AN INVESTIGATION OF THE EFFECT
OF OPERATIONAL LEVEL AND LOCUS OF CAUSAL CONTEXT
ON THE RECALL OF MAIN IDEAS

by

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Abstract

This study was an investigation of the influence of operational level and locus of causal context on the recall of main ideas in a story. The subjects were 40 kindergarten children. The children were administered a series of Piagetian tasks—seriation, classification, and conservation—and assigned to the preoperational level or the concrete operational level. Subsequently, the children listened to a story. One version of the story had the locus of causal context, (a statement of the cause-effect relationship which precipitated the events), prior to the events, and the second version had the locus of causal context after the events. The children's recalls of the story were tape-recorded. Two ways of eliciting responses were used; stimulated recall, or very general prompting, and probed recall or direct questioning. The protocols were scored according to the number of idea units, either stimulated or probed, that were recalled.

Two dependent variables, quantity and quality, were analyzed by a fixed effects, analysis of variance. Quantity referred to the number of main ideas recalled and quality to the proportion of main ideas recalled. The design was unbalanced, therefore, an a priori ordering was used. The organismic variable, operational level, was entered first, followed by locus of causal context.

The results revealed a significant effect of operational level on quantity of recall of main ideas. A subsequent subanalysis revealed that most of the variability was accounted for by stimulated recall. The effect of the locus of causal context on number of
main ideas recalled was not significant. Neither operational level nor locus of causal context had an effect on the differential recall of main ideas.

It was concluded that future research on the memory of young children for stories should take operational level into account. The effectiveness of stimulated, as opposed to spontaneous recall, was also discussed.
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The study of memory, both what we remember and how we remember, has long been of interest to psychologists (James, 1890). One productive area of research has involved memory for verbal material. Much of this work has investigated memory processes using lists of words as a less complicated way of studying complex phenomena. However, during the present decade there has been renewed interest in the study of memory of connected prose. One form of connected prose, the narrative form, has attracted much research attention.

Statement of the Problem

Although remembering, or not remembering, information which is presented orally is a facet of most people's daily experience, this study addressed the problem of the memory of children for narrative prose. Stories presented in prose narrative form are the basic content of primary reading and language arts programs. Children are asked to read, to listen to, and to remember information presented in prose form. The amount of this material is such that to attempt to retain all of it would place an intolerable burden on the child's memory. It is neither desirable nor necessary that the child retain everything he reads or hears. As some kinds of information and ideas are more important than others it is
desirable that these significant ideas be selected and remembered. The problem addressed in this study then was whether children in kindergarten are capable of extracting and remembering important ideas when they listen to a story. Of specific interest was the question of whether they recall more of the significant as opposed to the insignificant ideas. The effect of two variables, cognitive maturity and locus of causal context, on recall of these important, or main, ideas was examined. For the purpose of this study cognitive maturity was defined within a Piagetian framework. Locus of causal context was defined as placement of the cause-effect relationship which precipitated the events of the story either prior to the events (i.e. at the beginning of the story), or after the events (i.e. at the conclusion of the story).

Context of the Problem

It is appropriate at this point to examine specific aspects of this problem in greater detail. This study was concerned with the effect of cognitive maturity and locus of causal context on the recall of the main ideas in a story by kindergarten children. Therefore, an examination of the controversy surrounding the recall of main ideas by young children was particularly germane. A similar controversy also exists in the literature regarding the effect of the manipulation of certain structural features on recall. This was examined because causal context was treated as a structural feature. Finally, the appropriateness of cognitive level as a possible source of influence on the selection and recall of the main ideas in a story was investigated.
i) **Recall of main ideas in a story.** There is a conflict in the literature concerning the extent to which young children recall the main idea or gist of narrative prose. Piaget (1926, 1928) argued that young children before the age of 7-8 years think egocentrically. Therefore, a child does not abstract the information which is logically necessary for the understanding of a story, but will attend, idiosyncratically, to unimportant details. A contrary position has been maintained by Brown and Smiley (1977), Christie and Schumacher (1975), and Korman (1945). They have presented evidence which indicated that even young children have the ability to spontaneously reproduce ideas which are essential (i.e. main ideas), to a general understanding of a story. This conflict surrounding the child's ability to extract those ideas which are central to the theme of a story is particularly interesting in light of the requirements of the current reading curriculum. The attention directed towards teaching children how to differentiate between ideas which are central to the main thrust of a story and ideas which are merely peripheral would seem to support Piaget's contention that this is a sophisticated skill.

ii) **Locus of causal context and recall of main ideas.** One possible source of these conflicting results is the influence of structural features on story recall. Initially, much of the work on the manipulation of structural features was done with adult subjects (Dooling and Lachman, 1971; Dooling and Mullet, 1973; Mandler and Johnson, 1977; Meyer, 1975; Thorndyke, 1977). Recently
(Glenn, 1977; Stein, 1978) the influence of structure on the recall of young children has been investigated. Evidence accumulated so far indicates that structure can have a pronounced influence on recall; well-organized stories are recalled better than poorly organized stories (Stein, 1978). Although both adults and children are sensitive to structure, there are developmental differences with respect to memory for different structural features (Mandler and Johnson, 1977). It will be argued later in the section dealing with definitions that causal context is a structural feature of a story. To the extent that causal context is a summary of the story it functions in much the same manner as a statement of the theme, or a title. Therefore, manipulation of the locus of causal context is a possible source of influence on story recall.

A conflict exists in the literature regarding the locus of thematic effect. Dooling and Mullet (1973) presented evidence which indicated that provision of a thematic title prior to reading a metaphorical passage influenced recall positively, whereas the presentation of the title after reading, or no title at all, did not enhance recall. The results of a study by Thorndyke (1977) challenged the results of Dooling and Mullet (1973). Thorndyke demonstrated that the presentation of theme-before and theme-after were both better than no theme at all. The existence of these discrepant results which are discussed in Chapter 2, makes an examination of locus of causal context worthwhile. It is also noteworthy that the two studies just cited above were conducted with adult subjects. The present study was an attempt to extend the work on the effect of the manipulation of a structural feature
(in this case causal context) to children.

iii) Cognitive level and recall of main ideas. Age has been a variable of interest in several studies concerning memory for stories (Brown and Smiley, 1977; Christie and Schumacher, 1975; Paris and Upton, 1976), and developmental differences due to age have been noted. That changes in children's memory would occur with an increase in age appears self-evident. Of greater interest to this investigator, is the possibility of the existence of qualitative differences which are not age-related. Specifically, it seems feasible that cognitive maturity might influence the recall of stories. Several studies have investigated the influence of cognitive level, within a Piagetian framework, with reference to more general aspects of recall. (Arlin and Arlin, Note 1; Piaget, Inhelder and Others, 1973). Also, cognitive level, assessed by Piagetian tasks, has been used as a blocking variable to investigate the effect on recall of a story (Arlin and Arlin, Note 2). In these studies operational level significantly affected recall. Therefore, it seemed appropriate to investigate children's recall of narrative prose with reference to both cognitive level, using a Piagetian framework, and the locus of causal context.

Summary of the Problem

In summary, the problem central to this study was the nature of the effects of cognitive level and locus of causal context on the recall of the main ideas in a story by kindergarten children. Two conflicts were discussed: (i) the conflict regarding the
ability of children to select and remember main ideas, and (ii) the conflict regarding the locus of thematic effect. The appropriateness of Piagetian cognitive level as a variable of interest in a study concerning recall of main ideas was also discussed. The purpose of the study was to test hypotheses regarding both quantitative and qualitative differences in recall of main ideas.

Justification of the Study

A study of this nature can be justified on both theoretical and practical grounds. Of theoretical interest is a delineation of the variables which influence recall. The particular contribution of this study was the attempt to extend previous work by investigating (i) the effect of cognitive developmental level, (ii) the effect of locus of causal context, and (iii) the interaction of locus of causal context with cognitive level, on the recall of the main ideas of a story by kindergarten children.

A practical defense of a study of this nature may be found in the ubiquitous use of the narrative form generally. The attention of children in school is often directed to selecting the main ideas of the stories which they listen to or read. The importance of the skill of selecting and remembering main ideas is such that an attempt, however restricted, to investigate the variables which influence this skill, seems worthwhile.

Organization of the Study

This thesis is divided into five chapters. The remainder of this introductory chapter is devoted to general definitions of
the variables of interest. Chapter 2 deals primarily with a review of the pertinent literature and culminates with the presentation of six hypotheses. Chapter 3 contains a description of the methodology. The results are presented in Chapter 4. Chapter 5 contains the discussion and the conclusions.

Definition of the Variables

It is appropriate at this point to define the terms associated with the variables of interest. There were two independent variables, cognitive maturity and locus of causal context, and two dependent variables, quantity and quality of recall of main ideas. Quantity refers to the number of main ideas recalled while quality is used to denote the proportion of main ideas recalled. (Cognitive maturity was regarded in a Piagetian framework, therefore, cognitive maturity and operational level are synonymous.)

This section on definitions is divided into two parts. The first part deals with definitions pertaining to operational level, namely, (i) operational level, (ii) preoperational level, and (iii) concrete operational level. Part II deals with terms associated with the recall of a story, namely, (i) story, (ii) main ideas, and (iii) locus of causal context.

I. Terms Associated with Cognitive Maturity

i) Operational level. Operational level refers to intellectual functioning as defined by Piaget. In Piaget's developmental analysis of intelligence, progress from infancy to adult-
hood is characterized by movement through four major stages: sensorimotor (birth to 18 months; preoperational (onset of speech to 7 or 8 years); concrete operational (7-12 years); and formal operational (12 years and above) (Piaget, 1974). As this study was limited to kindergarten children, the stages of specific interest were the preoperational stage and the concrete operational stage.

ii) **Preoperational level.** The infant's gradual ordering of his world during the sensorimotor period establishes and modifies schemes of behaviour. The preoperational child, with this repertoire of behavioural patterns, develops the ability to utilize symbolic functions. During this period the ability to use a mental symbol for an object or an event, language, accelerates (Elkind, 1967). Preoperational thought is characterized by its attention to states, and its lack of reversibility (Inhelder and Piaget, 1964; Inhelder, 1962).

iii) **Concrete operational level.** The concrete operational thinker, in contrast to the preoperational child, is able to disregard potentially misleading perceptual information and to deal with such abstract concepts as class inclusion and conservation of number, substance, weight and volume (Flavell, 1963). Concrete operational children can distinguish between "appearance" and "reality" (McV. Hunt, 1961). Concrete, or manipulative, materials are still necessary (Piaget, 1972) but the child relies less on the perceptual saliency of the objects and more on the
mental activity of reversibility (Inhelder, 1962). There are three forms of reversibility - negation or inversion, reciprocity, and identity - which are postulated by Piaget as forming the basis of the ability to conserve. It has been argued that the child bases his argument of constancy on negation or inversion (a return to the original form would make them the same); reciprocity (he is able to see that height can compensate for width); or identity (that nothing has been added or taken away) (Inhelder, Sinclair, and Bovet, 1974). These forms of reversibility serve to distinguish the concrete operational thinker (Inhelder, 1962).

II. Terms associated with story recall

i) Story. A story, or narrative prose, is a particular form of connected discourse. Stories conform to an organizational structure which emphasizes plot. Usually, a protagonist is involved in a series of incidents or events (Mandler and Johnson, 1977). The events generally arise as a result of the main character's attempts to solve a problem (Thorndyke, 1977). Most traditional stories conclude with a resolution to the problem.

ii) Main ideas. Bartlett (1932) presented a view of memory for prose which was contrary to the trace theory which was then in vogue. He argued that recall was seldom verbatim, and that subjects typically extracted the essence or the "gist" of a story and used these ideas in active reconstruction. It is the main ideas, the ideas central to the theme of a story, rather than the details, which provide the substance for this active reconstruction.
Other writers have characterized these central ideas as thematically relevant (Christie and Schumacher, 1975), or high in the organization of the content of the passage (Meyer, 1975). One further distinction that can be made is that main ideas are those ideas which are logically essential to the story. Therefore, they are to be discriminated from the details of a story which are not essential for coherence.

iii) Locus of causal context. Causal context is provided by a statement of the cause-effect relationship which precipitates the action of a story. The statement deals with an event, and the consequences of the event, both of which are significant to the subsequent action or plot. In effect the statement of the cause-effect relationship functions to introduce subsequent action and to provide a context in which the action takes place. Causal context, although not synonymous with, is similar to, theme. Both provide unity and coherence to a story but causal context differs from a theme in that it emphasizes the cause-effect relationship which precipitates the action of a story. The locus of causal context can be manipulated. In this study the statement regarding the cause-effect relationship was placed prior to subsequent events (i.e. at the beginning of the story), or after the events (i.e. at the end of the story).

Summary of Chapter 1

The purpose of this introductory chapter was to specify the nature of the problem and to place it in a research context. The
problem investigated in this study was the influence of operational level and the locus of causal context on the recall of the main ideas of a story by kindergarten children. The statement of the problem was followed by a justification, on both theoretical and practical grounds, of the present study. The chapter concluded with a discussion of the variables and definitions of the terms used. Chapter 2 is devoted to a review of the literature which led to the formation of the six hypotheses which were tested.
This chapter is devoted to a review of the literature pertaining to cognitive structure and story recall. As a result of this review six hypotheses were formulated. Main effects of cognitive level and of locus of causal context on recall of the main ideas of a story were predicted as was an interactive effect of cognitive level and locus of causal context. Three of the hypotheses relate to quantitative differences and three to qualitative differences. To aid clarity, the discussion is presented in four sections. In the first section arguments emanating from Piaget's notions of intellectual development are presented. This section is subdivided into six parts: (i) syncretism, (ii) juxtaposition, (iii) transductive reasoning, (iv) the consequences of egocentrism, (v) the relationship between egocentrism and operational level and (vi) a formal statement of the first hypothesis. The second section develops ideas based upon research into the effect of context, (specifically the location of structural features), on story recall. This section is subdivided into three parts: (i) the relationship between prior knowledge and context, (ii) a consideration of causal context as prior knowledge, and (iii) a formal statement of the second hypothesis. The third section deals with the research which suggested a possible interactive effect of
cognitive level and locus of causal context. This section is also divided into three parts: (1) the utilization of information provided by causal context, (ii) reorganization of ideas in memory, and (iii) a formal statement of the third hypothesis. The final section deals with the question of differential recall of main ideas as opposed to details. Three hypotheses relating to qualitative differences are proposed. Chapter 2 concludes with a summary of the six hypotheses.

I. The influence of cognitive development on story recall

Piaget (1926, 1928) has argued that egocentrism dominates the thought and language of children prior to the age of 7 or 8 years, and that this has a profound influence on their reasoning abilities. Piaget argues that egocentrism leads to three kinds of thinking - transductive reasoning, syncretism and juxtaposition - which clearly distinguish child from adult thought. It is hypothesized in the present study that it may be freedom from these modes of egocentric thought which increase the concrete operational child's ability to recall more of the main ideas of a story.

Central to the concept of egocentrism is the notion that the child is incapable of seeing things from the point of view of another; therefore what he sees or hears is interpreted idiosyncratically. The main ideas of a story are not determined in an idiosyncratic and subjective way. The main ideas of a story are determined objectively by reference to logical necessity. The child's recall of ideas may not correspond to the local structure of the story. The egocentric child will likely attend to, and
remember, ideas because they have immediate meaning and importance for him rather than because they are essential to the logic of the story. The argument will be made that the egocentric modes of thinking, syncretism, juxtaposition and transductive reasoning, all involve a failure to apprehend logical relationships. Apprehension of the logical connections between statements would seem to be a necessary condition for the perception of main ideas. Each of these modes of thinking, syncretism, juxtaposition, and transductive reasoning will be examined individually in order to demonstrate how they inhibit the perception of relationships and hence the recall of main ideas.

1) Syncretism. Piaget (1928) explained the notion of syncretism in terms of gestalt psychology. He argued that the child selects one detail which becomes the most important part. Then the child imagines that he has understood everything and he develops a global schema, based upon this one detail, which is used to explain or interpret everything that was seen or heard. During this process no attention is paid to the necessity or logical relationships. The child's thoughts are captivated by what is important to him. Syncretism renders him incapable of objectively assessing ideas in terms of their logical necessity to the story. Therefore, this suggests that the child who indulges in syncretistic reasoning will have difficulty in selecting and recalling the main ideas of a story.
ii) **Juxtaposition.** Whereas syncretism is concerned with the perception of a part as the whole, and its subsumption under an incorrect global schema, juxtaposition deals with the lack of perception of the whole. Piaget described juxtaposition as a deficiency of relationships, a failure to perceive a totality. This, in his view, leads to a lack of logical connections between statements. Failure to perceive statements as pertaining to a common theme would seem to preclude the recall of those ideas which are essential to that theme. Therefore, reasoning by juxtaposition of ideas would not lead to the consistent selection and recall of the main ideas.

iii) **Transductive reasoning.** Juxtaposition, the tendency to regard statements as independent, may be seen as intimately linked to transductive reasoning. Piaget proposed that the outstanding characteristic of transductive reasoning is that the child makes associative rather than logical connections between statements. In this movement from particular to particular the child does not attempt to establish general propositions by successive inductions nor does he postulate these for the purposes of deduction. This primitive form of reasoning by associations rather than by logical necessity would appear to make it difficult for the egocentric child to perceive main ideas.

iv) **The consequences of egocentrism.** The consequences of egocentrism are both specific and general. It has been argued that the specific consequence of egocentric thought is reasoning
by syncretism, juxtaposition, and transduction. Reasoning of this nature leads to a failure to perceive logical relationships. Furthermore, it was argued that failure to perceive logical relationships leads to an inability to select and recall main ideas consistently or accurately. Piaget (1928) has also argued that egocentrism has, as a general consequence, a deficit in the child's field of attention. He argued that the child attends only to details and, unlike the adult, is unable to synthesize the details into a whole. It is egocentrism which prevents the child from holding several ideas in his head simultaneously. The ability to perceive several ideas simultaneously would seem central to the perception of main ideas.

The preceding argument is based on the notion that the perception of main ideas involves a selection, on the basis of importance or significance, between several ideas. Selection necessarily involves comparison and comparison involves the simultaneous appraisal of two or more ideas. If the egocentric child is incapable of dealing with several ideas simultaneously then the perception of main ideas will necessarily be difficult.

v) The relationship between egocentrism and operational level. It has been argued that egocentric ways of thinking result in a failure to see relationships. Piaget (1926, 1928) maintained that a decline in egocentrism is not effected until the development of socialized thought. This is thought to occur around the ages of 7 to 8 years (Piaget, 1928). However, I intend to argue that it is more appropriate to view the decline
in egocentric thinking as a function of cognitive maturity rather than chronological age.

Piaget (1974) has argued that a major cognitive development takes place around the age of 7, although this can happen earlier. He is referring to the development of concrete operational thought. A necessary condition for the inference of concrete operational thinking is the ability to conserve (Piaget and Inhelder, 1964). The idea of conservation is based on the appreciation of relationships. The child must understand that a given relationship remains the same in spite of a physical transformation. The ability to see the constancy of relationships, which conservation implies, leads to the conclusion that the reasoning ability of concrete operational thinkers is less influenced by syncretism, juxtaposition, or transduction.

vi) A formal statement of the first hypothesis

The decline in egocentrism, manifested by the ability of concrete operational thinkers to engage successfully in conservation tasks, leads to the first hypothesis. Operational level is related to the recall of the main ideas in a story by kindergarten children. Specifically, children at the concrete operational level recall a greater number of the main ideas than children at the preoperational level.

II. The Influence of Locus of Causal Context on Story Recall

In this section it is argued that the extent to which context can influence recall is directly related to a subject's prior
knowledge of that context, and his ability to utilize that knowledge. A distinction will be made between two kinds of prior knowledge, general and specific. Causal context will be examined as an example of the latter kind of prior knowledge. Furthermore, it will be argued that because causal context functions as a structural feature its locus is important in terms of story recall.

i) The relationship between prior knowledge and context.
It will be argued that the influence of context is determined by (i) prior knowledge of the context, and (ii) the subject's ability to utilize that knowledge. Prior knowledge of context will be dealt with first. The subject's ability to utilize the knowledge is discussed more appropriately in the following section dealing with the posited interactive effect between operational level and locus of causal context.

It is the contention of this writer that prior knowledge may be conceived as being both general and specific. Furthermore, it will be argued, in the section dealing with the interactive hypotheses, that specific prior knowledge is constrained by general prior knowledge. General prior knowledge is defined as knowledge which accrues to a person just by virtue of his existence in the world. The adjective 'specific' is attached to prior knowledge to designate that information which is provided by an investigator during an experiment. Both kinds of prior knowledge may be seen as functioning as advance organizers (Ausubel, 1965) in that they predispose a subject to make sense of incoming information.
Bartlett (1932) was the first investigator to propose that memory for prose was reconstructive and was influenced by prior experience. Investigators after Bartlett (Anderson and Ortony, 1975; Anderson, Reynolds, Schallert, Goetz, 1977; Bransford and Johnson, 1972; Dooling and Lachman, 1971; Dooling and Mullet, 1973) have supported the "strong" constructive theory (Dooling, 1977) that perception, interpretation and comprehension is influenced by the prior general experiences of the subjects. Anderson and Ortony (1975) challenged the idea that linguistic competency was sufficient to explain comprehension. They argued that the comprehension of a sentence was not accomplished by the mere concatenation of the meanings of individual words, but entailed the construction of a mental representation. They demonstrated that the formation of a mental representation depended upon knowledge of the world and an analysis of the context. Although the conclusions of this study were limited to sentences, Anderson and Ortony have provided evidence for the influence of prior experience on comprehension.

In a subsequent study Anderson, et al. (1977) expanded the work done with sentences to prose passages. Two of their hypotheses are of direct concern to the present study. They argued, as they had done previously (1975), that meaning is influenced by 'schemata.' (Schemata are conceptualized as internal representations of knowledge structures.) Furthermore, they argued that high level schemata can so influence perception of a passage that only one, schemata-based, interpretation is possible. In their study the interpretative frameworks, or schemata, were provided
by the academic interest and preparation of the subjects; physical education and music students interpreted the same passage in strikingly different ways. The authors suggested that the differences were in accord with the prior experience of the subjects.

The research reviewed above, although limited in terms of type of materials and subjects, does serve to support the idea that past experience can, in a very general manner, exert strong influences on present perception. Bransford and Johnson (1972) in an interesting pictorial manipulation demonstrated that specific information, provided prior to reading a passage, can enhance comprehension and recall. They advanced the idea that the provision of specific information prior to reading a passage helped the subject to create a context in which to comprehend the passage. Providing the same information after reading failed to produce a similar increment in recall. Likewise, the provision of partial cues (the same pictures but unrelated to each other) also failed to improve recall. It seems plausible that the partial cues did not enable the subjects to integrate the information and therefore deprived them of the opportunity to create a context.

In a similar experiment, where the context was provided verbally rather than pictorially, Dooling and Mullet (1973) obtained similar results. The provision of a thematic title prior to reading a metaphorical passage influenced recall positively, whereas the presentation of the title after reading, or no title at all, did not enhance recall. Dooling and Mullet argued that the thematic title functioned as a mnemonic device and therefore must be available during encoding. It is also plausible that the title
provided a context or frame of reference which led to more efficient encoding. If the subject was aware of the context prior to reading he presumably had schemata available which he could utilize and thereby reduce the burden on his memory. One would therefore anticipate increased recall.

ii) A consideration of causal context as prior knowledge.

It has been argued elsewhere (Chapter 1) that causal context functions similarly to theme in that it serves to lend unity and coherence to a text. Therefore, the locus of causal context, like the locus of thematic effect, could influence the recall of main ideas in a story by promoting efficient encoding and retrieval. However, before proceeding to a formal statement of the hypothesis, it is necessary to examine the conflicting results reported by Thorndyke (1977).

Thorndyke's work with theme (1977) provides a challenge to the results of Bransford and Johnson (1972) and Dooling and Mullet (1973). He found that the presentation of the theme after was better than no theme at all, whereas Bransford and Johnson (1972) and Dooling and Mullet (1973) found that the provision of information after reading did not influence recall. Thorndyke (1977) concluded that his subjects were capable of reorganization in memory. He explained the discrepant results as a function of the differences in stimulus materials (metaphorical as opposed to non-metaphorical prose). However, another explanation for these results is possible. Thematic title as used by Dooling and Mullet is a higher level of abstraction than theme as used by Thorndyke.
Thematic title was a generalization based upon the passage and therefore was implicit rather than explicit. In contrast Thorndyke's theme was explicitly stated in the passage. Therefore, it seems tenable to argue that because the level of abstraction of the stimulus materials in these studies was different that they are not strictly comparable. Therefore, the contradiction is perhaps more apparent than real.

iii) A formal statement of the second hypothesis.

Locus of causal context is related to recall of the main ideas in a story. Specifically, the presentation of the causal context prior to the events which it precipitates enhances the recall of main ideas, more than the presentation of causal context after the events.

III. The Interactive Influence of Cognitive Level and Locus of Causal Context on Story Recall

This section will take up two points which were raised in the previous section. The discussion will be centred on (i) the ability needed to utilize the information provided by causal context, and (ii) the cognitive requirements necessary for successful reorganization of ideas in memory. This section will conclude with the statement of an interaction hypothesis pertaining to quantity of recall.

1) The utilization of information provided by causal context.

The extent to which there are developmental differences in the attribution of causation will necessarily influence the ability
to use causal context as an organizational and mnemonic device. Development differences in cause-effect relationships have been examined and there are contradictions in the research literature. Piaget (1930) argued that young children use correlational evidence in the attribution of causation. He claimed that prior to the age of seven or eight years, the child is in fact pre-causal in his thinking. Egocentric ways of thinking lead to what Piaget (1930) has termed phenomenistic causality. The child makes associations at random and connects everything with everything. It has been argued above that this type of thinking is characteristic of the preoperational child. If the preoperational child's thinking is influenced by phenomenistic causality he would be unable to make accurate causal attributions. Therefore, he would be unable to use causal context as either an organizational device or a mnemonic device. Conversely, the concrete operational child who relies less on egocentric modes of thought should be able to perceive the cause-effect relationships and to utilize this in encoding and retrieval.

Other investigators have established contradictory claims. It has been argued that five-year-old children do make causal attributions based upon temporal contiguity (Siegler and Liebert, 1974) and consistent covariation (Mendolson and Schultz, 1976). One possible source of these discrepant results is operational level. If as Piaget has argued, phenomenistic causality is a result of egocentric thought then the discrepant results can be interpreted within a cognitive developmental framework.
ii) **Reorganization of ideas in memory.** Thorndyke (1977) suggested that subjects given a theme after they read a passage recalled more of the story than subjects given no theme because they were capable of the reorganization of the ideas in memory. A possible source of influence on the ability to reorganize material in memory is the developmental level of the subject. Piaget, Inhelder, and Others (1973) have presented evidence to suggest that memory processes are influenced by operational level. Brown (1975) and Stein (1978) have both argued that reversibility of thought allows concrete operational children to reconstruct a logical sequence when it is presented out-of-order. Preoperational children, because they lack reversibility of thinking, are incapable of mentally establishing logical relationships and therefore fail to integrate the information. The combination of phenomenistic causal thinking and the lack of reversibility in preoperational children led to the proposal of a third hypothesis.

iii) **A formal statement of the third hypothesis**

Operational level and locus of causal context interact to influence recall of the main ideas of a story. There is a differential effect of locus of causal context for the concrete operational level but not for the preoperational level. Specifically, concrete operational children recall more of the main ideas of a story when locus of causal context is presented at the beginning than at the end. However, there is no difference in locus of causal context for preoperational children.
IV. Qualitative Differences in Story Recall

It has been argued that cognitive level and locus of causal context will have significant positive effects on the number of main ideas recalled by kindergarten children. Developmental differences in total recall have been demonstrated (Christie and Schumacher, 1975), therefore, it is essential to determine whether the increase in recall of main ideas is a function of this increase in total recall.

It was hypothesized that the egocentric nature of preoperational thought would lead to a failure to see relationships. Concrete operational children, who are less influenced by egocentric modes of thinking, are more likely to be able to deal with logical relationships. Therefore, it was proposed that concrete operational children would recall a greater number of main ideas than the preoperational children. The preceding rationale which led to a hypothesis regarding quantity of recall of main ideas, may also be used to support a hypothesis regarding quality of recall. It seems tenable that because preoperational children are incapable of utilizing relational information that as well as recalling fewer main ideas they will recall proportionately less of the main ideas than the concrete operational children.

Similarly, the rationale developed regarding the influence of locus of causal context on the quantity of main ideas recalled, suggests that quality may also be influenced. If cause-before leads to greater recall of main ideas than cause-after then one would predict that cause-before would lead to a proportionately greater recall of main ideas.
In the previous section these arguments were used to support an interactive effect of operational level and locus of causal context on quantity of recall. It also seems likely that the interactive effect of these two variables could also influence quality of recall.

The rationale used to develop hypotheses regarding quantity also support hypotheses regarding quality of recall of main ideas. Therefore, three additional hypotheses were formulated.

i) Children at the concrete operational level recall proportionately more of the main ideas of a story. Children at the preoperational level recall proportionately fewer main ideas.

ii) Presentation of causal context at the beginning of the story results in proportionately greater recall of main ideas. The location of causal context at the conclusion of the story results in proportionately less recall of the main ideas.

iii) There is an interaction of operational level and locus of causal context on the proportion of main ideas recalled. There is a differential effect of locus of causal context for the concrete operational level but not for the preoperational level. Specifically, concrete operational children recall proportionately more of the main ideas when locus of causal context is presented at the beginning than at the end of a story, but there is no difference attributable to locus of causal context for preoperational children.
Summary of the Six Hypotheses

Three of the hypotheses related to quantitative differences in recall of main ideas and three related to qualitative differences. For the purposes of statistical analysis the hypotheses were stated in the null form. There is no difference in quantity or quality of recall of main ideas between concrete operational and preoperational children. Similarly, there are no quantitative or qualitative differences between cause before and cause after on the recall of main ideas. Finally, there are no quantitative nor qualitative differences between the groups attributable to an interaction between operational level and locus of causal context.
CHAPTER 3
DESIGN OF THE STUDY

This study was designed to ascertain the effects of cognitive level, locus of causal context, and the interaction of these two variables, on the recall of the main ideas of a story by kindergarten children. Therefore, it was necessary to determine the child's operational level prior to the story recall task. In order to bring clarity to the discussion the procedures for the Piagetian assessment and the story recall will be dealt with separately.

METHOD

Subjects

The subjects were 42 kindergarten children selected from three elementary schools in a suburb adjacent to a large metropolitan area in the lower mainland of British Columbia. The mean age was 5.8 years and the standard deviation was .25 years. The socio-economic level of the school catchment areas was lower-middle to upper-middle class. Two of the schools were situated in the older, commercial part of the city whilst the third was situated in a rapidly expanding suburb comprised of modern single family dwellings and condominiums.

Design

The original design was a 3 x 2 (operational level by locus of
causal context), fully-crossed fixed effects factorial. The children were assessed for operational level and then randomly assigned to one of the two versions of the story. The cells were balanced.

Procedure

I. Piagetian Assessment

The subjects for this study were selected from amongst 192 kindergarten children who were involved in a much larger study concerning the scaling of Piagetian tasks. Research assistants, including the present author, were trained in the administration of the Piagetian tasks. Training was accomplished by observation of the procedures, and by trial demonstrations during which feedback was given. The interrater reliability of scoring was computed on a random sample of 30 out of 192 cases. The reliabilities were: single seriation .89, double seriation .93, one-way classification .89, two-way classification .85, class-inclusion .60, three-way class inclusion .75, conservation of number .91, continuous quantity .91, discontinuous quantity .97. The lower reliabilities of the class inclusion and three-way classification tasks resulted from difficulty in the wording of these tasks and difficulty in probing. Neither of these tasks were used in the assessment of operational level for the children in the study.

The children were brought to a room, usually the library or a spare classroom, and the tasks were administered individually. The experimenters, most of whom were teachers experienced in dealing
with young children, made every effort to ensure that the children were comfortable and that they understood the instructions. All the equipment was visible on the table during the testing session and the tasks were presented in a game-like manner. The children were told that we were not only interested in their answers to the puzzles but also in the reasons they had for their answers.

Task Descriptions

Eight types of Piagetian tasks were selected for the assessment. They represented three sets of concepts and operations: seriation, classification, and conservation. There were two types of seriation tasks, four types of classification tasks, and two types of conservation tasks (Inhelder and Piaget, 1964). The protocol for the tasks and the scores for each task are presented in Table A, Appendix.

A. Seriation

i) One-way seriation. The child was presented with a set of nesting barrels, in a scrambled order, and asked to line them up from the biggest to the smallest. As only one-half of each barrel was used they were presented as if they were cups. The diameters of the half barrels ranged from 1 cm. to 10 cm.

ii) Double seriation. The child was given a set of wooden sticks varying in size from 2 cm. to 10 cm., and asked
to pretend that they were straws. They were then asked to find the straws which matched the cups so that the biggest cup got the longest straw and the smallest cup got the shortest straw.

B. Classification

i) One-way classification (first form). The children were given small attribute blocks (ranging in size from 2 cm. to 4 cm.) and asked to sort them into groups of things which go together. They were asked to tell why they grouped the blocks in a particular way. The blocks were then scrambled again and the child was asked to find another way to organize them. If they could group the blocks according to a second attribute they were again asked to explain their groupings.

One-way classification (second form). The children were provided by 3 cm. by 4 cm. pictures of individual animals and birds, (i.e., a horse, a duck, a rooster, etc.), and asked to sort them into 3 or 4 groups of things that go together. The child was asked to explain how the animals belonged together.

ii) Two-way classification (first form). The child was shown a matrix (21 cm. by 13 cm.) consisting of a red flower with a green flower next to it. Under the red flower was a red apple but the space next to the red
apple and under the green flower was empty. The objects were all identified for the child and he was asked to select, from amongst a red and green apple, a red and green flower, and a circle, the best object for the empty space that would complete the pattern. An explanation was required and they were also asked if anything else would go in the empty place as well as their choice.

Two-way classification (second form). A matrix similar to the one described above was used but the objects were circles and squares. The procedure was the same except for the change in names.

iii) Three-way classification. The matrix (21 cm. by 13 cm.) was composed of a red fish and a green fish which were facing each other. Under the red fish was a red bird and the children were instructed to select the object which best went with the fish and the bird. Selection was made from two red birds which faced left and right, 2 green birds which faced left and right, and a fish. The children were asked the reason for their choice.

iv) Class inclusion. The children were shown 10 small blocks (2.5 cm. square) seven of which were red and 3 of which were blue. Attention was drawn to the fact that all of the blocks were made of wood, but that some
were red and some were blue. The child was then asked to decide if there were more red blocks or more wooden blocks, and to tell how they knew they were correct in their response.

C. Conservation

i) Conservation of number. Three red and three blue blocks (2.5 cm. square) were lined up in a 1-to-1 correspondence and the child was asked if the rows were equal. After securing the child's agreement, the research assistant added two blocks to just one of the rows and the question was repeated. The rows were then made equal and the question put again. This procedure was repeated until both rows had ten blocks. The length of each row was approximately 30 cm. Equality of rows was again established. Then the research assistant pushed together the blocks of one row and asked if they were still the same, or if one row had more or less blocks than the others. The child was asked to explain his answer.

ii) Conservation of quantity (continuous quantity). The child was shown two balls of plasticene of approximately 3 cm. in diameter and was asked if there was the same amount of plasticene in each ball. If the child thought that they were unequal he was asked to make them equal. When the equality of the amount of plasticene was established the research assistant then proceeded to roll
out one ball of clay into a hot dog shape. The child was then asked if there was as much plasticene in the ball as in the hot dog, or if there was more or less plasticene now that it had been rolled out. The child was asked to give a reason for his answer.

Conservation of quantity (discontinuous quantity). The child was once again presented with two balls of plasticene and equality was established. The research assistant took one ball and split it into five balls of smaller but equal size. The child was then asked if there was still as much plasticene in the one ball as in the five balls, or if there was more or less plasticene in the five balls taken together. Once again an explanation of the answer was sought.

Scoring

Seriation tasks. Every effort was made to ensure that the children understood the tasks. If the child failed to respond the directions were reworded. If both single and double seriations were carried out correctly, without perceptual matching, the child was given two points for each task. If the series were ordered correctly, but the children used some trial and error, they were given one point for each task. Total possible points for the seriation tasks was four.
Classification tasks. Classification according to one attribute earned a score of one point. If the child could reclassify using another attribute he scored another point. Success in the classification of the animals earned a third point. Both forms of the two-way classification task with reasons were worth one point. In the three-way classification task one point was awarded for the correct answer and a second point was given for a satisfactory reason. The class inclusion task was scored one point for the correct answer and zero for an incorrect answer. The total possible points for all the classification tasks (including class inclusion) was eight points.

Conservation tasks. In the conservation tasks children who gave the correct answer were awarded one point, whilst those who supplied a reason were awarded an additional point. Therefore, there was a total of six points for the conservation tasks.

Assignment to Operational Level

Children who were not able to complete tasks beyond seriation were designated as preoperational. Many children were familiar with ordering tasks of this type through the use of such toys as the nesting barrels. It was assumed that familiarity with this type of task could lead to correct ordering without the necessity of operational logic.

Children who were capable of one and two-way classification and who answered the conservation of number task correctly with an appropriate reason for their answer were deemed to be at the
concrete operational level. A middle, intermediary group was also identified. These children did not give evidence of well-established or stable operations. Children in transition between the preoperational and concrete operational levels do not give evidence of secure or stable operations and may display behaviours which are intermediary between the two stages. This is reflected in their tendency to vacillate on questions, to change their answers, and to be generally inconsistent in their responses (Inhelder, Sinclair and Bovet, 1974). Children who demonstrate inconsistency in performance cannot easily be classified as preoperational or concrete operational. Therefore, in this study, it was decided not to classify children who gave anomalous responses but to assign them initially to an intermediary group. The intermediary group consisted of children who either (a) could classify but who were non-conservers of number, or (b) could conserve number but who had no classification skills other than simple classification.

A preliminary analysis revealed inconsistencies within the intermediary group. In order to avoid the discrepancies induced by the use of either classification or conservation skills as criteria for membership in the intermediary group, it was decided to reclassify the children according to a single criterion. Conservation of number was chosen as the operational skill which would most likely discriminate between the less and the more cognitively mature children. Support for the decision to classify according to skill in conservation is provided in the writing of Piaget: "The best criterion of the emergence of operations at
the level of concrete structure (towards the age of seven) is, in fact, the constitution of invariants or notions of conservation" (Piaget, 1964). Furthermore, Elkind (1969) sees the schema of conservation as a pivotal construct in the child's cognitive transition from the preoperational to the concrete operational stage.

The subsequent reorganization of the subjects affected only those children who had been originally assigned to the intermediary group. The reclassification of these children involved placing the non-conservers of number with subjects who had been originally designated as preoperational and the conservers with those designated as being at the concrete operational level.

Two children were dropped from the study. One, a boy, volunteered little spontaneously and had great difficulty attending to the task at hand. The second subject, a girl, was uncooperative. The reclassification of subjects led to unequal cell sizes. The final sizes are shown in Table 1.

Table 1
Final Sample Characteristics

<table>
<thead>
<tr>
<th>Causal Context</th>
<th>Operational Level</th>
<th>Preoperational</th>
<th>Concrete Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Number</td>
<td>2</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Before</td>
<td>Age $\bar{x}$ 67.50</td>
<td>69.57</td>
<td>71.86</td>
</tr>
<tr>
<td></td>
<td>SD    2.12</td>
<td>2.64</td>
<td>3.29</td>
</tr>
<tr>
<td>Number</td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>After</td>
<td>Age $\bar{x}$ 68.75</td>
<td>70.25</td>
<td>70.0</td>
</tr>
<tr>
<td></td>
<td>SD    4.27</td>
<td>3.94</td>
<td>3.61</td>
</tr>
</tbody>
</table>
II. Story Recall

Two versions of the story were written by the author. (See Figure 1) The main ideas are marked with an asterisk.

Figure 1

Story

* A Peter had a hole in his pocket
* B So he lost things.
1 He was going to the store
2 because he wanted to buy some candy.
3 He had a quarter to spend.
* 4 He put the quarter in his pocket.
5 He wanted the quarter to be safe.
* 6 On the way to the store the quarter fell out of his pocket.
7 He was very sad
8 because he lost his quarter.
9 The next day Peter went to play with his friend, Tom
10 because he wanted to show Tom his new green car.
* 11 He put the car in his pocket.
12 He wanted the car to be safe.
* 13 On the way to Tom's house the green car slipped out of his pocket.
14 He was even sadder
15 because he lost the car.
16 Soon it was Monday.
17 Peter was excited
18 because his kindergarten class was going to see a pond.
19 At the pond Peter found a frog.
* 20 He put the frog in his pocket
21 because he wanted to take it home.
* 22 On the way home the frog jumped out of his pocket.
23 Peter was so sad
24 he cried
25 because he lost the frog.
* 26 That night Peter's mum sewed up the hole in his pocket
* 27 so that he wouldn't lose anything else.

The story presented in Figure 1 was about a little boy called Peter who lost things because he had a hole in his pocket. Version two was similar except that idea units A and B were placed before number 26 and 27. In the first version of the story (Cause-
Before this fact was mentioned at the very beginning. In the second version of the story (Cause-After) this fact was mentioned at the end. Both versions of the story consisted of 207 words and contained 19 sentences. The reading level was Grade 1 as assessed by the Fry readability formula. The two versions of the stories were tape recorded. The reader was female. The recording of version one was 1 minute 42 seconds long whilst the recording of version two was 1 minute and 38 seconds. An effort was made to read both versions with similar emphasis and pauses.

The children were brought to a spare room for the story recall either straight after the Piagetian task or after a short break. The children listened to one of four stories as part of another study prior to listening to the Peter story. The instructions for the listening were identical. The children were told that they would listen to a short story and when it was finished that they would be asked to tell the story in their own words. They were also told that they would be asked questions about the story and that everything they said would be tape recorded. A story recall session took approximately ten minutes.

After the child had listened to the tape-recording of the first or second version of the Peter story he was asked to retell it in his own words. Every effort was made to encourage spontaneous recall; however, if this task proved to be too difficult, the child was prompted in a general way. When this modified form of spontaneous recall ceased to elicit responses then a probing technique was used.
Method

i) Stimulated recall. There is evidence to suggest that young children have difficulty with the spontaneous recall paradigm (Brown, 1975; Piaget, 1926). Therefore, a modification was considered defensible. Every effort was made to elicit spontaneous recall but, if this was unsuccessful, the child was encouraged by general prompts. The child was asked to tell as much of the story as he could remember. If he had difficulty beginning he was prompted in a very general way. The intention was to stimulate the child's recall in a general way without providing direct verbal cues. For example, the child was asked to tell who was in the story and what it was about. Other general prompts used were: "'tell me more', 'anything else?', 'what happened next?'." If the child stopped abruptly in the middle of a sequence, a technique suggested by Korman (1945), in which the experimenter repeated the child's last few words, was used. This technique proved to be quite successful in stimulating recall.

ii) Probed recall. Direct probing was used when the stimulation techniques failed to elicit any further responses. The children were questioned directly about any part of the story that they had previously not mentioned. In addition, they were all asked a standard set of questions (See Table B, Appendix) directed at both recall of events and understanding of relationships between events. If the child had previously mentioned the events or the reasons for the events in the stimulated recall, he was not asked those questions again.
Scoring of the Story Recall Protocols

i) **Idea units.** The story was divided into idea units according to a system proposed by Thorndyke (1977). For the purposes of this study an idea unit is defined as a clause or a sentence containing an action or stative verb. Relationships between modifiers and their modified terms are not considered as separate idea units unless they appear as relative clauses. The story consisted of twenty nine idea units (See Figure 1).

ii) **Main idea units.** Two adult, native speakers of English were asked to select the idea units which they thought were essential to the theme of the story. The theme, (causal context), was underlined. Previously, the experimenter had selected the most important ideas. The percentage of agreement between the experimenter and the two raters was 88% for rater 1 and 96% for rater 2. The percentage of agreement between the two raters was 96%. Ten idea units which were selected by all three adults were accepted as the main ideas of the story. These are indicated in Figure 1.

iii) **Assignment of scores.** Scoring was done according to the criterion of whether the child recalled the idea of the unit as opposed to the actual words. For example, to receive credit for number 9, it was not necessary to name Tom, but to know that Peter visited a friend. The correct noun was also not essential to earn credit, therefore waterhole or river was accepted instead of pond in number 18, and nickel or dime was accepted instead of
quarter for number 3. One point was awarded for each idea unit that the child recalled. Points were awarded for both stimulated and probed recall. In the event that a child recalled an idea unit both spontaneously and then when he was questioned directly, he was credited with only one point for the spontaneous recall (i.e. each idea unit was only scored once).

iv) **Reliability of the scoring of the protocols.** Each protocol was scored twice, once by the experimenter and once by a person who was naive about the purpose of the study. A percentage of agreement for each protocol was calculated. Agreement ranged from 100% (4 cases) to 69% (1 case) with the median percentage of agreement being 90%. The difference between scores was examined and after discussion 100% agreement was reached. The consensus score was the score that was used in the subsequent analysis.

v) **Scores**

a) **Quantity.** Each child's score consisted of 4 parts: main ideas recalled spontaneously or when probed, and details recalled spontaneously or when probed. The number of stimulated and probed main ideas were combined to give a total number of main ideas recalled. It was this combined score for main ideas which was analyzed. A subanalysis on the components (stimulated main ideas and probed main ideas) was performed subsequently to the analysis
b) Quality. A particular question addressed in this study was the differential recall of main ideas by concrete operational children. It was, therefore, necessary to look at the relationship of main idea units to the total number of idea units recalled. The ratio of main idea units to the total number of idea units recalled, (main ideas and detail), was converted to a percentage.

Subsequently, the score for main idea units recalled was broken down into its components (stimulated and probed). The ratio of stimulated main ideas to the total of stimulated ideas was changed to a percentage. Similarly the ratio of probed main ideas to the total number of probed ideas was also converted to a percentage. There were three percentage scores for each child: percentage of main ideas within total recall, within stimulated recall and within probed recall. These scores were submitted to arcsine transformations in order to normalize the distribution. The transformed scores were used in the analysis.

The Analysis of the Data

The original 3 x 2 (operational level by locus of causal context) design was modified because of the reclassification
(discussed above) of subjects in the intermediary group. The two dependent variables, quantity and quality, were analyzed by a 2 x 2 (operational level by locus of causal context) fixed effects, two-way analysis of variance. As shown in Table 1 the cell sizes were nonorthogonal. Thus, an a priori ordering approach (Overall and Spiegal, 1969) was adopted. The organismic variable (operational level), was entered first, followed by locus of causal context. As this study was of an exploratory nature the alpha level for all tests was set at .05.

Summary

Chapter 3 was concerned with reporting the methodology involved in testing the six hypotheses. The Piagetian assessment procedures and method of scoring adopted were presented. Procedures concerned with the administration and scoring of the story recall tasks were also detailed. Information regarding the calculation of the scores on the two dependent variables was given. The chapter concluded with a description of the design and the analysis.
CHAPTER 4

RESULTS

Chapter 4 is devoted to the presentation of the results of the analysis. The results for quantity and quality will be discussed separately.

I. Quantity of Recall

1) Recall of main ideas

The mean number of main ideas recalled and the standard deviations are provided in Table 2.

Table 2

Cell Means and Standard Deviations for Recall of Main Ideas by Operational Level and Locus of Causal Context

<table>
<thead>
<tr>
<th>Causal Context</th>
<th>Preoperational</th>
<th>Concrete Operational</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>x</td>
<td>SD</td>
</tr>
<tr>
<td>Cause Before</td>
<td>9</td>
<td>4.44</td>
<td>(2.46)</td>
</tr>
<tr>
<td>Cause After</td>
<td>8</td>
<td>4.00</td>
<td>(2.67)</td>
</tr>
<tr>
<td>Overall</td>
<td>7</td>
<td>4.24</td>
<td>(2.49)</td>
</tr>
</tbody>
</table>

As shown in Table 2, operational level significantly influenced recall of main ideas $F(1,36) = 5.27; p < .05$. Concrete operational children ($\bar{x} = 5.74$) recalled more main ideas than preoperational children ($\bar{x} = 4.24$). Locus of causal context was nonsignificant ($F < 1.0$). The interaction was also nonsignificant ($F < 1.0$).
Table 3

Analysis of Variance Summary Table for Total Recall of Main Ideas

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op. Level</td>
<td>22.75</td>
<td>1</td>
<td>22.75</td>
<td>5.28</td>
<td>0.023</td>
</tr>
<tr>
<td>Causal Context</td>
<td>0.008</td>
<td>1</td>
<td>0.008</td>
<td>-</td>
<td>0.97</td>
</tr>
<tr>
<td>Op. L. X C.C.</td>
<td>2.17</td>
<td>1</td>
<td>2.17</td>
<td>-</td>
<td>0.48</td>
</tr>
<tr>
<td>Error</td>
<td>155.22</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a $F < 1.0$

Subanalysis of the two components of recall of Main Ideas

Stimulated Main Ideas and Probed Main Ideas.

i) Stimulated recall of main ideas

When stimulated recall of main idea was treated as the dependent variable operational level significantly affected the amount of recall, $F (1,36) = 5.00 p < .05$ as shown in Table 3. Concrete operational children ($\bar{x} = 3.5$) recalled more main ideas than preoperational children ($\bar{x} = 2.2$).
Table 4

Cell Means and Standard Deviations for Stimulated Recall of Main Ideas by Operational Level and Locus of Causal Context

<table>
<thead>
<tr>
<th>Causal Context</th>
<th>Operational Level</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preoperational</td>
<td>Concrete</td>
<td>Operational</td>
<td>Overall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>SD</td>
<td>x</td>
<td>SD</td>
<td>x</td>
</tr>
<tr>
<td>Cause Before</td>
<td>2.67 (2.12)</td>
<td>3.06 (1.62)</td>
<td>2.91 (1.81)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cause After</td>
<td>1.75 (1.67)</td>
<td>4.00 (2.00)</td>
<td>3.05 (2.15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>2.24 (1.92)</td>
<td>3.52 (1.83)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contrary to predictions the locus of causal context was nonsignificant. (F< 1.0) The interaction was also non-significant $F (1,36) = 2.37; p > .05.$

Table 5

Analysis of Variance Summary Table for Stimulated Recall of Main Ideas

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Level</td>
<td>17.33</td>
<td>1</td>
<td>17.33</td>
<td>5.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Causal Context</td>
<td>0.0</td>
<td>1</td>
<td>0.0</td>
<td>-a</td>
<td>1.00</td>
</tr>
<tr>
<td>Op.Level x C.C.</td>
<td>8.19</td>
<td>1</td>
<td>8.19</td>
<td>2.37</td>
<td>0.13</td>
</tr>
<tr>
<td>Error</td>
<td>124.42</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$a \quad F<1.0$
ii) Probed recall of main ideas

When probed recall of main ideas was treated as the dependent variable none of the results were significant (F < 1.0 in each case). (See Table C, Appendix). A table of means and standard deviations for probed recall is also in the appendix (Table D).

II. Quality of Recall

None of the research hypotheses relating to the differential recall of main ideas were supported. Operational level and locus of causal context had no significant effect on the percentage of main ideas recalled (F < 1.0 in both cases). The interaction was also nonsignificant (F < 1.0)

Table 6

Means and Standard Deviations for Proportion of Main Ideas Recalled (Transformed Scores) by Operational Level and Locus of Causal Context

<table>
<thead>
<tr>
<th>Causal Context</th>
<th>Operational Level</th>
<th>Preoperational</th>
<th>Concrete</th>
<th>Operational</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x  SD</td>
<td>x  SD</td>
<td>x  SD</td>
<td></td>
</tr>
<tr>
<td>Cause Before</td>
<td>1.75 (0.71)</td>
<td>3.40 (5.3)</td>
<td>2.70 (4.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cause After</td>
<td>1.62 (0.68)</td>
<td>1.86 (0.19)</td>
<td>1.76 (.46)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>1.69 (0.68)</td>
<td>2.66 (3.84)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The summary analysis of variance table is presented in the Appendix (Table E).
Subanalysis

An analysis of the transformed scores of stimulated recall revealed no significant effect of operational level $F(1,36) = 3.32, p > .05$, and no significant effect of locus of causal context ($F < 1.0$). The interaction was also nonsignificant $F(1,36) = 1.35; p > .05$.

Table 7

Means and Standard Deviations for Proportion of Stimulated Main Ideas Recalled (Transformed Scores) by Operational Level and Locus of Causal Context

<table>
<thead>
<tr>
<th>Causal Context</th>
<th>Operational Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preoperational</td>
</tr>
<tr>
<td></td>
<td>$\bar{x}$</td>
</tr>
<tr>
<td>Cause Before</td>
<td>1.76  (0.75)</td>
</tr>
<tr>
<td>Cause After</td>
<td>1.35  (0.86)</td>
</tr>
<tr>
<td>Overall</td>
<td>1.83  (0.54)</td>
</tr>
</tbody>
</table>

A summary analysis of variance table is presented in the appendix (Table F).

An analysis of the percentage of probed recall also revealed no significant effect of operational level, ($F < 1.0$) causal context, ($F < 1.0$) or their interaction ($F < 1.0$).
Table 8

Means and Standard Deviations for Proportion of Probed Main Ideas Recalled (Transformed Scores) by Operational Level and Locus of Causal Context

<table>
<thead>
<tr>
<th>Causal Context</th>
<th>Operational Level</th>
<th>Preoperational</th>
<th>Concrete</th>
<th>Concrete Overall</th>
<th>Concrete Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Preoperational</td>
<td>Concrete</td>
<td>Concrete Overall</td>
<td>Concrete Overall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.67 (1.03)</td>
<td>1.76 (0.94)</td>
<td>1.58 (0.96)</td>
<td></td>
</tr>
<tr>
<td>Cause Before</td>
<td></td>
<td>1.48 (0.93)</td>
<td>1.90 (0.50)</td>
<td>1.83 (0.75)</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td>1.73 (0.95)</td>
<td>1.72 (0.72)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The summary analysis of variance table is presented in the Appendix (Table G).

Chapter 4 dealt with the presentation of the results. Operational level significantly influenced the recall of main ideas. Most of the variability in recall of main ideas was contributed by stimulated recall. Locus of causal context was not significant. Similarly operational level by locus of causal context was not significant. There were no effects of operational level, causal context, or the interaction between them, on the proportion of recall of main ideas. A discussion of these results is presented in the succeeding chapter.
CHAPTER 5
DISCUSSION AND CONCLUSIONS

This study was conducted to test hypotheses relating to the influences of operational level and locus of causal context on the recall of main ideas by kindergarten children. Two dependent variables, quantity and quality of recall of main ideas, were analyzed using a fixed effects, two-way analysis of variance. The results of the analysis revealed that operational level significantly influenced recall of the number of main ideas, and that stimulated recall accounted for most of the variability. However, there was no difference in proportions of main ideas recalled.

Chapter 5 is devoted to a discussion of these results. Limitations of the study will be noted and some reflections on future research will be offered. Some conclusions will also be presented.

Limitations of the Study

This study was limited in terms of subjects and type of stimulus material used. The subjects were 40 five and six year old kindergarten children selected from an urban lower-middle to upper-middle class neighbourhood in the lower mainland of British Columbia. The material used was an example of one form of connected discourse, namely narrative prose. The form of the narrative, a simple story, (Mandler, 1977) also limits the generalizations that can be made.
Discussion of the Results

The effects of the two independent variables, operational level and locus of causal context, will be discussed separately.

I. Operational Level

i) Quantity of recall.

The significant main effect of operational level on number of main ideas recalled appeared due to stimulated recall. It is possible that the seemingly contradictory evidence regarding recall of main ideas by young children could have arisen because of different methods used to elicit recall. Korman (1945) used general eliciting techniques to get at the child's recall and Christie and Schumacher (1975) encouraged the children to recall as much as possible. In contrast Piaget had the children retell stories to other children. It is feasible that the differences in recall in these studies could, in part, be due to the listener. An adult listener with knowledge of the story is likely to respond differently, either overtly or covertly, than a child listener who has no knowledge of the story.

Stimulated recall functioned most effectively in discriminating these two groups of children. In contrast probing or direct questioning, did not serve to distinguish these two groups. Future research involving memory for stories might fruitfully employ stimulation techniques with young children, rather than explicit probed techniques.
ii) Quality of recall

This study failed to demonstrate that there were differences between operational levels in terms of the proportion of main ideas recalled. A possible source of the failure to reject the null hypothesis lies in the instructions which were given to the children. The children were told to listen to the story carefully and to retell as much of it as they could remember. Future research could investigate the effect of instruction and operational level and recall. For example, instructions to recall only the most important things might reveal significant differences between the two groups. One would anticipate that under these circumstances the concrete operational children would recall proportionately more of the main ideas than the preoperational children.

It is also feasible that conservation of number, although a pivotal concept in concrete operational thinking, is not powerful enough to discriminate between preoperational and concrete operational children. A more specific aspect of concrete operational thinking may be linked to qualitative differences in recall of main ideas. For example, selection of main ideas involves apprehension of part-whole relationships, therefore, class-inclusion tasks may serve to discriminate children who selectively attend to main ideas.

II. Locus of Causal Context

None of the hypotheses regarding the influence of causal context were substantiated. The failure to demonstrate an effect of causal context suggests several things. First, the lack of a
main effect of locus of causal context suggests that both versions of the story were equally easy or equally difficult to recall. It seems likely that familiarity with the particular cause-effect relationship in this story made both versions equally easy. Future research could make use of probes to determine the child's understanding of what is happening. Further research could be directed at evaluating the influence of an implicit, as opposed to an explicit, statement of the causal theme. The expression of unfamiliar as opposed to familiar cause-effect relationships might also lead to other results.

It is possible that there are developmental differences in the extent to which a structural feature is used as an organization and retrieval device. Previous work with the manipulation of theme (Dooling and Mullet, 1973; Thorndyke, 1977) was done with adult subjects. Perhaps young children are unable to take advantage of this feature because they do not attend to it. Instructions which made the theme apparent might lead to its utilization in the enhancement of recall.

Implications

The results of this study indicate that operational level does have an effect on recall of main ideas. Consequently, further research which examines the memory of children for stories should take into account the level of cognitive maturity of the subjects. This study also presented evidence that stimulated recall was a useful way of discriminating between groups of children. Stimulated recall, which entails more adult direction
than just spontaneous recall, but less adult direction than probing, might prove fruitful in further work on children's memory for prose.
REFERENCE NOTES


REFERENCES


Korman, T.A. O dinamike myshleniia v vosproizve-verdenii (On the dynamics of thought during recollection). *Dolshkol'noe Vospitanie*, 1944, 3-4, 30-34.


APPENDIX

TABLE A  Protocol for Piagetian Assessment
TABLE B  Questions Used in Probing
TABLE C  Summary ANOVA table for Number of Probed Recall of Main Ideas
TABLE D  Means and Standard Deviations for Number of Probed Recall of Main Ideas
TABLE E  Summary ANOVA table for Quality of Recall (Proportion of Main Ideas Recalled - Transformed Scores)
TABLE F  Summary ANOVA table for Quality of Recall (Proportion of Stimulated Main Ideas - Transformed Scores)
TABLE G  Summary ANOVA table for Quality of Recall (Proportion of Probed Main Ideas - Transformed Scores)
Table A

Protocol for Piagetian Assessment

Name ____________________________

Date of Birth ____________________

1. Single seriation:
   correctly ordered
   some trial and error
   out of sequence

2. Double seriation:
   correctly ordered
   some trial and error and/or out of sequence
   unable to order second sequence to first

3. Simple classification:
   a. attribute (colour or shape)
   b. attributes (colour and/or shape and/or size)
   c. attributes (animals)

4. 2-way classification (First form):
   object selected
   reason for selection

5. 2-way classification (Second form):
   object selected
   reason for selection

6. 3-way classification
   object selected
   reason for selection

7. Class inclusion (First form):
   more wooden blocks or more _____ (colour) blocks
   reason
8. Class inclusion (Second form)
   a) If all the birds flew away from the world would there be any animals left?
      yes/no
      why?
   b) If all the animals left for some reason would there be any birds left?
      yes/no
      why
   c) Are birds, animals?
      yes/no
      why?

9. Conservation of number:
   some/more/less
   reason

10. Conservation of quantity (continuous quantity)
    some/more/less
    reason

11. Conservation of quantity (discontinuous quantity)
    some/more/less
    reason
Table B

Probes

1. Where did Peter go?
2. How much did he have to spend?
3. Where did he put it?
4. Why did he put it there?
5. Where did he go the next day?
6. Why did he go there?
7. Why was Peter sad?
8. Why was he excited?
9. What did he find?
10. What did he do with it?
11. Why did he do that?
12. What happened to it?
13. What did his mother do?
14. Why did she do that?
Table C
Summary ANOVA table for Number of Probed Recall of Main Ideas

<table>
<thead>
<tr>
<th>SV</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op. Level</td>
<td>0.37</td>
<td>1</td>
<td>0.37</td>
<td>0.15</td>
<td>0.70</td>
</tr>
<tr>
<td>C.C.</td>
<td>0.01</td>
<td>1</td>
<td>0.01</td>
<td>_a</td>
<td>0.95</td>
</tr>
<tr>
<td>Op. Level X C.C.</td>
<td>1.93</td>
<td>1</td>
<td>1.93</td>
<td>0.78</td>
<td>0.38</td>
</tr>
<tr>
<td>Error</td>
<td>87.97</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a  F < 1.0
Table D

Means and Standard Deviations for Number of Probed Recall of Main Ideas

<table>
<thead>
<tr>
<th>Causal Context</th>
<th>Preoperational</th>
<th>Concrete Operational</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$</td>
<td>SD</td>
<td>$\bar{x}$</td>
</tr>
<tr>
<td>Cause Before</td>
<td>1.78  (1.72)</td>
<td>2.42  (1.73)</td>
<td>2.14  (1.71)</td>
</tr>
<tr>
<td>Cause After</td>
<td>2.25  (1.75)</td>
<td>2.00  (1.00)</td>
<td>2.11  (1.33)</td>
</tr>
<tr>
<td>Overall</td>
<td>2.00  (1.70)</td>
<td>2.22  (1.40)</td>
<td></td>
</tr>
<tr>
<td>SV</td>
<td>SS</td>
<td>df</td>
<td>MS</td>
</tr>
<tr>
<td>------------------</td>
<td>--------</td>
<td>----</td>
<td>-------</td>
</tr>
<tr>
<td>Op. Level</td>
<td>8.72</td>
<td>1</td>
<td>8.72</td>
</tr>
<tr>
<td>C.C.</td>
<td>6.78</td>
<td>1</td>
<td>6.78</td>
</tr>
<tr>
<td>Op. L X C.C.</td>
<td>4.84</td>
<td>1</td>
<td>4.84</td>
</tr>
<tr>
<td>Error</td>
<td>317.37</td>
<td>36</td>
<td>8.81</td>
</tr>
</tbody>
</table>
Table F

Summary ANOVA table for Quality of Recall
(Proportion of Stimulated Main Ideas - Transformed Scores)

<table>
<thead>
<tr>
<th>SV</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op. Level</td>
<td>1.18</td>
<td>1</td>
<td>1.18</td>
<td>3.32</td>
<td>0.07</td>
</tr>
<tr>
<td>C.C.</td>
<td>0.35</td>
<td>1</td>
<td>0.35</td>
<td>0.99</td>
<td>0.32</td>
</tr>
<tr>
<td>Op. Level X C.C.</td>
<td>0.48</td>
<td>1</td>
<td>0.48</td>
<td>1.35</td>
<td>0.25</td>
</tr>
<tr>
<td>Error</td>
<td>12.75</td>
<td>36</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table G

Summary ANOVA table for Quality of Recall
(Proportion of Probed Main Ideas - Transformed Scores)

<table>
<thead>
<tr>
<th>SV</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op. Level</td>
<td>0.63</td>
<td>1</td>
<td>0.63</td>
<td>0.85</td>
<td>0.36</td>
</tr>
<tr>
<td>C.C.</td>
<td>0.01</td>
<td>1</td>
<td>0.01</td>
<td>0.01</td>
<td>0.91</td>
</tr>
<tr>
<td>Op Level X C.C.</td>
<td>0.25</td>
<td>1</td>
<td>0.24</td>
<td>0.33</td>
<td>0.56</td>
</tr>
<tr>
<td>Error</td>
<td>26.80</td>
<td>36</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>