-

ory since many age-related changes in memory have been attri-
buted to the development of metamemory (Flavell and Wellman,
1977; Brown and deLoache in Cavanaugh and Borkowski, 1980).

2.32 Research.Methodology

Several authors have noted the problems associated with re-
search into metamemory (Lawson, 1980; Cavanaugh and Perl-
mutter, 1982; Robinson, 1983).   Such problems include the
degree to which an individual's cognitive processes may be
accessible to introspective analysis, as well as the amount
of ˙information˙ that may be lost through verbal reports (Cav-
anaugh and Perlmutter, 1982).   With reference to the latter,
Robinson (1983) notes that apart from the underestimation of
knowledge thought to be associated with information based on
verbal reports, verbal reports may also result in an over-
estimation of ability.   Research difficulties that are more
specifically related to metamemory research include, for
example, the apparent task-specificity and intra-individual
variability of at least some metamemorial skills (Lawson,
1980).   Finally there are problems related to experimental
design such as the almost total lack of replication of re-
search (with the exception of Cavanaugh and Borkowski, 1980)
and absence of reliability measures (Cavanaugh and   Perl-
mutter, 1982).

By using different study designs and new materials, research
tends to generate a greater number of tentative findings

rather than confirming previous results and thus consolidating the knowledge and understanding of various aspects of metamemory. Similarly, with regards to the general lack of reliability measures, the significance of the findings may be weakened since the degree of error is not known and thus cannot be accounted for. Furthermore, it is through replication studies and the use of reliability measures that the better assessment methods may be identified, and consequently the lack of replication and reliability measures may effectively be restricting the progress evidenced in this field.

Of the various research methods evident thus far in metamemory research, the use of interviews and questionnaires - part of what Cavanaugh and Perlmutter (1982) call the "independent measures" - is of greatest interest here. Cavanaugh and Perlmutter (1982) comment on several problems associated with this particular research technique. Firstly, there is a concern with the validity of the method; the concern resides with the subject's understanding of questions as this could influence whether the questions assess what the researchers want to know. Secondly, they observe that formats such as that of multiple choice may be very restrictive. Finally, when interviews are used to obtain retrospective reports by subjects, factors such as demand characteristics and other possible sources of interference need to be considered (Cavanaugh and Perlmutter, 1982).

Despite these difficulties, some interview methods have provided important data and most notable is the the study by

Kreutzer, Leonard and Flavell which has been upheld as "the best example" of the interview method of research (Cavanaugh and Perlmutter, 1982, p. 17), a view which has received support from other sources (Lawson, 1980; Dachler and Buk- atko, 1985). In terms of this study's results it has pro- vided "some of the most exciting examples of quite sophis- ticated strategic behaviour on the part of young children" (Lawson, 1980; p. 151).

This study investigated the metamemory status of grade K, 1, 3 and 5 children (ages 6 - 8 and 9 - 11) through an extensive interview schedule which covered a wide range of tasks. This is seen as important in that it accounts for the task- specificity of some metamemorial skills, not only in terms of the actual tasks themselves (cf. Lawson, 1980) but also to some degree in terms of the context within which the skills are researched (ie. the traditional laboratory task as op- posed to the more everyday kinds of memory problems). This latter aspect has recently been recognised as a potentially important facet of metamemory research (Ceci and Bronfenbren- ner, 1985). The nature of the Kreutzer et. al. investi- gation (1975) thus allows for a comprehensive assessment of metamemory in children. As such it may be gainfully used in a replication study for the purpose of strengthening previous research findings and for advancement of assessment methods (cf. Cavanaugh and Borkowski, 1980). Furthermore, the nature of this study is thought to make it particularly useful in the assessment of metamemory cross culturally, as

this often involves research with new population groups where an extensive assessment study is needed.

2.33 The Context of Research

Recent evidence has emerged which suggests that the context within which metamemory is investigated may be an important factor influencing results. Ceci and Bronfenbrenner (1985) investigated strategies used by children in two contexts, a familiar (home) setting and unfamiliar (laboratory) setting. The task involved prospective memory where children were asked to place cup cakes in the oven at a specified time and to remove them 30 minutes later. During the waiting interval the children were invited to make unlimited use of a video game.

Results indicated that strategic monitoring was more pronounced in the home setting as compared with that of the laboratory. Furthermore, findings indicated that the "laboratory, as an unfamiliar and thereby somewhat anxiety-arousing environment, is more likely to activate variation in research findings as a function of characteristics of both the person (eg. age and sex) and the immediate situation (eg. the nature of the task)" (Ceci and Bronfenbrenner, 1985, p.158. Cf. * at end of this section). The results thus point to the importance of considering the context of research when interpreting the findings.

Although recent research has emphasised that the context of

14

research may be an important variable in research findings, this had been previously suggested by a study done by Istomina (1975, in Ceci and Howe, 1982). In keeping with the Soviet approach to research Istomina worked within a socio-historical paradigm, which emphasises the effect of environmental vairables on cognitive processing. In the study young subjects listened to lists of common objects and shortly afterwards were asked to recall the words; however, the situations within which the task varied from straight forward rote memorization to the incorporation of the recall items in to a game. Although the conditions were matched in terms of timing of words presented and the interval between pesentation and recall, subjects in the "game" condition recalled almost twice as many items as children in the other condition (Ceci and Howe, 1982). The interpretation of these results was that young children do not spontaneously employ memory strategies in the list-learning condition whereas in the motivating game situation they do (Wagner and Paris, 1981. Cf ** at end of this section).

Thus whether or not young children are able to demonstrate fairly sophisticated strategy use may depend in part on the context in which they are required to do so (Ceci and Bronfenbrenner, 1985), and laboratory assessment of children's metamemory ability may have underestimated this.

* One of the interesting possibilities resulting from this research is that children may use somewhat complex strategies automatically (Ceci and Bronfenbrenner, 1985) and this would

then have implications for the theoretical dimension of novice-expert used by Brown and Deloache to explicate the metacognitive differences between children and adults (in Robinson, 1983). According to this hypothesis the transition from a novice to an expert involves deliberate self-regulation until overlearning occurs, processes would become relatively automatic. Robinson has observed that " the question of age-related and task-related differences in the amount of conscious processing is an important and interesting one, and it is a pity we have so little evidence (1983, p.116).

** This study has interesting theoretical impications with regards to the distinction between intentional attention and incidental attention. Ceci and Howe (1982) comment that with the meaningful goal in the game situation, the component of intention was actively included by the experimenter and hence was not indicative of mature metamemory skills on the part of the young subjects. It should be noted therefore, that there is a distinction between knowing HOW to use strategies, and knowing that one is using them (Robinson, 1983).

2.40 COMPARATIVE RESEARCH FINDINGS

The development of the field of metamemory within cognitive psychology has had an important effect on comparative studies into memory. Up until 1960 the underlying hypothesis of comparative memory investigations was that "memory was an inherent faculty or cognitive structure that varied among people, some having more and some less" (Wagner and Paris, 1981, p. 413). The new developments have suggested that while some structural factors may be invariable, other factors such as metamemory are not and the focus of comparative research has shifted from identifying inherent deficits in groups of people to identifying relative differences in the use of memory skills (Wagner and Paris, op. cit.). This may be a more beneficial approach since it allows for the inves-

tigation as to the reasons that may account for such differences besides those related to genetic inheritance e.g. cultural factors.

2.41 Age Related Differences

Preschool Children

There is evidence to suggest that even as young as 3 years children have some concept of intentional remembering and as such have sensitivity to the need to engage in some activity at the time of storage in preparation for future retrieval. Alcredelo et. al. (1975*) found that when children were taken for a walk during which they were exposed to an event and later asked to find the location of the event, recall results were better where subjects had had prior knowledge of the task as opposed to no prior knowledge.   In a similar study by Wellman (1975*) 3 year old children watched an experimenter hide a toy and then leave the room on some pretext. When the experimenter returned after a short interval the subject was asked to locate the hidden toy.   Where subjects had been informed beforehand that they were to be asked to locate the hidden toy, different behaviours (preparation for retrieval) and improved recall results were evident.

It has been suggested that the demonstration of intentional

* reference in Flavell and Wellman, 1977

17

storage at such a young age may be associated with the avail-
ability of simple, task appropriate strategies in any partic-
ular experimental situation and this has been seen as in-
creasingly significant (Flavell and Wellman, 1977). Fur-
thermore, regarding the above mentioned studies, it should
also be noted that the tasks involved the spatial location of
tangible objects as opposed to learning a list of names,
where the former may be more relevant in the every day
life of the young child (Flavell and Wellman, 1977). The
latter point was thought to be important in terms of the lack
of evidence of sensitivity in pre-schoolers where this was
examined within a study-recall paradigm (Short and Miller,
1981). In one such study 4 year olds failed to differen-
tiate in any way between instructions to "look carefully" at
a set of items, and to memorize the items for future recall
(Appel et. al, 1972 *). Similar findings were reported by
Miller et. al where memory instructions did not appear to
generate different behaviours compared to watch instructions
(1978, in Short and Miller, 1981). More recent evidence,
however, has succeeded in demonstrating sensitivity in pre-
schoolers where this was coupled with strategy and recall and
this then suggests that metamemory knowledge in preschoolers
may not be limited to situations involving memory of loca-
tion, as suggested by the above mentioned studies (Short and
Miller, 1981).

* reference in Flavell and Wellman, 1977

Considering preschoolers predictions of memory span following a memory task, Yussen and Levy (1975*) found that 4 year old subjects predictions were not in keeping with their prior performance, indicating that they did not seem to take cognizance of their recent performance. In terms of Flavell's taxonomy (1979) it may be said that in this case the subject's failure on a memory task didn't seem to provide these 4 year olds with a metamemory experience or in any case, one that they were immediately aware of. However, in some cases young children's predicton of their memory ability was more accurate following practice (Markman, 1973 *). Moreover, it is possible that children's performance may differ across tasks and it has been suggested that the ability of 5 year olds to predict performance was more accurate when it concerned certain motor tasks, as opposed to a list of names (Markman, 1973 *).

Research into preschooler's metamemory to date thus seems to indicate sensitivity in these young children, but general evidence concerning observed preparation for recall or recall performance which implies that strategies must have been employed, is not uniform (Short and Miller, 1981).

Beginning of Middle childhood (ages 6 - 8)

Research data concerning the state of metamemory in the beginning of middle childhood would appear to be less diver-

* reference in Flavell and Wellman, 1977

gent than that for younger children. They appear to have a fairly good understanding of everyday expressions relating to memory such as "remember" and "forget" (Kreutzer et. al, 1975).

Children within this age group have shown metacognitive knowledge relating to the person variable in that they do have some idea that recall ability is likely to increase with age (Kreutzer et. al, 1975). Regarding their own memory ability, however, these children are usually inaccurate in the prediction of their own memory, with the tendency to overestimate their recall ability (Yussar & Levy 1975 *).

This age group has indicated their belief that certain item characteristics such as colour (Kreutzer et. al. 1975) and familiarity, (Moynahan, 1973*; Kreutzer et. al, 1975) enhances an individual's memory ability. Furthermore they have some idea that task characteristics, such as amount of material to be recalled as well as length of study time may affect memory performance (Kreutzer et. al., 1975). At age 6 - 7 years children occasionally showed an understanding that events which occurred long ago may be especially hard to remember (Kreutzer et.al., 1975), and 8 year olds seem to realise more fully that longer retention intervals called for longer study times, whereas 4 and 6 year olds did not (Rogoff et. al, 1974*). There does, however, seem to be a degree

* reference in Flavell and Wellman, 1977

of paucity in their metamemory concerning task variables expecially, it seems, with regards categorization of material (Moynahan, 1973* ; Salatas and Flavell, 1976*).

If asked to retrieve data or to prepare for future retrieval most young children are able to think of some appropriate way of doing this and generally they favoured external "in the world" as opposed to internal mnemonics (Kreutzer et. al, 1975). Even these young children recognise the benefits of writing down information as a memory aid (Kurdek and Burt, 1982).

End of Middle Childhood 9 - 11

Children in the 9 - 11 year age group show greater metamemory in all the variables relating to metamemory knowledge. Considering firstly the person variable, children of this age group know both that recall ability is likely to increase with age, and that older children are likely to set about preparation for retrieval in a different manner than younger children (Kreutzer et. al, 1975). Older children also have a more advanced knowledge of their own memory ability. In one study 9 year olds were more able to predict which items they may be able to recall at a later time out of items they were unable to name at first, as compared with the 5 and 7 year old subjects (Wellman 1975*).

* reference in Flavell and Wellman, 1977

Turning to studies concerning metamemory of task variables, 9 - 11 year olds seem to understand the inhibiting effect that retroactive interference may have on preparation for recall and retrieval (Kreutzer et. al, 1975; Kurdek and Burt, 1982) and they recognise that pairs of opposites are easier to learn than other types of paired asssociated words (Kreutzer et. al, 1975). In addition 11 year olds are cognizant of the fact that a request to memorize items for future recall calls for active engagement in some preparation for retrieval whereas an instruction to look carefully does not, and they act accordingly (Appel, 1972*). Children in this age groups are more likely to correctly predict the relative difficulty of remembering sets of strongly categorized items vs. equal sized and comparable sets of conceptually unrelated items, as compared with younger subjects, despite the fact that all ages detected the categories and despite the lack of age difference in recall ability of the categorized vs. non categorized sets (Moynahan, 1973*).

Finally, the strategies that 9 - 11 year olds apparently have available to them are generally more numerous, varied and sophisticated than younger children (Kreutzer et. al., 1975). Older children recognised the importance of system-atic mnemonic strategies (Kurdek and Burt, 1982). Moreover, the rational use of external mnemonic aids also increases with age and was exhibited by almost all 12 year subjects in

* reference in Flavell and Wellman, 1977

one study (Danner, 1976*).   In considering the way in which
children may search the external world for a lost item,
Drozdal and Flavell (1975)* found that 9 - 10 year olds were
able to understand and articulate the idea that if an item is
discovered missing at part B of an itinerary and A is the
last place at which one was sure one had the item, then one
must search for the item in the A - B part of the itinerary.

An important development emerging within this age group is
the awareness that memory performance is influenced not only
be the above mentioned variables, but also by their interac-
tion (Kreutzer, et. al, 1975).   Qualitative evidence of
this was found in the Kreutzer study where children made
spontaneous mention of variable interaction, for example of
amount of material to learn and time factors.   In addition
subjects made explicit use of terminology ("and then", " so
that") (Kreutzer et. al., 1975) which was suggestive of an
understanding that that components of a memory problem may be
related in a scheme comprising an initial state, a goal state
and a way of moving from the former to the latter, ie. a
means-end interaction (Flavell and Wellman, 1977).

Apart from considering children's metamemory knowledge some
studies have investigated what may be classified as meta-
memory experiences (Flavell, 1979) where older children (11
year olds) were more likely than younger subjects to show
improvements in performance with practise and thus were able

* reference in Flavell and Wellman, 1977

to utilize their experience beneficially in future situations (Tenney, 1975*).

Further developments.

Kreutzer et. al. (1975) note that their 11 year old sub-jects were not at ceiling on a number of tasks and suggest that adolescents and adults may do better, espcially with re-gards to their ability to explicitly verbalise some meta-memory knowledge, and greater planfulness and sophistication in their strategy use. This premise was endorsed by re-search showing that the adults spontaneously engaged in sophisticated indirect retrieval strategies, whereas few 6 and 9 year olds did (Salatas and Flavell, in press*). Also, when comparing the use of external memory aids amongst 10 and 13 year olds, Siegler and Liebert (1975*) found that more older children made use of the suggested aid - written recor-dings in this case - than the 10 year olds.

General Comments and Conclusions

The difference in metamemory knowledge between preschoolers, children at the begining of middle childhood and those at the latter stages of middle childhood appear to be both quantita-tive and qualitative. Research pertaining to the youngest age group appears somewhat varied in terms of subject's

* reference in Flavell and Wellman, 1977

metamemory. However, research has demonstrated the presence of sensitivity, especially (but not exclusively) in relation to the spatial locaton of tangible objects in preschoolers and this at least may provide some sort of baseline for future work. In the early stage of middle childhood children seem to show a general understanding of everyday terminology and they demonstrate some understanding of the various variables (person, task and strategy) relating to metamemory knowledge. However, at late childhood this understanding is apparently more developed and children are better able to articulate it in a way that makes this knowledge evident. They appear to engage in greater planfullness. Moreover, whereas younger subjects may understand that certain properties of individual items may affect memory performance, older children also recognise the relations that may exist between items - their understanding is thus further integrated and more fully developed.

It has been found that with age children become more likely to regulate and monitor their own psychological proceses (Kurdek and Burt, 1982). Within the field of metamemory there is much evidence to support this view (Flavell and Wellman, 1977), as developmental research has shown that "subject's knowledge of metamemory increases very rapidly during childhood" (Lawson,1980, p.151). Regarding the nature of this development, there is evidence for the view that children's cognitive abilities are better conceptualised as developing along a continuum than in a step like absent/

present fashion (Kurdek and Burt, 1982).

One of the notable age related metamemory developments in the decrease in production deficiency with the increases in age and metamemory development may thus include getting to know when and why intentional storage and retrieval of information should occurr (Flavell and Wellman, 1977).

2.42   Cross Cultural Studies

As in the study of metalinguistics, a close association has been observed between the progression of metamemory and school attendance, and hence it has been suggested that schooling may be directly implicated in metamemory development (Robinson, 1983).   It has been observed that at school one is expected to remember material without the use of external aids and often with no particular goal in mind (Brown, 1978, in Robinson, 1983).   Cross cultural research has been especially useful in the examination of such observations as it facilitates the investigation of previously confounded or noncontrastable variables, such as age and education (Wagner, 1978).   Unfortunately, most of the cross cultural research to date has been only indirectly associated with metamemory, and the use of strategies has been inferred from the developmental increases evidenced in the recall of older school children, rather than having been directly and systematically measured, (Wagner, 1978; Robinson, 1983). Nevertheless, the cross cultural investigations which indirectly relate to metamemory have a direct bearing on the

topic, providing fundamental contextual information for any future cross cultural data concerning metamemory and hence will be considered here.

Cross cultural research has worked towards the clarification of factors that may be significantly implicated with regards cognitive changes and early studies sugested that both age and education may be important in memory development (eg. Cole et. al., 1971). With reference to the "control processes"*, however, schooling was seen to be the more important factor, so much so that it was hypothesised that "higher level mnemonic skills or strategies for remembering (such as verbal rehearsal) may develop only in the context of formal education, not by maturation alone" (Wagner, 1974). However, in this study, the variable of formal schooling was confounded by that of urban environment and it was subseqently attempted to assess the relative contribution of these two factors on memory (Wagner, 1978). The indications were that the development of memory strategies may be dependent in part on formal schooling, but that living in an urban environmnet may also be a positive influencing factor (Wagner, 1978).

A second advantage of cross cultural research is that allows the examination of the extent to which statements resulting

---

* the author uses the term control processes to refer to both mnemonics and metamemory.

from data on specific populations may be applied to other populations (Wagner, 1978). Besides cultural factors being implicatated in the employment of strategies, there is also evidence to suggest that culture may be important in terms of the nature of mnemonics utilized (Wagner, 1978). One of the pioneers in cross cultural memory research in the western world, Bartlett, found that subject's recall of passages was reconstructed so as to be compatible to cultural schemata or prescribed interpetations, and later laboratory research supported this perspective (Wagner and Paris, 1981). Furthermore certain cultural groups appear to have developed unique mnemonics, such as using rhythm, singing and use of body movement (dancing, mime representations) that may be particularly effective for the type of information to be recalled on a given task (Wagner, 1978).

In the evaluation of findings generated by cross cultural studies it has been cautioned that "cross cultural comparisons are often unreliable due to especially difficult testing conditions and problems in eliciting optimal performance ßand henceö direct comparisons between ontogenetic and cultural differences in memory development may not be warranted" (Wagner and Paris, 1978, p. 416). Furthermore, this diminished reliabilty may indicate the need for replication studies so that stronger data may be produced.

It is thus possible to conclude that memory development may be facilitated by a variety of global cultural variables such

as high levels of formal schooling and urbanization, and that differencs are clearly evident in the planful use of active strategies (Wagner and Paris, 1981). The implication of cross cultural research as regards metamemory is that like ontogenetic research, cross cultural research has revealed that "subjects may often vary more in their use and under-standing of mnemonic techniques and knowledge-driven schemata than in underlying competence or ability to remember" (Wagner and Paris, 1981, p. 416). Moreover, the strategies used may differ in nature according to culture or cultural sub-groups. Finally, in assessing cross cultural findings, it should be borne in mind that certain practical research difficulties may limit the reliability of such research.

2.43 Research with Retarded Children

Investigations into the metamemory of educably mentally re-tarded (EMR) children has shown that they do not generate and use memory strategies spontaneously. However, when such children are explicitly instructed and trained to use various strategies, they are able to use them effectively (Wagner and Paris, 1981). The notable feature of EMR children, there-fore, is their "production deficiency" .

2.44 Conclusions

Comparative metamemory research includes investigations across different age groups, different cultural groups and

29

finally studies involving educable mentally retarded children. It has been noted that caution should be exercised in drawing direct comparisons between ontogenetic and cultural differences in this area, due to practical research difficulties encountered in cross cultural studies; however, in reviewing the findings generated by comparative investigations it appears that some similarities have been noted, most obvious of which is that of production deficiencies for memory strategies which have been found in young children, retarded children and in cultural groups who lack formal schooling (Wagner and Paris, 1981).

2.50 BLACK EDUCATION IN SOUTH AFRICA

In the light of the findings from cross cultural research which suggest that education may play an important role in metamemory development, it was thought that an examination of black education in this country may be important in terms of understanding the results from the present study. In a recent article the observation was made that the quality of education is dependent on the qualifications, experience and competence of the teachers, and that in all these areas black teachers are "under siege and fighting for survival" (Hartshorne, 1985, p. 149). Statistics show that the black teacher is typically under the age of 30, has some degree of professional training but is lacking the minimum personal

academic qualification of a senior certificate*. Black education may also be suffering due to other factors such as low morale associated with political and economic factors (for example the over large classes) with the result that the classroom style if characterised by "dependence upon the textbook, disinclination to allow pupils to question and discuss, and discipline which is rigid and authoritarian" (Hartshorne, 1985, p. 150). The feeling, then, is that black education in South Africa is in a state of crisis.

Therefore, with reference to black South African schools it should be noted that the undesirable state of education may limit the degree to which memory development may be enhanced through that medium.

2.60 THE METAMEMORY-MEMORY RELATIONSHIP

One of the primary factors which stimulated interest in metamemory was the belief that an individual's memory knowledge may be associated with their memory behaviour (Flavell and Wellman, 1977). If such a link could be established then the development of knowledge concerning metamemory would be important in that it would facilitate the understanding of memory performance as well as memory development (Flavell and Wellman, 1977; Cavanaugh and Perlmutter, 1982). Furthermore,

---

* more than 50 percent is under the age of 30; 17% have no professional training and 24% have at least a senior certificate.

if a causal link between metamemory and memory was found to exist it would have significant practical implications in that work could be done to enhance children's memory performance through teaching them metamemory skills.

Preliminary research done by Wellman et. al in 1975 did seem to support this hypothesis where the subject's memory knowledge was apparent in a problem solving situation (cited in Flavell and Wellman, 1977). Although this research made it evident that the study of the memory-metamemory relationship and its development would be complicated, the conclusion reached on the basis of this initial study was that this area of research would be worthy of further investigaton (Flavell and Wellman, 1977).

Generally research into the nature of the relationship between memory and metamemory has not been as encouraging as suggested in the earlier works cited above. Despite a number of investigations into memory-metamemory links, and the diversity of research approaches, the relationship has not as yet been well established (Cavanaugh and Borkowski, 1982). Results from Markman's study (1974), for example, led Lawson (1980) to conclude that "there would appear to be a functional independence of metamemory skills and memory performance" (p. 152), and much of the subsequent research has reported only a questionable memory-metamemory association (Cavanaugh and Borkowski, 1980; Cavanaugh and Perlmutter, 1982).

Various reasons for these disappointing results have been proposed. One important reason for the lack of strong correlation may be the confined perspective within which the relationship has been studied. This includes both the use of limited indexes of metamemory (eg. a verbal self-report) and the examination of the relationship using only a single memory task (Cavanaugh and Borkowski, 1980; Cavanaugh and Perlmutter, 1982). In an attempt to address these problems Cavanaugh and Borkowski investigated the metamemory-memory relationship by means of a comprehensive and broad based assessment of metamemory and testing on three memory tasks. The subjects' were in grades k, 1, 3 and 5 where ages ranged from roughly 5 - 10 years. However, the results indicated, as previously, only a moderate correlation between metamemory and memory, and one of the conclusions reached by these authors was that " good verbalizable metamemory was not a necessary perequisite for good memory" (Cavanaugh and Borkowski, 1982, p. 452).

Since the likelihood of a meaningful association between knowledge of memory and the use of that knowledge in memory tasks is intuitively acceptable, research into the topic has continued on the basis that methodological problems are likely to account for disappointing results thus far and two, more recent, studies have yielded some encouraging results.

Waters (1982) used a recall task of a list of paired associates to assess the relationship between metamemory, strategy use and memory performance in children in grades 8 and

10. Her results showed a positive relationship between metamemory and strategy use as well as strategy use and performance in both age groups. Moreover, within this age range there was no evidence of any change in the relationship between metamemory and implementation of that knowledge in terms of strategic behaviour. In terms of the development of such a relationship, given previous research finding using younger subjects where the relationship of metamemory to memory performance has not been strongly correlated, these results suggest that role of metamemory in memory development changes from middle childhood years to adolescence (Waters, 1982).

Secondly, research by Fabricius and Hagen (1984) has provided recent evidence of a relationship between metamemory and memory performance. This retrospective study used a younger sample group (subjects in grades 1 and 2) than did Waters (1982). Subjects were involved in tasks designed to elicit category sorting strategies, after after which they were asked to make causal attributions about their performance. Metamemory was assessed via the indexing of these causal attributions. Results pointed to a relationship betweeen verbalizable knowledge about a sorting strategy and subsequent use of the strategy. Furthermore, analysis of the findings made it seem unlikely that the use of the strategy was attributable to the act of making the causal attributions.

Authors emphasised the importance of acknowledging children's own ideas about whether a specific strategy is more useful than another when considering the relationship between knowledge of memory and memory performance.

These more recent studies have provided more promising data concerning the existence of a relationship between knowledge of memory and memory performance; yet there is still a need for replication studies to provide additional information to corrobarate existing information (Waters 1982).

The establishment of a link between memory and metamemory is only one aspect of interest in this area; another and closely related facet of interest is the determination of the characteristics of this relationship. Although the relationship was hypothesised fairly early in the relevant literature, there was little elaboration as to the possible nature of the relationship (Cavanaugh and Perlmutter, 1982). In the earlier work on this topic the relationship seems to have been construed in fairly simplistic terms. Battig, for example, proposed that increased flexibility on the part of the individual with regard to strategy modification is associated with improved performance (1975, in Lawson, 1980). More recently Lawson (1980) has noted that one may need to consider strategy quality in addition to flexibility, thus suggesting the relationship may not be a simple one-to-one type association. Having accepted that discrepancies in beliefs and action have been noted in other areas, this alone should caution thinking of the metamemory-memory connection

35

in a deterministic fashion (Flavell and Wellman, 1977).
Hence knowing that a particular strategy may be optimal in a
specific situation need not mean that such a strategy will in
fact employed in it.

Recently Flavell has addressed himself to the question of
when the metamemory-memory connections are likely to be evi-
dent and has suggested that this may be when the achievement
of a memory goal is specifically and strongly desired (in
Cavanaugh and Perlmutter, 1982). This hypothesis has been
supported by the growing body of research suggesting that
the inclusion of a rationale for strategy use enhances stra-
tegy transfer (Cavanaugh and Perlmutter, 1982). Paris and
his collegues for example have provided further evidence for
this (Paris et. al, 1982). Their study showed that children
who had received justification, rationale and feedback coner-
ning the use and benefits of using the strategies learnt more
than children to whom the strategies were merely demon-
strated. The authors report that " it seems reasonable to
surmise that children's beliefs about the usefulness of the
mnemonic tactics provided rationales for the subsequent use
(or nonuse) of the strategies " (Paris, et. al., 1982, p.
507). It thus seems important to consider the effect of
subject perceptions on the relationship between metamemory
and memory performance and this may be especially so in
relation to enquiry into children's production deficiency.

Thus research into the metamemory-memory relationship has

36

advanced, with a move away from viewing the relatonship in a deterministic fashion and the acknowledgement that it is likely to be very complex (Cavanaugh and Borkowski, 1980), necessitating the consideration of multiple factors that may affect/moderate the relationship. There remains, however, a problem which future research needs to consider, that of detailing the mechanism by which the two components of the metamemory-memory relationship may influence each other (Robinson, 1983).

3.00 METHOD

3.10 SUBJECTS

The sample comprised 94 black school children who were non systematically selected from a primary and a secondary school in Kwa Mashu.   It had been intended to have a sample size of 100 with 20 subjects from each age group but some protocols were found to be invalid and thus were excluded. The subject characteristics are noted in Table 1.

Table 1

Class/Standard	Mean Age	Number	
Class 1	6,6	16]	37
Class 2	7,3	21].	
Standard 1	8,5	20]	
Standard 2	10,0	18]	57
Standard 3	10,7	19]	

3.20 PROCEDURE

For the purposes of standardization the procedure of the Kreutzer, Leonard and Flavell study (1975) was followed as far as was practicable in our unique situation.   It was initially proposed that all the interviewing be done in a quiet room at the school; however practical difficulties were encountered by the interviewer in the situaton which pre-cluded this possibility.   Firstly, due to the limitations of space the only available interview situation was that of a room adjoining the school office which was not optimal as,

being next to the functionally central area of the school, there were noise disturbances and other disruptions. Due to these disturbances a quieter situation was sought. It was decided to use a church building situated close to the school. Although this location was better than the school-room, its use was limited by the unavailability of students after school hours and thus the majority of subjects were interviewed at the school. Those interviewed in the church building these were predominantly older subjects, as they were more readily available after school hours.

The interviewing was done in Zulu by a fully bilingual re-search assistant. The interviewer was of the same cultural group as the subjects which was thought to be important as this would not only lessen any demand characteristics that may have otherwise operated, but it also facilitated the understanding of subjects' responses. The interviewer was also known to many of the subjects as "another mother" since her own children attended the same school as the subjects attended, which may have enhanced the interview process.

After briefly establishing rapport the interviewer explained the purpose and the nature of the study; thereafter the Digit Span subtest of the Wechsler intelligence Scale for children was administered as a warm-up exercise. Following this the Memory Ability item was presented with the latter part of it always repeated at the end of the interview. The remaining items were administered in varying orders according to ten

randomly derived sequences. The protocol is briefly discussed·
later on in this section and specific questios from it may be
found in the Results section.   If the subject obviously had
not understood the question, it was repeated. If the subject
was still unable to respond further probes were used, which
often entailed repeating the question in the second person.

The interview sessions were audially recorded and later
translated and transcribed by the interviewer.   On average
the sessions lasted between 30 - 45 minutes but on occasion
unavoidable disturbances were encountered which extended the
interview time.   In these instances subjects were allowed a
brief rest interval to prevent fatigue.

3.30 SCORING AND ANALYSIS

The protocols were scored and analysed in accordance with the
method used by Kreutzer et. al. (1975) where suitable for
this study. The criteria for scoring data into categories are
noted in the results section.

3.40 QUESTIONNAIRE

The questionnaire was essentially that used by Kreutzer et.
al. (1975) with the only difference being that it was trans-
lated in Zulu.   The original interview schedule was trans-
lated from English into Zulu by the interviewer and was then
back translated by a second person as a reliability measure.

To make the questionnaire items more suitable to subjects in the present study, names of children were altered to Zulu names and specific items in the some sections (Immediate-Delay, Coloured-Uncoloured-Spacing, Opposite-Arbitrary, Preparation:Object and Retrieval:Object) were modified, without altering their essential nature to make them more relevant to the situation of subjects in this study.

A brief description of each of the sections comprising the questionnaire shall be given.

Memory Ability - this item served both as a warm up exercise and was also used to gauge children's perceptions of their own memory ability in relation to other children's memory ability and in various situations.

A. Savings - the awareness that previous learning may facilitate present recall was assessed.

B. Immediate-Delay - here the understanding of the rapid decay of short term memory was investigated.

C. Story-List - this item considered subject's understanding that the presentation of the material to be remembered (ie. in a list or in a story format) may affect preparation for retrieval.

D. Coloured-Uncoloured-Spacing - the subject's perception of the possible effects of colour and spacing on preparation for retrieval was considered in this item.

41

E. Opposites-Arbitrary - subject's understanding that it is easier to remember pairs of opposite words than pairs of words which are less strongly associated was examined.

F. Study Time - this item looked at the task variable of length of time available for preparation for retrieval and subject's awareness that greater availability of time allows for better memory performance.

G. Study Plan - here strategies used by subjects to memorize picture items were examined.

H. Preparation:Object - the strategies used in the prospective memory for objects were examined.

I. Preparation:Event - as in the above, item strategies used in prospective memory were considered, but here were specifically related to memory for events.

J. Retrieval:Object - this item considered the search strategies subjects may use to locate an object.

K. Retrieval:Event - this looked at strategies subjects may use to remember the date of a past event.

L. Retroactive Interference - this item pertained to children's knowledge that retroactive interference may hinder preparation for retrieval and hence recall itself.

M. Rote-Paraphrase - this looked at children's understanding that knowing how one is expected to relate a story (word for word or giving the gist) facilitates preparation for retrie-

val and furthermore that it is easier to relate the gist of a story rather than retelling it word for word.

4.00   RESULTS

In order to facilitate examination of the results this section includes the item questions and where indicated, a brief discussion of the categories and scoring procedures. In making comparisons between the different ages the Class 1 and 2 pupils are grouped together to form one group while Standard 1, 2 and 3 subjects form the second group, where the former group may be referred to as the younger groups and the latter as the older age category.

4.10   RESPONSE ANANLYSIS

Memory Ability

Sometimes I forget things. 1. Do you ever forget? 2. Do you recall things without difficulty?   3. Do you recall things better than your friends or do they recall better than you? Let's say if I give you ten things to look at quickly and tell you to remember them, if you recall six of them, how many do you think your friends will recall? Sometimes though a person always recalls things witout difficulty it is possible to have things he recalls with less difficulty than others.   4. Are there things that you recal better than others?   5. Are there types of things that are harder to recall than others.

At the end of the interview the interviewer said;

Now I want to go back one question I asked you at the beginning, are there things that you forget?   Are there types of things that you don't recall as easily as you recall others?

Subjects tended to give explicit Yes or No answers irrespective of age, when asked if they were able to remember things easily or if they tended to forget things, and also when asked how their memories compared with their friends (questions 1, 2 and 3, ref. Table 2). The higher number of Yes

answers in the second as opposed to the other questions arises from a portion of subjects giving Yes answers in each

Table 2

	Forget?			Good Rememberer?			Friends Better?			
	Yes	Some-times	No	Yes	Some-times	No	Yes	Some-times	No	Same
c1	5	1	10	10	3	3	7	0	9	0
c2	8	3	8	14	1	4	6	1	11	1
s1	8	5	6	11	5	3	11	1	8	0
s2	9	3	6	13	3	1	4	1	12	1
s3	9	5	5	9	3	7	10	1	6	1

case. This suggests that these subjects consider themselves to be good rememberers, despite saying that they do forget things and that their friends are better rememberers than themselves - however, it may also simply indicate that some subjects tended to answer in the affirmative irrespective of the question.

When asked about the type of things they may find easier or harder to remember (questions 4 and 5) most subjects, almost without exception, cited recurrent events and/or described various groups of everday memory tasks (ie. a Category answer) as opposed to referring to one particular occassion or task where the subject's memory had been poor or good (Instances). The Category answers included a wide range of answers; school subjects such as spelling and arithmetic, for example, were fairly often cited as being either easy or difficult to remember as was a second group of tasks, namely

household chores. However, also included in the Category answers were those which seemed to show greater understanding such as the following 7 year old's response; "if I have been studying at night, in the morning I remember some of the things I learnt, but not all" and finally, the answer given by a standard 3 pupil, "when I have been asked to do something while I'm doing something else, I forget what I've been asked to do". It appears then, that the Category responses represented varying, rather than a uniform, level of mnemonic awareness.

A. Savings

Bheka and Bonga attend school. The teacher wants them to learn the names of all the birds that may be found in their location. Bheka has learnt these names the pevious year but had forgotten them. Bonga was learning them for the first time from the teacher. 1. Do you think there is a possibility that one of the two boys will have less difficulty in learning the names of these birds? 2. If you say yes, which one? 3. Why?

As is evident in Table 3, most subjects seemed to realise that the different situations of the two hypothetical learners, Bheka and Bonga, had a bearing on the memory task at hand and most subjects favoured the Relearner's situation (ie. that of having previously learned the birds names) as advantageous. There was a tendency for older subjects to give a Relearner response rather than any other answer, as compared with younger subjects. Where subjects failed to provide a relevant answer they obtained a None scoring.

Table 3 Savings

	Relearner	Choice Learner	Same	None	Reason for Savings*	Relearner Other	choice None
c1	8	2	4	2	5 (2)	0	2
c2	12	5	3	1	8 (1)	1	3
s1	10	8	3	0	8 (0)	0	1
s2	15	0	1	1	15 (7)	0	0
s3	17	1	0	2	15 (4)	0	1

* figures in parentheses indicate the more explicitly
  verbalised Savings responses.

A minority of subjects failed to give a satisfactory reason for having given a Relearner answer. These subject may have given an "I don't know" type answer, but some simply said that the relearner was "bright". Such None responses were given predominantly by the younger subjects. An exception to this came from a standard 3 pupil who answered that the relearner would fare better since he would "listen when the teacher is teaching" - this None response, unlike the others, did seem indicative of some understanding of memory, although in this particular instance it was somewhat misplaced.

Most subjects did substantiate their choice of Relearner with an answer which at least implied an understanding that prior learning facilitated present learning (Savings response). The number of Savings responses increased significantly with age; comparing the age groups of class 1 and 2 as opposed to standard 1, 2 and 3 and their answers, Savings vs Other and None responses, $x^2 = 8.77$, $p < 0.01$.

Within the category of Savings a distinction was drawn between those answers that merely referred to Bheka's previous

learning experience (implicit Savings response) and those which were more clearly verbalised, where subjects explicitly linked previous learning to the current situation. Such Explicit Savings responses derived predominantly from the standard 2 and 3 students. Thus the older age group not only provided significantly more Saving type answers but also tended to verbalise these answers in a clearer and more comprehensive fashion.

The only response classified as Other, given by a class 1 boy, is worth while quoting here; he felt that the Relearner would find the birds names easier to learn because "the beginner would have difficulty because his mind would like him to remember/miss his home. If he tries to remember at the school, his mind will prevent him".

B. Immediate-Delay

If you wish to visit a friend and somebody gives you the number of his house; 1. Would it make any difference if you went straight there after you heard the number or if you first go for a drink of water before you go there? 2. Why? 3. What do you do if you don't want to forget a long number, for example 512367?

The data in Table 4 refers to both questions 1 and 2, where answers were categorised as Aware if the subject showed any understanding of the idea of rapid loss of information from short term memory in either of the answers to these questions. There is evidence of greater awareness of the limits of short term /recall memory in the class 2 age group and older.

Table 4   Immediate Delay A

	Aware	Not Aware
c1	6	10
c2	14	7
s1	15	5
s2	14	4
s3	11	7

With respect to question 7 (Table 5),   most subjects,   except
for the youngest age group, indicated that they would use the
external nmemonic aid of Write Down, in preference to rehear-

Table 5   Immediate Delay B

	Write Down	Rehearse	Other	None
c1	3	1	4	8
c2	15	2	3	3
s1	14	5	3	0
s2	14	4	1	0
s3	18	1	0	0

sal or any other strategy when attempting to remember a house
number.   In order to qualify for a Rehearsal answer, subjects
needed to refer to repeated internal efforts to   memorize,   a
concept vividly captured by the literal translation of a
standard 1 boy's answer - "I'd keep repeating the number in
my heart and then put it away in my brain".   Contrary to
responses   in the above-mentioned categories,   responses

49

classes as Other represented a less cohesive groups of answers. They tended to be either vague, where pupils said that they would "look" or "think" of the number or alternatively subjects said they'd attempt to elicit the help of other people to assist them in recalling the number.

In considering subject's use of various strategies, analysis showed that older subjects were more likely to relate a Write Down or Rehearse answer as compared with younger subjects. The result for Write Down and Rehearse vs. Other and None x the two age groups was $x^2 = 17.82$, $p < 0.01$.

C. Story - List

The other day I showed boys and girls your age these pictures. I asked the first girl to study them so that she could tell me about them later without her looking at them, what pictures they were. Later I took the same pictures and showed them to another girl and told her a story about them [the interviewer drops the pictures one after the other after talking about each one of them]. A man gets up from a BED in the morning, dresses up, puts on his new COAT and SHOES. Then he sits at the TABLE and eats breakfast. After eating he gives his DOG its food. Then he puts on his HAT, goes into his CAR and goes to work. I said to the girl who had been listening to the story she should study the pictures to be able to tell me what pictures they were without the pictures in view. She would not need to tell me the story, but to give the names of the pictures. 1. In your opinion, did the story about the pictures make it easy or difficult for the second girl to remember? 2. Of these two girls, the one who had the story an the one that did not, which do you think learnt more words and recalled them with more ease? 3. Why?

The data in Table 6 suggests that the majority of subjects at all ages thought the story format would facilitate learning and recall (Easier responses), while a number either didn't

know, or vacillated and were unable to reach a conclusion (Other Responses).

Table 6 Story List

TABLE 5

	Story Format			Justification	
	Easier	Harder	Other	Present	Absent
c1	10	2	4	1	14
c2	11	0	10	1	20
s1	13	3	4	5	15
s2	10	0	8	5	12
s3	15	1	3	4	15

With respect to the subject's reason for their choice, more older subjects were able to provide a well articulated justification (Present) as compared with younger subjects. An example of such a justification was that of a standard 1 subject who noted that the "story relates the pictures to life and can make her (hypothetical student) think of her own father dressing and getting into his car". Although a Present response was usually associated with an answer of the story format being Easier (question 1), this was not necessarily so. A case in point is a class 1 child's answer - he reasoned that the story format would not facilitate learning as one would have less time to observe, and thus learn, the pictures.

The trend for the number of relevant justifications (Present) to increase with age was significant; considering Present vs.

Absent responses for the two age groups $x^2 = 4.50$, p < 0.05.
Thus although there was no age-related distinction in whether
or not subjects thought the story would aid learning, there
was such a distinction in their substantiation of their
reason which seems to indicate a significantly greater degree
of awareness and understanding on the part of older subjects.
However, it should be noted that the total number of subjects
who did provide a justification was very small.

D. Coloured - Uncoloured - Spacing

Do you see that these pictures are the same except that
some are coloured where as the others aren't? You may see
that these pictures don't have colour. If I asked you to
study these pictures and know them well so that when they are
covered you may tell me what pictures they were; 1. Is there
anything about these types of pictures that makes one set
easier to recal than the other? 2. Why? 3. Arranging them
like this, does it make a difference? [interviewer spreads
the better learned set out]. Do you think that they arrange-
ment of these pictures would make learning easier/ is it the
same/ is it different?

Table 7 Coloured - Uncoloured - Spacing

	Coloured-Uncoloured			Spacing	
	Coloured	Uncoloured	Same	Effect	no effect
c1	12	4	0	6	9
c2	17	2	2	7	14
s1	15	1	3	6	14
s2	9	5	4	3	14
s3	16	3	0	5	12

Table 7 clearly indicates that most subjects at all age

levels reported that they thought that the bright colours of

the Coloured format would aid recall, while with regards to

spacing, most thought it would have No Effect.

E. Opposite - Arbitrary

I am going to show you a new way of learning things. I am
going to give you pairs of words. Study them so that when I
show you one of them you give the one that goes with it
[child learns practise set]. Here are two other lists of
words a little harder than those we have been learning. You
may study them in the same way. These words are opposites.
These words on the second list refer to people and things
they do. 1. In your opinion is there anything in these lists
that would make one of them easier to learn? 2. Why? 3. Let
us assume that these five blank cards are others [those which
the subject has found easier to learn]. Now suppose I add an
item/card to this easy list, 1. which one will be the more
difficult list, this one or this one? [the titration process
continues].

Generally most subjects seemed to recognise that the diff-

erences in the opposite and arbitrary list had some implica-

tion for the hypothetical memory task in question 1 as

Table 8 Opposite - Arbitrary A

	Opposites	Arbitrary	Same
c1	7	5	4
c2	7	12	2
s1	12	7	1
s2	10	7	1
s3	14	5	0

indicated by the very small percentage of subjects who said

both lists would be equally difficult/easy to learn (ie. Same

answers). The trend for older subjects to select the Opposite list, as seen in Table 8, was significant. With Opposite vs. Arbitary and Same responses x the two age groups, the X^2 value was 4.80, p < 0.05.

The reasons given by subjects for their Opposite and Arbitrary choices are noted in Table 8. In justifying an Opposite choice, subjects were often vague such as saying that the opposite list was simply easier to learn, without specifying why they thought this might be so. Such non-specific answers were classified as Other and tended to predominate in the lower age groups with 66% of class 1 and 2 giving Other justifications as opposed to 30% of the older subjects.

The Alternatives and Familiarity answers were of a more specific nature with the latter often referring to the fact that the Opposite type list was learnt at school and a class 2 student noted that he was used to singing/chanting the paired words at school. The percentage of standard 1, 2 and 3 subjects who gave an Alternative response in association with an Opposite choice was 38, as compared with 16% for class 1 and 2 subjects. Thus older subjects seemed more likely to give a specific relevant reason why the Opposite list may be easier to learn and recall, and moreover gave answers showing a greater degree of understanding (Alternatives) as opposed to younger subjects.

Turning attention to the reasons subjects gave for their choice of the Arbitrary (see Table 9) list it is clear that a

large proportion of these answers were of the vague type
(ie. Other response) - in fact, in this instance Other
responses accounted for 82% of the responses, while only
accounting for 38% of the responses relating to an Opposite
choice. This seems to indicate that subjects making an
Arbitrary choice were less likely to be able to provide a
specific rationale for having made that choice than subjects
who thought the opposite list easier to learn.

Table 9   Opposite - Arbitrary B

	Alternatives	Opposites Familiar	Other	None	Arbitrary Familiar	Other	None
c1	2	1	3	0	2	3	0
c2	0	1	5	1	0	11	1
s1	4	4	3	1	1	4	0
s2	5	2	3	0	2	6	0
s3	5	4	5	0	0	5	0

The data in Table 10 refer to the titration process in ques-
tion 3 where subjects were asked to indicate how many addi-
tional items (of the kind they reported were more easily
learnt) would be needed to make the "difficult" list seem
preferable. This section considers subjects' awareness that
the number of items to be learnt affects memory performance.
To some degree it also examines children's knowledge of how
various factors (in this case the number of items and type of
data to be learned) interrelate to affect memory performance.

Most subjects were prepared to have the favoured list exten-

55

Table 10 Opposite - Arbitrary C

	1	2	Items added 3	4	5 - 10	11+
c1	8	1	1	0	0	2
c2	7	5	0	0	3	2
s1	8	4	2	0	3	1
s2	7	1	1	1	3	2
s3	7	1	4	1	3	1

ded by one item, after which the numbers of subjects agreeing to further additional numbers decreased markedly. It would seem that that children of all age groups have some idea that the number of items to be learnt is one factor which affects memory performance and realised that there was a certain "trade off" between the characteristics of items to be studied, and the number to be studied.

Table 11 Study Time A

	Remember Most? 5 min	1 min	Subject's Choice? 5 min	1 min
c1	15	1	11	2
c2	19	2	16	5
s1	15	5	16	4
s2	15	2	11	6
s3	14	6	16	3

F. Study Time

Earlier I asked two children to look at these pictures and study them because I wished to see how well they'd remember

56

them. I asked them how much time they would need to study them before I removed them and asked how many they remembered. One child said one minute, the other gave long time and said five minutes. 1. Why do you think this child asked for a long time, about 5 minutes? 2. Which child recalled a bigger number, the child who asked for one minute, or the child who asked for five minutes? 3. Why? 4. What would you do, would you take five minutes or just one minute? 5. why?

The responses to questions 2 and 4 were very similar with a large majority of subjects, irrespective of their age answering in favour of 5 minutes (Table 11).

Whereas no age trends were evident in the subject's choice of learning time, older subjects were significantly more able to articulate an Adequate rationale for their choice (Table 12)

Table 12 Study Time B

	Adequate*	Other	None
c1	4 (5)	1	8
c2	7 (8)	8	6
s1	10 (10)	6	4
s2	17 (17)	0	1
s3	17 (17)	1	1

* numbers in parentheses indicates an adequate justification in any of the three questions.

to clearly indicate that the longer study time facilitated one's performance on the task, and reference was usually made to one being able to learn one could learn a 'great deal' or 'carefully'. Where children merely said that 5 minutes would enable to hypothetical student to "know" or to "think about" the pictures their responses were classed as Other. Also classified as Other were answers referring to innate

qualities of the hypothetical child (such as saying he/she was intelligent). The X^2 value for Adequate vs. Other/ None, and using the usual age divisions, was $X^2 = 17.67$, $p < 0.01$.

From this exercise it appears that younger children may have some idea that performance on a memory task is facilitated by longer study times although they are not often able to sub- stantiate this. However subjects' ability to explicate this idea significantly increased in association with an increase in age and at the standard 2 level almost all answers to question 1 were indicative of an understanding that an in- creased learning period facilitates memory performance.

G. Study Plan

Let's say I ask you to study these pictures and I say do what you please with them, if you like move them about, change their positions or alternate them as you wish. And I give you 3 minutes to look at and study them. Thereafter I'll remove all the pictures and ask you what pictures you have been studying. 1. What would you do to remember them? 2. Is this how you learn as a rule? 3. Has anyone recommended your method to you? 4. What do you think a small child would do? 5. How would you have studied these pictures last year or a few years back.

When subjects set about studying a group of pictures, at least half of them merely inspected the items, contemplated them or named them (Look). The overall use of the other rational strategies (Complete Categorisaton, Association, Rehearsal, External storage) centered around grouping the items into conceptual categories (Complete Categorization)

and Rehearsal of the items.

Relatively few subjects demonstrated or reported using Asso-
ciation as a mnemonic aid but where this did occur it was
often imaginative such as that supplied by a standard three
subject who said that he would "make them [the pictures] into
a story - I'd put some MEAT down with my HAND, and cut BREAD,
and eat it, then eat an APPLE, then I'd wash my EARS, put on
my JERSEY and CAP - put my SOCKS on my FEET and go".

Table 13 Study Plan A

| | Subject's Own Study Plan | | | | | |
	Complete Cat.	Assoc.	Rehearsal	External	Look	Random
c1	0	3	2	0	9	3
c2	3	0	3	1	12	6
s1	2	0	4	1	14	0
s2	2	0	5	0	12	1
s3	6	2	0	0	8	3

The majority of subject from each age group seemed to realise
that younger children's learning strategies were generally
less sophisticated than those of older children (ie. Look,
Random Rearrangement and Poorer Performance responses). The
responses from subjects in the two broad age divisions (class
1 and 2 vs. Std. 1, 2 and 3) were thus fairly similar and no
age trends were noted in this exercise.

Table 14   Study plan B

	Complete Cat.	Assoc.	Younger Child's Study Plan Rehearsal	External	Look	Random	Poorer
c1	1	1	1	0	2	2	10
c2	1	1	2	1	8	4	4
s1	0	0	0	1	5	2	11
s2	0	0	1	0	7	0	10
s3	0	0	2	0	7	1	7

H.   PREPARATION - OBJECT

Let's assume that tomorrow you are going to go with a friend to play football.   You want to be sure you take your boots. 1. How would you make sure you took them on your way to school the following morning?   2. Would you do anything to avoid forgetting? 3. How many ways could you think of to ensure you did not forget?

Responses were categorised according to a.) the number of responses given by each subject, and b.) the variety of strategies used by subjects, as indicated by the number of categories and subcategories provided.

There were four Categories, namely Boots, Note, Other Self, some of which were further categorised.   An answer was scored as Boots if subjects referred to using the boots to ensure that they would be available at the time of the game. This category consisted of the following 4 subcategories; 1.) putting the boots in a school bag or next to things to take to school the next day, 2.) putting boots where they would be seen the next day,   3.) getting the boots to school prior to the next morning, 4.) attaching boots to the body,

60

putting them next to his body either the night before or on the morning of the soccer day.

Two subcategories formed the Self category, 1.) any active internal effort to facilitate recall and 2.) an assertion that the pleasurable associations and excitement would almost guarantee recall.

A Note response was one that referred to the use of any written reminder and Others refered to asking one or more people to aid recall. These Categories were not further subcategorised.

Table 15 Preparation Object A

| | Responses | | | | Subcategories | | Categories | |
---	1+	2+	3+	4+	2+	3+	2+	3+
c1	10	4	1	0	1	0	3	0
c2	19	10	4	1	5	0	4	0
s1	19	9	3	1	3	0	6	0
s2	17	11	3	0	1	0	8	0
s3	19	10	3	0	3	0	5	0

Table 15 gives a general overview of how subjects responded to the questions in this section in terms of the numbers (Responses column) and variety (Subcategories and Categories) of responses given. Subjects of all age levels seemed well able to list at least one strategy. While some subjects gave as many as three responses, and two students gave four,

the range of strategies seemed to be somewhat restricted as indicated by the data in the Category and Subcategory columns. Therefore, where more than one strategy was provided by a subject they were usually similar to the extent that they fell within the same category and subcategory.

The kinds of strategies provided by subjects is indicated in Table 16. By far the most preferred mnemonic aid noted by all subjects in this section was that of Boots, that is, subjects generally said that the to-be-remembered boots

Table 16 Preparation Object B

	Boots	Note	Other	Self	None*	Prep.
c1	5	0	5	5	6	0
c2	19	1	9	5	2	1
s1	14	0	8	10	1	2
s2	16	1	10	5	1	6
s3	27	0	5	0	0	3

* refers to number of protocol where no relevant answer was given in any one protocol.

would be a central feature of their mnemonic strategy. This may indicate that even at a young age some children have a fairly realistic idea of the failings of both their own memory and other people's.

Older subjects also provided substantially more Boot responses as compared with younger subjects. Since some subjects provided more than one response the usual Chi squared test is not applicable to these figures. However it would

appear that older subjects favoured external memory prompts and moreover, ones that were directly related to the situation and that would be easily noticed.

Age differences were sometimes noted in the quality of subject's responses. Two standard 1 pupils, for example, gave rather interesting accounts of how they might go about preparation for recall; one said that he would dream about him carrying, in this case, the boots to school, while the other provided a detailed view of her relatively sophisticated memory strategy - she suggested that she would "dream of myself playing with the ball in my sleep, then I'd remember [that] my younger sister Nombuso always plays the ball at night - I'd see her playing and be remimded and then I wouldn't forget in the morning".

In order to assess the nature of responses in a more quantitative fashion, answers were scored for the presence or absence of Preparation. If a protocol showed indications of being planful and means-end oriented in this section it was scored as preparation in addition to the other classifications. As indicated in Table 15 very few protocols did show such planful preparation and no age trends were evident.

The primary age differences seen in this exercise relates to the kind of strategy subjects reported, rather than the numbers of strategies cited or variety of strategies mentioned.

I. PREPARATION:EVENT

If you have been asked to a friend's birthday party; 1. What
would you do to make sure you remembered the day of the
party? 2.   Is there anything else you would think of doing
in order to remember? 3. How many ways of ensuring you
remember can you think of?

As in the previous section, answeres were scored in terms of
number of responss and the variety of responses given.   In
this item a Note response included the followng three sub-
categories; 1.) the   use of an already prepared memory aid
such as a written invition, 2.) the memonic use of any other
kind of written record eg. marking a calendar, 3.) the use of
the birthday present or, in one case, the use of birthday
clothes, as a reminder.

As previously the Others category refered to asking other
people to aid memory.   The self category included the two
subcategories as detailed in the previous section, with one
being the more active and the other being more passive.

Table 17 Preparation Event A

	Responses			Subcategories		Categories	
	1+	2+	3+	2+	3+	2+	3+
c1	16	6	1	2	0	4	1
c2	20	10	5	1	0	3	2
s1	20	13	2	1	0	8	1
s2	17	10	4	1	0	7	0
s3	19	10	1	1	0	7	1

Generally most subjects at all ages provided at least one response to the question with many giving at least two responses and some giving as many as three (Table 17). Where subjects provided different ways of remembering the party day, they differed **across** Categories rather than **within** Categories (i.e. the number of 2+ Categories is greater than the number of 2+ Subcategories. See also Table 17). However, as noted previously, the use of categories and subcategories was generally limited.

There seems to be a general trend for subjects to prefer external mnemonic aids, such as some sort of written note (Note) or enlisting the help of other people (Others) to assist in recall, as opposed to internal strategies (Self). Furthermore, this tendency is slightly stronger in the older subjects. A class two student had total faith in her ability to recall - she argued that "I'll be remimded by the heart [and] I'll be remimded by my mind if my heart forgets".

Table 18   Preparation Event B

	Note	Others	Self	None	Put
c1	5	6	11	0	0
c2	10	13	12	1	0
s1	9	13	13	0	0
s2	9	14	8	1	0
s3	16	10	4	0	3

In an attempt to assess the planfulness of subjects strate-
gies answers were scored as Put if there was an explicit
mention of placing the reminder where it would be frequently
seen prior to the party day. From the data in Table 18 it
would seem that explicit means end strategies may only be
starting to emerge at the standard 3 level.

J. RETRIEVAL:OBJECT

Let's assume you have lost a jersey at school. 1. What
things can you do to try to find it? 2. Is there anything
else you can do? 3. Anything else, think of all the possible
ways?

At least half the subjects at each age level were able to
cite a minimum of two different ways in which they could set
about finding a mislaid jersey, with a smaller number of
subjects's responses covering three or more different sub-
categories (Table 19).

Table 19 Retrieval Object A

	Subcategories				
	0	1+	2+	3+	4+
cl	0	16	8	1	0
c2	2	19	13	2	0
sl	1	19	11	2	2
s2	0	19	13	6	0
s3	0	19	14	3	0

Table 20 refers to the different methods subjects may have used in order to relocate the missing object. If the subject referred to individually going to look for the object (Search) they may simply look in the places where they think the object may be (Likely Places); search for it more systematically through retracing their movements from the time they noticed the jersery missing (Retrace Steps); searching various places sequentially, Ordered Search (and here they needed to make this explicit by saying they would first do X and then do Y) and finally by characterising any search method as being thorough and exhaustive (Exhaustive Search).

Table 20   Retrieval Object B

	Likely Places	Retrace Steps	Search Ordered Search	Exhausted Search	Others Active	Passive	None
c1	13	2	0	1	2	9	0
c2	16	0	1	0	4	22	2
s1	18	4	2	1	2	21	1
s2	18	2	0	6	6	17	0
s3	12	3	1	0.	4	31	0

Alternatively the subject may enlist the aid of other people (Others) in which case she may ask them to aid her in the search (Active) or simply enquire if anyone else has seen the jersey or if they will keep an eye out for it (Passive). Also included in the Passive category was an answer saying they would report the missing jersey. Where no relevant answer was given it was scored as None.

Of the activities cited by subjects the most prominant was that of reporting the missing jersey (Others, Passive) and that of looking in relevant places for the jersey (Search, Likely Places). Enlisting the help of others in the search was used more frequently overall than Retrace Steps, Ordered Search and Exhaustive Search. Subjects from all age groups responded similarly with regards to the nature of retrieval methods reported but where subjects failed to provide a strategy these were mostly confined to the younger age group.

K. RETRIEVAL:EVENT

Let's say a friend has a dog and you asked how old his dog is, then he answers that he got it as a puppy at a certain Christmas, but he can't remember what Christmas it was; 1. What could he do to help him remember what Christmas it was when he got the dog? 2. Anything else?

The task in this instance was to think of ways in which one could assist a friend in recalling a previous event - in this case the acquisition of a puppy. Once again responses were categorised into various categories and subcategories.

Here the Note category included all non-human external re-trieval strategies and there were four subcategories; 1.) Present, where the subject referred to the use of a method to recall a past event through present orientated retrieval methods, such as marking a calender or writing a note. As such this category probably reflects a failure to understand the problem, 2.) Improbable, here the method is appropriate

but the external aid, such as a mark on the calender or a note would most likely not have existed, 3.) Plausible, the subject indicates using items such as the dog's tag or papers to aid recall and where such items are likely to have been in existance, 4.) Size, where memory is assisted through using the dog's size to gauge age.

The Self category was also subcategorized into the following groups; 1.) Passive , where recall was thought to be automatic, 2.) Direct Unelaborated, where there was a suggestion of an active attempt to remember the date, but where this was not further elaborated, 3.) Direct Elaborated, where the subject described a fairly systematic, orderly or thorough direct internal search procedure (such as thinking backwards), 4.) Indirect, where objects, events or facts temporally associated with the receipt of the dog were used to aid recall. The Others category retained its usual meaning.

Table 21 Retrieval Event A

	Note	Others	Self	None/Irrelevant*
c1	1	9	12	1
c2	3	17	16	0
s1	3	13	13	2
s2	6	18	11	3
s3	4	15	14	1

* indicates protocols where no relevant answer was given in this section

The majority of subjects within each age level gave responses

covering one or more (1+) subcategories and many of the subjects' answers covered two-or-more subcategories (Table 21).

It is evident from Table 22 that overall subjects preferred to ask other people when the puppy was acquired (Others) or to look to themselves (Self) to recall the date, rather than attempting to ascertain the date from any written (probable or improbable) records (Note category). In seeking external and human memory aids (Other response) an enterprising standard three girl suggested that "if the dog had been part of a pair [the friend] could go and ask the other owner which Christmas he got his dog" and in a similar vein, "if there was a baby that was born that Christmas, he could go and ask when that baby was born".

Table 22 Retrieval Event B

| | | Note | | | | Self | | |
	Present	Improb.	Plausible	Size	Passive	Direct Unelab.	Direct Elab.	Indirect
c1	0	1	0	0	1	8	2	1
c2	0	2	0	1	1	11	2	2
s1	0	2	0	1	3	6	3	1
s2	0	1	1	4	1	3	6	1
s3	1	1	1	1	0	6	3	5

Table 23 indicates that a small number of subjects simply thought that they would recall the date without any difficulty (Self, passive); likewise a minority said they would recall objects, events and the like temporally associated

with acquision of the puppy which would assist their memory (Self; indirect). Most of those suggesting the use of internal methods thought that recall would require some personal effort. Of this group very few subjects actually denoted how they would proceed with an internal search.

The third category of strategies was that of Note and comprised both written aids where the Present and Improbable categories represented naive strategy possibilities as opposed to the Plausible and Size subcategories. Generally the number of subjects reporting this strategy was small and the spread over the various subcategories was more or less similar for all age groups.

Table 23   Retrieval Event C

	0	Subcategories 1+	2+	3+
c1	2	14	6	0
c2	1	20	12	1
s1	1	19	6	1
s2	3	15	8	1
s3	1	18	10	2

L. RETROACTIVE INTERFERENCE

One day two friends went to a birthday party where they met 8 children they had not seen before. I'll give you the names of these children they met; Themba, Mandla, Sipho, Mondli, Bongiwe, Zandile, Thandi and Nomusa. After the party one of these firends went back home, and another went to practise a

sketch they were going to play. At the practice she met 7
other children who were new to her. These names were Zinhle,
Munta, Vusi, Hlengiwe, Nozipho, Sandile and Thandazile. At
supper the parents of the two children asked for the names of
the children they had met at the party that day. 1. Which of
the friends do you think had least difficulty in recalling,
is it the one who went straight home or the one who went to
the practise for the sketch and met more children? 2.
Why?

More subjects overall said that the child who went home
(Home) would have less difficulty in recalling the names
than the friend who went to the sketch (Play). The number of
Home responses was also greater than the number of subjects
who said Neither.

Justifications provided by subjects were only categorised
where a Home choice had been made. Four categories were used
to score answers; an answer was scored as Retroactive Inter-
ference if it indicated that the Play friend would forget the
party names, or confuse them due to the interfering effects
of the intervening learning; Fewer Names was scored if the
subject said that the child going home had fewer total names
than the play friend, and as such represented some misunder-
standing of the task as the problem was to recall only the
first 8 names for both friends; if the subject said that the
friend going straight home would have more time or opportun-
ity to study the names the answer was scored as Learning
Opportunity. None/irrelevant retained the usual meaning.

Many subjects were not able to substantiate their Home choice
but when they did provide a relevant reason for having made a
Home choice it was almost without exception one that was

classified as Retroactive Interference (Table 23). Moreover the numbers citing this justification increased with age.

Table 24 Retroactive Interference

	R.I.	Fewer	Home Learning	Opp.	None	Play	Neither
c1	1	0	0	7	8	8	0
c2	2	0	0	11	13	7	1
s1	5	0	1	5	11	7	1
s2	6	0	0	8	14	2	2
s3	7	0	0	6	13	4	2

In comparing retroactive interference with other Home justifications, (including None) with the two age groups, $x^2 = 5.09$, $p < 0.05$. Thus although younger subjects may have had some intuitive understanding that retroactive interference may inhibit memory performance, older subjects were more likely and able to articulate this.

M. ROTE-PARAPHRASE

The other day I played a story telling record for a little girl. I asked her to listen carefully to the record and play it as many times as she wished because I would ask her to recall the story. Before listening to the record she asked me one question; "Do I need to retell the story word for word or in may own words?". 1. Why do you think she asked this question? 2. Do yoou think the answer to this question would have helped her to know how to study this story? 3. If I had told her that she should know it word for word, what do you think she would have done? 4. If I had told her to study it so that she could retell it in her own words what do you think she would have done? 6. Why?

Responses to question 1 were scored as None if the subject

failed to provide any relevant answer (eg. I don't know). The Didn't Know category referd to unelaborated answers such as saying that the hypothetical little girl asked the queston because "she didn't know" or "so she would not forget". Where subjects provided greater elaboration, saying that the little girl asked "so she would know what to do" or "so she wouldn't do the wrong thing", this was scored as Task Demands. Answers designated as Memory Difficulty represented the greatest degree of understanding where the subject stated or implied that learning/recalling a story in one's own words is easier/less demanding of time and effort than learning/recalling a story word for word.

Table 25   Rote Paraphrase A

		Quest. 1			Quest. 2	
	None	Don't Know	Task Demands	Memory Difficulty	None	yes
c1	5	6	5	0	5	9
c2	10	8	3	0	6	15
s1	7	5	8	0	6	15
s2	6	4	6	2	5	12
s3	5	2	11	0	4	14

Examining the answers to question 1 in Table 25 it is seen that many subjects were unable to say why the learner may want to know how she was expected to retell the story. If subjects were able to provide a relevant (informative) answer they usually referred to the need for the studier to know

what to do (Task Demands). Two subjects, both of the older
age group were able to extend this arguement and showed an
understanding of the implication that word for word learning
as opposed to relaying the gist of the story would have for
learning (Memory Difficulty response).

The better elaborated responses derived primarily from the
older subjects.   Looking at the ratio of None/Irrelevant and
Don't Know responses vs. Task Demands and Memory Difficulty
responses over the two age groups, the x^2 value is 5.62, p <
0.05.

Considering subjects' responses to question 2 it appears that
most   subjects at each age group expressedly did feel that
knowledge of how the hypothetical learner was expected to
retell the story would help her to study the story.   This
number was very similar to the total number of subject provi-
ding any relevant answer in question 1 (ie. Didn't Know, Task
Demands, Memory Difficulty).   This may mean that the less
well elaborated responses to question 1 (Didn't Know and to
some extent Task Demands) represented a difficulty of verbal-
ising their understanding rather than a lack of that under-
standing.

The data in Table 26 reflect subjects' answers to questions
3 and 4 which relate to their study procedures for word for
word learning and "own words" learning respectively.   In
addition responses were also analysed in terms of whether or
not subjects differentiated between these two types (ie. word

for word and own words) in the strategies/activities repor-
ted (Differential Study), if they implied that word for word
learning would be more difficult (Harder) and if they made
reference to any intensive, careful or repeated study in
their answers (Intensive Study).

Table 26 Rote Paraphrase B

| | Quest. 3 | | | Quest. 4 | | | |
	None	Activity	None	Activity	Differ.	Harder	Inten.
c1	0	16	3	13	1	2	4
c2	0	20	2	18	4	3	4
s1	0	19	1	18	7	6	9
s2	1	17	2	16	4	4	2
s3	0	19	1	18	8	3	7

In relation to questions 3 and 4 the majority of subjects
irrespective of the age groups reported some relevant study
activity or method. Considering the results noted in the
latter 3 columns it is evident that generally few subjects
noted different types of study methods in relation to the two
different tasks, (Differential Study), or made mention to the
one as being more difficult than the other (Harder) and,
finally, the numbers describing Intensive Study methods were
also small. Thus although there does appear to be a slight
increase in numbers associated with an increase in age for
all three of these categories, the low figures precludes one
from drawing conclusions from these results.

Table 27 Rote Paraphrase C

	Quest. 5		Quest. 6	
	None	Own Words	None	Appropriate
c1	2	14	14	0
c2	6	14	20	0
s1	6	14	16	2
s2	7	10	16	1
s3	5	13	14	4

The results seen in Table 27 appear representative of many of the afore mentioned findings. Subjects on the whole did report that retelling a story in one's own words is easier than recall on a word for word basis, but few subjects were actually able to provide an appropriate justification for this answer. Although the figures are again small, where an appropriate reason was given in question 6 it was given by subjects in the older age group. This may indicate that the emergence of an understanding which is able to be verbalised is beginning to emerge at these age levels.

4.20 SUMMARY OF RESULTS

The tasks in the interview schedule were aimed at assessing various aspects of metamemory, especially children's knowledge of the variables (person, task and strategy) which might affect the nature of memory performance.

Considering firstly the person variable, children from class 2 and older seemed to have some idea of the rapid loss of

information from short term memory (Immediate- Delay). Sub-
jects appeared to show some recognition that a young child is
likely to employ different (less planful and effective) study
methods compared to an older child (Study Plan). The older
group of subjects also demonstrated greater understanding of
the notion that previous learning facilitates relearning
which was evident in the significant increase of Savings
justifications by this group.

Secondly, results concerning subjects' awareness of task
variables pointed to a degree of awareness in even the youn-
gest group of subjects that various aspects of the task may
affect preparation for retrieval. This was indicated in
their preference for certain task characteristics over
others, namely the choice coloured memory items (Coloured-
Uncoloured- Spacing), items that were presented in a story
format (Story-List) and longer study times (Study Time).
Many subjects also answered that they did think that prior
knowledge of how one is expected to perform the task (such as
giving the gist of the story or citing it word for word)
would facilitate appropriate preparation for recall (Rote-
Paraphrase). However, the demonstration of knowledge in a
number of instances may be somewhat tenuous in the case of
the younger subjects as relatively few subjects were able to
substantiate their choices satisfactorily (Story-List, Study
Time, Rote-Paraphrase). Conversely, the older subject sample
showed a better conceptual grasp of the effect of many of the
task variables through their often significantly better jus-

tifications of their choices (as in Story-List, Rote-Para-phrase, Opposites- Arbitrary).

Turning to the strategy variables it was evident that sub-jects, irrespective of age, were generally well able to describe at least one way of preparation for retrieval across a variety of situations, although the overall use of the wide ranging categories and subcategories was somewhat restricted. Interestingly the relative use of subcategories was greater in the sections relating to retrieval tasks (Retrieval:Object, Retrieval:Event) as opposed to prepar-ation for retrieval tasks (Preparation:Object; Preparation: Event). This may indicate that subjects are either more familiar with these sorts of tasks in their every day life alternatively that they are better able to relate to the retrieval tasks in the interview situation than the prepar-ation for retrieval ones.

The use of external strategies seemed widespread with even the youngest age group favouring external memory aids in Preparation:Object and upward of class 2 subjects showed a preference for the use of external strategies to prompt short term recall of numbers (Immediate-Delay) and future recall of events (Preparation: Event). Age differences were observed in the trends for older subjects to report substantially greater use of external aids in Preparation:Object, sugges-ting this age group finds such strategies to be especially useful for prospective memory when this involved memory for

objects. However, external aids were utilized only minimally
in associaton with pictorial items (Study Plan).

The use of internal strategies seemed to vary according to
the task. While Rehearsal was reportedly used less than
various external strategies for short term memory storage
(Immediate-Delay), results often did not indicate a clear
preference for either internal strategies or external stra-
tegies. In Preparation:Object, for example, the external
memory aid of Boots was generally used far more than Rehear-
sal whereas the external strategy of Others was not. In
addition, in Retrieval: Event, Self was cited far more oten
than Note, but the same distinction between internal and
external strategies was not evident in comparing the use of
Self and Others in this section.

The only age differences noted in the use of external stra-
tegies was in Preparation:Event where there seemed to be a
decline in the use of internal strategies (Self) with an
increase in age; apart from this instance the use of inter-
nal strategies did not appear to vary much across the diff-
erent age groups.

Finally, a more global assessment of subject's understanding
of the variables that operate in memory processes (person,
task and strategy) pointed to the greater awareness on the
part of older subject of the interrelations between the
differing variables in some of the sections in contrast to
the seemingly more compartmentalized knowledge demonstrated

by younger subjects . This was seen in Story-List Justification of story choices and in Opposites-Arbitrary, the significant age associated increase in Opposite choices and, to a degree, the reluctance to increase number of items in the titration procedure.

Age differences of this study were thus found in the ablity of the older children to clearly and elaborately verbalise their understanding of various aspects of memory, as seen in their justification for their responses. Also, in some instances older subjects showed greater awareness of the interrelations between various variables.

5.00 <u>DISCUSSION</u>

5.10 **RESULTS**

5.11 Comparative Data

The results from this interview study indicate that while younger children may seem to have some awareness or intuitive knowledge about their own memory functioning, older children usually had a better understanding of memory and were better able to account for this. This general trend was in keeping with previous research (Flavell and Wellman, 1977). With regards to the younger age group, similarities in these research findings and previous research results were noted in the recognition by children as young as 7 years of the advantage in writing information down as a way of aiding recall (cf. Kurdek and Burt, 1982).

Comparable findings were more frequently noted in the performance of 9 - 11 year old group, namely in their understanding the influence of retroactive interference on preparation for retrieval (cf. Kurdek and Burt, 1982), their active engagement in preparation for retrieval when asked to memorize (cf. Appel, 1972), the use of systematic mnemonic strategies (cf. Kurdek and Burt, 1982) and rational use of external mnemonic aids (cf. Danner, 1976).

Since the present study attempted to replicate, where suitable, the study by Kreutzer, Leonard and Flavell, (1975) it

was thought that a closer comparison of the present findings with those of the American study was warranted.

The most prominent feature evident in the comparison is that in a number of cases the trends evidenced in the present results were similar in nature (ie. qualitatively) to those seen in the American study. Importantly, though, in the present study these trends appeared to be either weaker or slower to emerge. Therefore although these trends were thus qualitatively similar, they appeared to differ quantitatively from the American sample, as observed in the following areas;

a.) subjects' understanding of rapid short term memory decay (Immediate-Delay) and the effect of certain task variables on memory performance (Story-List, Rote-Paraphrase).

b.) the tendency for older subjects to show greater understanding of the interrelations between differing variables.

c.) the ability of older subjects to provide well verbalised and explicit rationalisations for answers (Study Time, Opposite Arbitrary, Rote-Paraphrase).

Quantitative differences between the American and the present study were noted in the restricted use of various strategies (Preparation:Object), subcategories (Preparation:Event, Retrieval:Object) and finally categories (Preparation:Object) evident in this study.

In order to attempt to account for these results it is impor-

tant to consider the factors thought to be important in the development of metamemory. Cross cultural research has pointed to various factors that seem to be implicated in the development of higher level mnemonic skills (Wagner, 1974). Firstly, formal education was shown to be intimately related to the development of higher level strategies, and secondly, research has also shown that urban environment may also play an important role (Wagner, 1978).

Regarding the nature of the the urban environment and how this correlates with cognitive development, it is not known how the quality or the nature of that environment (the township) is implicated due to the lack of relevant research. It is therefore not possible to comment on the effect that the urban township in which the subjects of this study lived (Kwa Mashu township) had on their cognitive development, specifically that of metamemory.

With respect to education, however, there is evidence indicating that the current nature of black eduction in South Africa is such that students are seemingly greatly disadvantaged in comparison to South African whites (Hartshorne, 1985). The sparsity of experienced and well trained teachers, added to the poblems of overcrowding (Hartshorne, 1985) makes this learning situation far from satisfactory, let alone optimal, and may at least partially account for the slower emergence of children's knowledge of their own memory when compared to the American sample. Of specific importance

is the view that, associated with the problems faced by black teachers, little use is made of discussion and questioning techniques in the classroom (Hartshorne, 1985). It may be speculated that this restricted opportunity for discussion may be especially important for many black children, whose parents adhere to the cultually promulgated authoritarian parenting role, seldom requiring them to provide a rationale for their own point of view, while opportunities for adult-child discussion may be severely limited both at school as well as home for similar reasons. This may be seen to be associated with the apparent difficulty that many subjects encountered in attempting to provide some sort of justification for their choice.

Thus there appears to be a delayed emergence of certain aspects of metamemory amongst the South African black sample. A possible explanation for this delay may be found in the link between memory performance and metamemory. Admittedly the demonstration of such a relationship has not been strongly supported in research (Cavanaugh and Borkowski, 1980), but it has been argued that this is likely to be due to methodological problems rather than the non-existence of such an association (Cavanaugh and Perlmutter, 1982). This premise is supported by results of more recent research which has been more encouraging in terms of providing some evidence of a correlation between metamemory and memory (Waters, 1982).

If metamemory indeed reflects memory performance, as postu-

lated by (Fabricus and Hagen, 1984) it would then be expected that black students might encounter greater difficulty at school than the American students.

Since educational factors do appear to be intimately related to the development of metamemory, and in view of the reportedly undesirable state of black education in this country, the present research would support the view that greater attention should be given to improving the quality of black education in the expectation that this would lead to an improvement in memory performance and metamemory, and would in turn promote school performance.

Apart from the above noted differences beweeen the American and the present study,(the general slower and weaker emergence of metamemory), other, more qualitative differences were evident. An examination of the relative use of external strategies by subjects in the two samples shows that black subjects reported far greater use objects, rather than written notes, as memory prompts for prospective object memorization, unlike the subjects in the Kreutzer et. al. study, who showed a much smaller discrepancy between the use of these two memory strategies. Interestingly this position is reversed in prospective memory of events where the black subjects' reported use of various external strategies was fairly uniform but the American subjects favoured notes far more than getting other people to assist their memory.

It would appear that subjects in the present study recognise the utility of external mnemonics and readily employ them but that their use of written notes is comparatively limited. This may well represent a cultural difference where there may be less familiarity with written notes (especially amongst the older generations who would then not provide a model for this type of behaviour). It may also be speculated that there is less availability of the materials necessary for this kind of memory aid.

In some instances subjects' strategy use reflected certain situational factors. This was seen in the Retrieval; Object category where a high number of subjects' answers reflected an Others strategy choice, as opposed to the American sample where greater use is made of the Lost and Found category. This latter category refers to the lost and found offices operated by most American schools but which do not exist in the local black schools. In view of this lack of Lost Property facilities in black schools, the Other strategy choice may be seen to subsume the category of Lost and Found and this may account for the more extensive use of this latter choice by the present research's sample group.

Finally, in one instance subjects in this study showed seemingly greater metamemory relating to the person variable. In Memory ability the overwhelming majority of subjects cited categorical examples of the occasions when they perceived their memory as being generally good or poor while a number of subjects in the American study inappropriately listed

specific instances.   Reasons for these results are not appa-
rent.

5.12   Contextual Issues

Recent evidence has suggested that the context within which
metamemory investigations are made may be an important factor
influencing results   and that the demonstration   of   fairly
sophisticated strategy use may depend,   in part,   on the con-
text   in   which   this is examined (Ceci   and   Bronfenbrenner,
1985).   The   nature of the present study was such   that   it
included both laboratory type sections (C,   D, E, F, G) while
other sections related more to the day-to-day type experience
a child may   have (A, B, H, I, J, K, L, M).

There   did   not   appear to be any   differences   in   subject's
performance   on the more laboratory related task as   compared
with the more familiar,   day-to-day tasks.   It may be specu-
lated   that   although   the questions   themselves   related   to
either   more formal tasks or more everyday tasks,   the actual
physical context of the investigation was uniform for all the
tasks   and that this may determine performance to   a   greater
extent than the nature   of the tasks per se.   In the Ceci and
Bronfenbrenner   study (1985) for example,   the task was not a
typical laboratory one, but one that may be   familiar to many
of the subjects from their home experiences;   however, it was
the physical context that appeared to influence results.

5.20 METHOD

The present study was formulated according to the method used by Kreutzer, Leonard and Flavell (1975). The interview items covered a wide range of items, thus investigating children's knowledge of person, task and strategy factors involved in memory over a variety of tasks, and thereby accounting for the task-specificity of some metamemorial skills (cf. Lawson, 1980). These attributes were thought to be especially important as the present study was done in the absence of any previous cross cultural research into metamemory in this country.

The difficulties encountered in this research were associated primarily with the specific situation in which this study was executed, most notably that of the unavailability of a quiet room that could be used for interviewing purposes. Where possible the church building (where the interviewing could be done without interruption) was utilized but many of the subjects were interviewed at the school in less favourable conditions.* Of those seen at the school the majority were of the younger age groups and hence these subjects may have been at a disadvantage compared with many of the older subjects who were seen at the church.

---

* In many ways the difficulty regarding examination space encountered in this study is representative of many situational problems faced on a daily basis by black school teachers (Hartshorne, 1985).

89

The relative effects of this variable on the results are not known but it should be noted that the interview situation varied across age groups and hence, to some degree, the effect of such variation was controlled for. Furthermore, the school situation would be very familiar to all the subjects which may have reduced any anxiety they mmight otherwise have experienced and if so, enhanced performance on the interview schedule.

6.00 SUMMARY AND CONCLUSIONS

Results indicated that even at the age of 6 - 8 years children may have some awareness of aspects of memory functioning. However, as expected older subjects showed greater knowledge about various aspects of memory. This was most apparent in their ability to explain their choices in a rational and informed manner as was seen especially in the ability to reason that previous learning may facilitate present study, that a story format may facilitate the learning of items, that prolonged study time facilitates recall, and to verbalise notions of retroactive interference.

Older subjects also showed insight into the idea that knowledge of how one is expected to reproduce learnt material may facilitate preparation for retrieval and exhibited a preference for learning items that were opposites rather than those that were arbitrarily related. Finally, older subjects showed significantly greater use of rational strategies to aid short term memory.

A second though less obvious age difference was the greater awareness on the part of older subject concerning the inter-relations between the differing variables in some of the sections, in contrast to the seemingly more compartmentalized knowledge demonstrated by younger subjects. This was seen in Story-List Justification of story choices and in Opposites -Arbitrary, the significant age associated increase in Oppo-

site choices and, to a degree, the reluctance to increase number of items in the titration procedure.

In comparison with the American study the major finding was that in many cases the trends oserved in the present study were weaker or slower to emerge than those seen there. Various cultural factors were thought to be associated with this lag, noteably the poor quality of black education in South Africa. However, the extent to which other cultural factors, such as the urban environment of the townships, affect the development of metamemory is not known. In view of research indicating a relationship between metamemory and memory performance, and the possibility of this emerging more strongly in future research, it is suggested that sub-jects' performance on the interview schedule emphasises the importance of improving black education in this country.

REFERENCES

CAIRNS AND VALSINER, Child Psychology. Annual Psychological Review, (1984) 35

CAVANAUGH, J.C. AND BORKOWSKI, J.G., Searching for Meta-memory-Memory Connections: A Developmental Study. Developmental Psychology, (1980) 16 (5), 441 - 453

CAVANAUGH, J.C., AND PERLMUTTER, M., Metamemory: A Critical Examination. Child Development, (1982), 53, 11 - 28

CECI, S.J., AND BRONFENBRENNER, U., "Don't Forget to Take the Cupcakes out of the Oven": Prospective Memory, Strategic Time-Monitoring, and Context. Child Devleopment, (1985), 56 152 - 164

CECI, S.J. AND HOWE, M.J.A., Metamemory and Effects of Intending, Attending, and Intending to Attend, in Aspects of Consciousness Vol. 3 Ed. Underwood, G., Academic Press, London, (1982)

DELOACHE, J.S., AND BROWN, A.L., Where Do I Go Next? Intelligent Searching by Very Young Children. Developmental Psychology, (1984), 20 (1), 37 - 44

FABRICIUS, W.V., AND HAGEN, J.W., Use of Causal Attributions About Recall Performance to Assess Metamemory and Predict Strategic Memory Behavior in Young Children. Developmental Psychology, (1984), 20 (5), 975 - 987

FLAVELL, J.H., Metacognition and Cognitive Monitoring. American Psychologist, (1979) 34 (10) 906 - 911

FLAVELL, J.H., On Cognitive Development. Child Development, (1982) 53, 1 - 10

FLAVELL, J.H., AND WELLMAN H.M., Metamemory, in Perspectives in the Development of Memory and Cognition, Eds. Kail, R.V., and Hagen, J. W., L.E.A., (1977)

HARTSHORNE, K.B., The State of Education in South Africa: Some Indicators. South African Journal of Science, (1985), 81, 148 - 151

KITCHENER, K.S., Cognition, Metacognition and Epistemic Cognition. Human Development, (1983), 26, 222 - 232

KNOPF, A.A., The Development of Memory, in Cognitive Development, Eds. Dachler, M.W., and Bukatko, D.. New York, (1985)

KREUTZER, M.A., LEONARD, C., FLAVELL, J.H., An Interview Study of Children's Knowledge about Memory. <u>Monographs of the Society for Research in Child Development,</u> (1975), 40, 1 - 57

KURDEK, L.A., AND BURT, C.W., First- thought sixth- Grade Children's Metacognitive Skills: Generality and Cognitive Correlates. <u>Merrill-Palmer Quarterly,</u> (1981), 27 (3), 287 - 305

KURTZ, B.E., AND BORKOWSKI, J.G., Children's metacognitiona: Exploring Relations among Knowledge, Process and Motivational Variables. <u>Journal of Experimental Child Psychology,</u> (1984), 37, 335 - 354

LAWSON, M.J., Metamemory: Making Decisions about Strategies, in <u>Cognition, Development and Instruction,</u> Eds. Kirby, R.J. and Biggs, J.B. <u>Academic</u> Press, New <u>York,</u> (1980)

LEFEBVRE-PINARD, M., Understanding and Auto-Control of Cognitive Functions: Implications for the Relationship between Cognition and Behaviour. <u>International Journal of Behavioral Development,</u> (1983) 6 15 - 35

PARIS, S.G., NEWMAN, R.S., AND MCVEY K.A., Learning the Functional Significance of Mnemonic Actions: A Microgenetic Study of Strategy Acquisition. <u>Journal of Experimental</u> Child <u>Psychology,</u> (1982), 34 490 - 509

ROBINSON, E., Metacognitive Development in <u>Developing</u> Thinking, Ed. S. Meadows. Methuen, London (1984)

SOLSO R.L., <u>Cognitive Psychology.</u> Harcourt Brace Jovanovich, New York (1979)

WAGNER, D.A., The development of Short-Term and Incidental Memory: A Cross-cultural Study. <u>Child Development,</u> (1974), 45, 389 - 396

WAGNER, D.A., Memories of Morocco: the Influence of Age, Schooling, and Environment on Memory. <u>Cognitive Psychology,</u> (1978), 10 (1) 1 - 28

WAGNER, D.A., AND PARIS, S.G., Problems and Prospects in Comparative Studies of Memory. <u>Human Development,</u> (1980), 24, 412 - 424

WATERS, H.S., Memory Development in Adolescence: Relationships between Metamemory, Strategy Use, and Performance. <u>Journal of Experimental Child Psychology</u> (1982), 33, 183 - 195

YUSSEN, S.R., AND BIRD, J.E., The Development of Metacognitive Awareness in Memory, Communication, and Attention. <u>Journal of Experimental Child Psychology,</u> (1979) 28, 300 - 313